REVIEW REPORT

on the

PHYSICS PROGRAM

JANUARY, 2001

EXECUTIVE SUMMARY

The UCC Physics Program can boast accomplishments far out of proportion to its size. It will launch its Co-op option in Fall, 2001; it will soon implement a joint applied Physics degree with the Trades and Technology Division; and the proportion of its graduates employed in Physics-related jobs matches, if not exceeds, those from other science disciplines such as Biology and Chemistry.

Physics enrolments are comparable to, if not better than, those of most other Physics programs in the province; however, Physics enrolments are lower than those of other academic programs at UCC. Twice in the last five years the program has been put on notice of deletion by the UCC administration, and twice it has survived. But the only way in which it can secure its future seems to be by increasing enrolments. The Review Committee suggests several strategies to this end, some of which are already practised by the Physics faculty, and others of which should be considered for adoption. These strategies, in conjunction with the new programming options, may well promote higher enrolment levels in Physics classes.

The Review Committee external representatives thoroughly examined the Physics curriculum and make several suggestions for curriculum adjustment to the UCC faculty. The Committee feels that now is the time to harness the energy and ideas of recently-recruited faculty to make changes to the program. The Committee also urges the Dean, Sciences and Health Sciences, and the Physics faculty to pursue capital equipment depreciation policy initiative recently broached with the Budget Planning and Priorities Committee as a result of the Chemistry Program Review (July, 2000).

TABLE OF CONTENTS

PHYSICS PROGRAM REVIEW COMMITTEE MEMBERS

CHAIR	Dr. Jack Bradshaw, Mathematics and Statistics, UCC
ASSISTANT CHAIR	Ben Giudici, Electronics, UCC
EXTERNAL REPRESENTATIVE	George McGuire, Chair, Department of Physics, UCFV
EXTERNAL REPRESENTATIVE	Dr. Colin Scarfe, Professor of Physics, UVIC
RESOURCE PERSON	Dr. Onkar Rajora, Physics, UCC
RESOURCE PERSON	Dr. Doug Bickley, Chair, Physical Sciences/Engineering, UCC
DEAN	Dr. Colin James Dean, Sciences and Health Sciences, UCC
REVIEW COORDINATORS	Dr. Alastair Watt Director, Institutional Research and Planning, UCC Dorys Crespin-Mueller, Research Analyst Research Analyst, Institutional Research and Planning, UCC Michaline Novak, Research Analyst Research Analyst, Institutional Research and Planning, UCC

CHRONOLOGY OF THE PHYSICS PROGRAM REVIEW

The Physics Program Review was launched on May 2, 2000. A planning meeting with members of the Physics Department and Institutional Research and Planning was held to discuss program review procedures and questionnaire design. Guidelines and examples of required documents for the program review were provided. A second meeting was held on May 30, 2000 with members of the Physics Department and Alastair Watt to continue discussions of the items listed above. Questionnaires were refined and finalized by August 17, 2000.

Stakeholders in the Physics Program were surveyed on the following dates:

Former Students (1996-00):	August 28, 2000
Faculty:	August 25, 2000
Current Students (2nd Year):	November 3, 2000
Current Students (Yrs. 3, 4):	November 3, 2000

Reminders were mailed to non-responding former students on September 18, 2000. All faculty had responded by October 2, 2000. The Office of Institutional Research attempted to contact non-responding students by phone between October 5 and 10.

The cut-off date for all responses was November 7. Information binders were sent to members of the Physics Program Review Committee on November 14, and that committee met to analyze the data and form its recommendations on December 11 and 12, 2000.

PROGRAM BACKGROUND

When Cariboo College opened in 1970, the Physics faculty were Roland Cobb and Tom Walton. As laboratory demonstrator, Ed Baron was responsible for laboratories in Chemistry, Physics and Biology. Initially, the courses offered in Physics were at the first year level and meant for transfer to the universities. Eventually more courses were added so that by 1989, the department was offering a full complement of courses up to the second year Physics level in addition to the service courses required in the departments of Computer Aided Design and Drafting (now called EDDT – Engineering Design and Drafting Technology) and Respiratory Therapy. The department also offered and (still offers) courses in the first year Engineering Transfer Program.

In September 1989, the institution began to offer upper level (third and fourth year) courses in association with the three major universities in B.C. in several disciplines including Physics. The first degree offered in sciences was the B.Sc. in general science in collaboration with the University of British Columbia. The B.Sc. (major) in Physics was introduced in 1991, and up until 1996 the degree was awarded in the name of UBC. UCC now offers science degrees in its own name.

ADMISSIONS DATA

PROGRAM REQUIREMENTS

Major in Physics

First Year	
BIOL 110 or 111 or 120 or 121 or GEOL 111 or 205	3 credits
CHEM 110/120 or 111/121	6 credits
COMP 100	3 credits
ENGL 110 or 111	3 credits
(or two of ENGL 110, 111 or 121)	(6 credits)
MATH 113/123 or 114/124	6 credits
PHYS 110/120 or 115/125	6 credits
Electives	0-3 credits
Second Year	
(Admission requirement: Minimum C+ grade in first year Physics course)	
ENGL 229 or 230	3 credits
MATH 211	3 credits
MATH 212	3 credits
MATH 224	3 credits
MATH 317	3 credits
PHYS 200	3 credits
PHYS 209	3 credits
PHYS 215	3 credits
PHYS 220	3 credits
Elective	3 credits
Third and Fourth Years	
(Admission requirement: Students must obtain better than the minimum passing mark to enrol in a Physics Major Program)	
PHYS 308	3 credits
PHYS 311	3 credits
PHYS 312 or MATH 316	3 credits
PHYS 313	3 credits
PHYS 319	3 credits
PHYS 412	3 credits
Physics Electives	12 credits
Electives	30 credits

Physics Electives include:	
PHYS 314	3 credits
PHYS 315	3 credits
PHYS 318	3 credits
PHYS 414	3 credits
PHYS 448	3 credits
Note: Not all upper level Physics courses are offered every year, but they will be alternated over a two-year period.	

TABULAR SUMMARY OF QUESTIONNAIRE RESPONSES
PHYSICS PROGRAM REVIEW

Recipient	# Sent	# Completed & Returned	% Returned
Faculty	9	9	100%
Current Students:			
Year 2	18	18	100%
Years 3/4	9	9	100%
Former	29	19	73%
TOTAL	**65**	**55**	**89%**

Former Students:

Returned Envelopes = 3

Non-Respondents = 7

SUMMARY OF QUESTIONNAIRE RESPONSES

STUDENT RESPONSES

The responses of former, upper level, and lower level students were very consistent, allowing the summaries of their responses to be grouped together.

Admissions and Advising
Students are split in their opinions on whether course selection advising for 1st and 2nd year is satisfactory while guidance received for upper level courses was rated excellent. Students felt they are more likely to receive good advising from faculty members or B.Sc. advisors than counselors.

Structure and Curriculum
Students would greatly appreciate more course selection especially at the upper level. The alternation of year 3 and 4 course offerings is viewed as highly undesirable. Students spoke highly of the benefits of project based lab work especially in the 3rd and 4th years. Some students would have appreciated more opportunity to evaluate courses rather than the instructors. One student suggested PHYS 319 should emphasize electronics topics more relevant to industry.

Learning Process
Students find the Physics program enjoyable and speak highly of faculty approachability and helpfulness. A number of students felt the program workload and difficulty to be higher than in other areas but this is to be expected.

Resources
Most students make little use of the library, preferring the Internet as a more up to date resource for Physics information. A number of comments were made concerning the need for newer laboratory equipment. Some felt study space in the Science building is inadequate.

Faculty Resources
Universally, students feel instructors always made time for them and that faculty credentials have given the Physics courses and program credibility. Students very much appreciate the approachable and knowledgeable Physics faculty but feel that more faculty are needed to ensure program security and to allow more courses to be offered.

Student Skills and Abilities
Students generally felt they were well prepared by the program but that more computing, independent research skills, oral communication skills, and team work skills would benefit the program.

Strengths
Students universally cited faculty quality and dedication, approachability of faculty, and small class size, as the primary strengths of the Physics program.

Limitations
The limitations identified by students are the shortage and alternation of upper level course offerings, the small number of faculty, the need for updated lab equipment, and low enrolment.

One Significant Change

The most commonly suggested significant changes by students were:

- increased upper level course selections
- elimination of alternation in 3rd and 4th year offerings
- incorporating Co-op into the Physics program
- addition of a faculty member
- stimulation of enrolments by increasing awareness of opportunities in Physics.

FACULTY RESPONSES

Program Objectives

Several responses suggest setting goals and realizing program objectives have been slowed due to stresses created by uncertainty and a perceived lack of institutional support. Modernizing laboratory equipment should be made a high priority.

Admissions and Advising

Two faculty members feel the department should take a more active role in advising, even at the first year level to alleviate some of the problems students have raised around the advising issue.

Structure and Curriculum

Faculty feel the limited and alternating upper level course offerings take away from the logical progression of the program and make it very inflexible. Several pointed to lack of faculty as being a major limitation. One individual felt the applied emphasis of the program is an important strength.

Learning Process

One individual feels the student to faculty ratios in 2nd, 3rd, and 4th years are conducive to effective learning but that student numbers in first year courses are far too high. Another noted that UCC's primary focus on instruction highlights the learning process at the expense of research.

Resources

Faculty feel UCC library resources are inadequate for them to keep abreast in their professions. Aging laboratory equipment is also a major concern.

Faculty Resources

Faculty agree that more staff are urgently needed in the program if existing course offerings are to be maintained and a wider variety offered in the future.

Articulation and Liaison

Communication within the Physics group is felt to be productive. Several members suggested department relations with the Dean are not what they could be. One member feels the faculty should interact more with physicists at OUC, UCFV, and UNBC, just as they always have with local high school teachers.

Outcomes

One member of the department suggested 2nd year offerings could be broader to provide more ease of transfer for students headed elsewhere.

Student Skills and Abilities

Faculty feel students finish the Physics B.Sc. with a very good skill set. One member feels more courses in computer programming and numerical methods would improve the program.

Major Strength

The following strengths were clearly indicated in faculty responses:

- students receive a broad exposure since faculty are highly dedicated to teaching.
- faculty are well educated, conscientious, and experienced.
- the faculty provide several service courses to other programs.

Major Limitation

Insufficient courses offerings, alternation of upper level offerings, and too few faculty are considered significant limitations. There is a sense of non-support from administration, and that faculty must do more than those in larger programs in order for the program to survive.

One Significant Change

Two members indicated another faculty member should be hired. Two others suggested eliminating upper level course alternation so courses would be offered each year. One suggested reviewing and modifying course content to ensure all topics required of an undergraduate physics program are indeed covered in a suitable order.

Major Changes Affecting the Program

Issues that may have the most positive future impact include:

- introduction of Co-op to the Physics program.
- development of a joint degree with Trades and Technology
- increasing demand for Physics graduates.

Issues that may have the most negative future impact include:

- inability to acquire funds to hire another instructor
- discouragement over the possibility of further cuts

Additional Comments

- there is a sense that promotion, encouragement, support, and commitment to the Physics Program from administration are lacking.
- there is a need to create a local demand for Physics graduates by promoting employment in Physics and making people aware of career prospects.
- with two retired members having been replaced with new faculty, and new courses being added in astronomy, it is difficult to see how the department will maintain its current program for the next two years.

STRENGTHS OF THE PHYSICS PROGRAM

The Review Committee has identified the following strengths in the Physics Program:

1. A broadly experienced and highly qualified faculty who have created a desirable learning environment through a strong commitment to teaching. Faculty have made themselves very accessible and have created good working relationships with students.

2. The faculty have been able to develop several effective services courses in response to the needs of other programs at UCC.

3. The program is well placed to take advantage of diversity within the institution by offering unique programming options such as the joint degree being developed with the Trades and Technology Division.

4. The program has a group of satisfied alumni and current students. Program graduates are finding rewarding work directly related to their Physics degrees and job prospects for physicists both in the provincial and national workplaces are known to be on the increase.

5. The program offers a well rounded curriculum with a good balance of theoretical and applied courses, and co-operative work experience is being introduced in Fall, 2001.

6. Laboratory activities are well coordinated and integrated into the program courses.

7. Good physical facilities.

AREAS OF THE PHYSICS PROGRAM WHICH CAN BE IMPROVED (WITH RECOMMENDATIONS)

Through interviews and examination of the data, the Review Committee identified the following main areas for improvement in the Physics Program: enrolments, staffing, curriculum, operating capital, and administrative support.

1. Enrolments:

Although enrolments in the UCC Physics Program are, and have been, better than those at most like-sized institutions throughout British Columbia and Canada, in the last few years low enrolment figures in comparison with other academic programs have been a source of concern for UCC administration and faculty alike. On two occasions in the last five years, in 1996 and again in 2000, the UCC Physics Major Program has been put on notice of deletion if efficiencies were not effected. In 1996, it survived at the cost of a faculty position, a laboratory demonstrator position, and the relinquishment of 12 hour scholarly activity contracts by two of its faculty; in 2000, it was saved only by a more generous than usual 8% increase in UCC operating budget by the Ministry of Advanced Education, Training and Technology. Clearly, however, the problem of low enrolments has not gone away, and constitutes a perennial threat to the Physics major. The only way to mitigate this threat is for this program to increase its enrolments. The Review Committee is aware of the efforts made by past and present faculty to maintain and bolster enrolments, through liaison with high schools in the UCC region, through participation in Science Night and other promotional events, and through fostering of the UCC Physics Club. And while it applauds these initiatives, it urges the Physics faculty to renew their efforts to raise the public consciousness about Physics by intensifying (or adopting) some or all of the following strategies:

- **extending their high school liaison activities beyond Kamloops (indeed, beyond the UCC region);**
- **utilizing the Public Relations Department to advertise the Physics Program, via brochures, press columns and aggressive recruitment drives throughout the province;**
- **creating stronger lines of communication with industries that might appreciate (and hire) those with a Physics education;**
- **working more closely with organizations such as the Science Council of BC and UCC's own Advanced Technology and Innovation Centre;**
- **inviting UCC Physics graduates and undergraduates to act as ambassadors for the UCC Physics Program by giving informational talks to services groups, high schools, clubs and organizations;**
- **hosting regional Physics competitions for high school students (like the annual Math competition)**
- **updating the Physics website; perhaps showcasing graduates and linking to employer websites**

Action: Physics faculty

These activities, in conjunction with the new programming initiatives mentioned in the next section, will hopefully boost enrolments in the Physics Program.

2. Staffing:

A. Impact of the Co-op option and joint Degree with Electronics

The Physics faculty is planning to add a Co-op option to the Physics degree and is developing a joint degree with Electronics. The Committee feels that these initiatives will enhance the enrolment in Physics and strongly supports them. In order to introduce Co-op and the joint degree with Electronics successfully, the Physics faculty indicate it will be necessary to offer Physics 309 and Physics 310 every year, instead of (as is currently the case) in two-year rotations. The Committee concurs with this need and agrees that the success of Co-op and the joint degree may be compromised without offering these courses every year. Therefore, the Committee recommends that,

i) **with the introduction of Co-op and the joint degree with Electronics, that Physics 309 and Physics 310 be offered every year. This will have impact on staffing resources, and will necessitate an increase of 0.5 of a faculty FTE in Physics.**

Action: Physics faculty; Dean, Sciences and Health Sciences; Vice-President, Instruction and Student Services

B. Scholarly Activity Positions

The Dean of Sciences and Health Sciences informed the Committee of his commitment to convert two 16 hour faculty positions into 12 hour (scholarly activity) positions. The Committee strongly supports this initiative. The external representatives noted that it is extremely difficult for a faculty member to re-engage in research after a four or five year hiatus, as has been the case with UCC Physics faculty since 1996. Therefore, the sooner new faculty members are given research release time, the more likely they are to re-engage successfully in research and increase the scholarly productivity of the Physics faculty.

C. General

The strongest and most consistent message from students and faculty was the lack of course selection at the 3rd and 4th year level. The Committee agrees that a larger selection of courses at the 3rd and 4th year level would be desirable, but also recognizes the reality of the impact of student demand on the ability of a program to increase course selection. Okanagan and Fraser Valley Physics Programs are experiencing similar restraints. The Committee understands that the Physics Program lost a faculty member and a lab demonstrator position in 1996 due to low enrolments in Physics. The Committee identified a number of factors which argue for the need to re-instate these positions; namely:

i) A need to offer Physics 309 and Physics 310 every year

ii) A new service course for Electronics: Physics 158

iii) The large number (11) of part-time lab sections

and

iv) The desirability to provide research release (12 hour positions) to current faculty.

Summary

For the Physics faculty to implement Co-op, introduce a joint degree with Electronics, and add a new service course (Physics 158), additional staffing is necessary. Failure to provide additional staffing will jeopardize the success of both the Co-op initiative and the joint degree. The re-instatement of the faculty position may also allow for the addition of one or two 3rd and 4th year courses. The Committee therefore recommends:

i) **that the faculty and the lab demonstrator positions cut in 1996 be re-instated as soon as possible.**

Action: Dean of Sciences and Health Sciences; Vice-President, Instruction and Student Services; Vice-President, Administration and Finance

3. Curriculum:

The Committee reviewed the course outlines, calendar descriptions, and survey response data, and conducted personal interviews with students and faculty on the Physics curriculum. The Committee recommends that the Physics faculty review the course selection and in doing so, address the following concerns:

a) **The external representatives noted a weakness in the offerings in Electricity and Magnetism. In their opinion, most of the material in Physics 311 could be offered at the 2nd year level, allowing for additional topics in the 3rd year course.**

b) **Two specialized courses, Physics 209 - Methods of Measurement and Physics 318 - Acoustics, developed by faculty no longer teaching these courses, were questioned with respect to their appropriateness by some students and some faculty. The Committee noted that the statistics topics in Physics 209 overlap with the content of Statistics 200. An external member of the Committee recommended a 3rd year laboratory course containing labs relevant to the 3rd year Physics courses in which students are enrolled as well as some of the labs from Physics 209. This would allow for the replacement of Physics 209 with a second year Electricity and Magnetism course. The Committee also noted strong support for Physics 209 by some faculty. The Committee noted some concern about the content of Physics 318 - Acoustics and whether or not, with the limited number of courses available, another course might not be appropriate. The external representatives were not aware of a similar course at other institutions, but the Committee did not feel it had sufficient information to comment on the appropriateness of Acoustics relative to other possible Physics courses. Therefore, the Committee is only raising the issue: "Is Acoustics an appropriate course in a severely limited range of course offerings and is there another course which would be more appropriate?"**

c) **The number of courses at the 3rd and 4th year level was a concern of all students and faculty. A Physics major must take all 3rd and 4th year Physics courses currently available. An external representative suggested that, even if funding is not available, the number of courses be expanded to provide more choices for students. For example, instead of mandating the courses being offered, provide the students with a list of courses which will be offered (core) and another list of courses which could be offered depending on student demand.**

d) **The Committee noted the recent turn-over in faculty in the Physics Department. In reviewing the course offerings, the Committee recommends the Department take into account the changes in the strengths of the new faculty along with offering courses compatible with the joint degree in Electronics.**

Action: Physics Faculty

4. Operating Capital:

The Physics Program received major funding for operating capital in 1989 to equip the 3rd and 4th year labs and in 1992 to equip the new labs in the expansion of the Science Building. Looking forward, there is going to be significant cost in replacing worn-out and out-dated equipment. A huge discrepancy exists between the current Physics Program capital equipment budget (last year $12,000, plus $5,000 for computer acquisition) and the average annual budget necessary to keep the lab equipment operational and up to date. The projected operating capital budget needs of the Physics Program for equipment replacement over the next 20 – 25 years are $827,000 (averaging $40,000 per year) (See Appendix H). Clearly, an annual budget of $12,000 is not compatible with the projected operating capital budget needs.

The Committee concurs with the recommendations of the Chemistry Program Review Committee, namely:

a) **that the Vice President, Administration and Finance, or his designate, develop an institutional policy for purchase and replacement of capital equipment, such a policy to account for expected useful life of equipment from the outset and allocate the necessary funds on an annual basis for its maintenance, repair, and eventual replacement;**

Action: Vice-President, Administration and Finance

b) **that the Divisional Dean set up a five-year rolling plan for equipment replacement;**

Action: Dean, Sciences and Health Sciences

5. Administrative Support

There is a perception, on the part of some faculty, that support from administration is lacking. This is not surprising given the reduction in Physics staff in 1996 and the potential loss of the Physics major in 2000. Evidence to the Committee, however, indicated strong support from the Dean of Sciences and Health Sciences for maintaining the Physics degree (See Appendix I) and enthusiastic support for the program initiatives with respect to the Co-op and the joint degree with Electronics. The Committee observed that the Physics faculty feel under attack, but the Committee also observed that the faculty may not have been sufficiently pro-active in promoting their program. Looking forward, the Committee believes that the new initiatives will enhance enrolment and alleviate the main source of conflict between the faculty and Administration.

a) **With respect to the implementation of the Co-op and the joint degree, the Physics faculty should clearly detail the support needed for successful implementation of these initiatives, and the Dean should communicate clearly to the faculty how he will be able to assist them.**

Action: Physics Faculty, Dean of Sciences and Health Sciences

APPENDIX A
METHODOLOGY

The data were collected in the following ways:

1) Consultation took place with program faculty and members of the Department of Institutional Research on the design of the surveys.

2) Surveys were administered to Physics Program faculty, current students and former students. All data were processed using SPSS to achieve frequency rates and mean responses. Subjective comments for each group were recorded separately and anonymously.

3) "Descriptive Data" on Physics Program's objectives, course outlines, etc., were solicited from Joanne Rosvick, and Onkar Rajora, Physics instructors.

4) Data on annual seat utilization rates, graduation rates, gender and grade distributions were provided by the Office of Institutional Research and Planning.

5) The following people associated with the program participated in the review process or were interviewed:

- Dr. Normand Fortier, Physics Program faculty member
- Dr. Joanne Rosvick, Physics Program faculty member
- George Weremczuk, Physics Program Laboratory Demonstrator
- Mike Bayer, 4th Year Student, Physics Program

APPENDIX B
SEAT UTILIZATION – FALL SEMESTER ONLY

The following takes into account the stable enrollment and capacity for the following semesters: fall 1997, fall 1998, fall 1999 and fall 2000

Physics

Year	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollment	Total capacity (#of seats)	Total % utilization
1997	361	393	92%	34	47	72%	395	440	90%
1998	385	413	93%	33	50	66%	418	463	90%
1999	378	431	88%	18	44	41%	396	475	83%
2000	439	479	92%	27	47	64%	466	521	89%

Comparison with other Science disciplines for the same period:

Fall 1997

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollment	Total capacity (#of seats)	Total % utilization
CHEMISTRY	481	526	91%	102	133	77%	583	659	88%
BIOLOGY	788	830	95%	235	236	100%	1023	1066	96%
PHYSICS	361	393	92%	34	47	72%	395	440	90%

Fall 1998

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollment	Total capacity (#of seats)	Total % utilization
CHEMISTRY	479	489	98%	93	163	57%	572	652	88%
BIOLOGY	808	810	100%	261	311	84%	1069	1121	95%
PHYSICS	385	413	93%	33	50	66%	418	463	90%

Fall 1999

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollment	Total capacity (#of seats)	Total % utilization
CHEMISTRY	466	501	93%	109	142	77%	575	643	90%
BIOLOGY	876	900	97%	270	308	88%	1146	1208	95%
PHYSICS	378	431	88%	18	44	41%	396	475	83%

Fall 2000

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollmen t	Total capacity (#of seats)	Total % utilizati
CHEMISTRY	487	543	90%	137	153	90%	624	696	90%
BIOLOGY	847	888	95%	295	318	93%	1142	1206	95%
PHYSICS	439	479	92%	27	42	64%	466	521	89%

1997/98 (Fall/Winter)

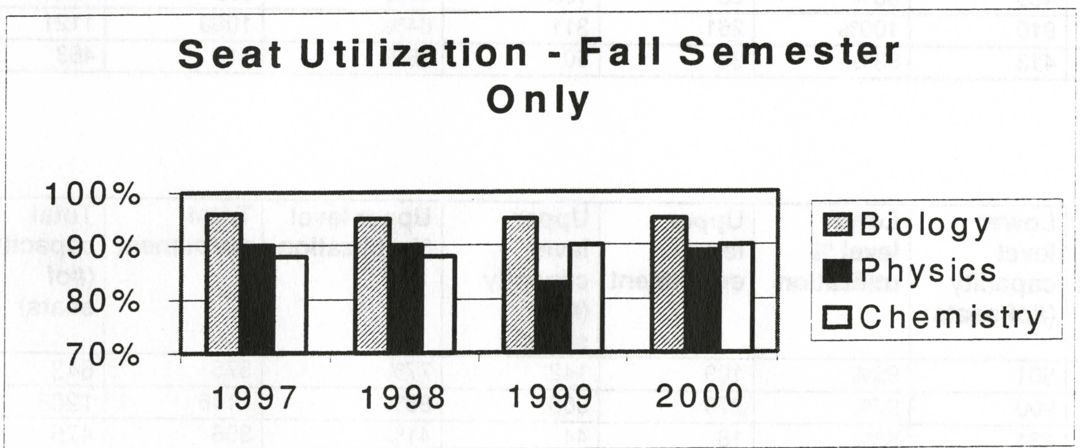
Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollmen t	Total capacity (#of seats)	Total % utilizati
CHEMISTRY	873	987	88%	192	322	60%	1065	1309	81%
BIOLOGY	1459	1606	90%	511	533	96%	1970	2139	92%
PHYSICS	702	797	88%	55	73	75%	757	870	87%

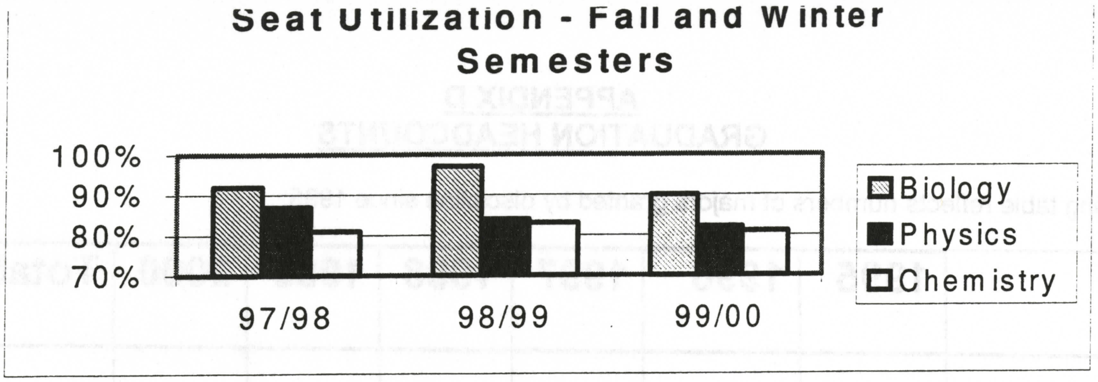
1998/99 (Fall/Winter)

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollmen t	Total capacity (#of seats)	Total % utilizati
CHEMISTRY	849	910	93%	158	298	53%	1007	1208	83%
BIOLOGY	1517	1514	100%	507	578	88%	2024	2092	97%
PHYSICS	642	740	87%	51	82	62%	693	822	84%

1999/00 (Fall/Winter)

Discipline	Lower level enrollment	Lower level capacity (#of seats)	Lower level % utilization	Upper level enrollment	Upper level capacity (# of seats)	Upper level % utilization	Total enrollmen t	Total capacity (#of seats)	Total % utilizati
CHEMISTRY	828	978	85%	196	288	68%	1024	1266	81%
BIOLOGY	1599	1773	90%	539	598	90%	2138	2371	90%
PHYSICS	691	819	84%	36	70	51%	727	889	82%





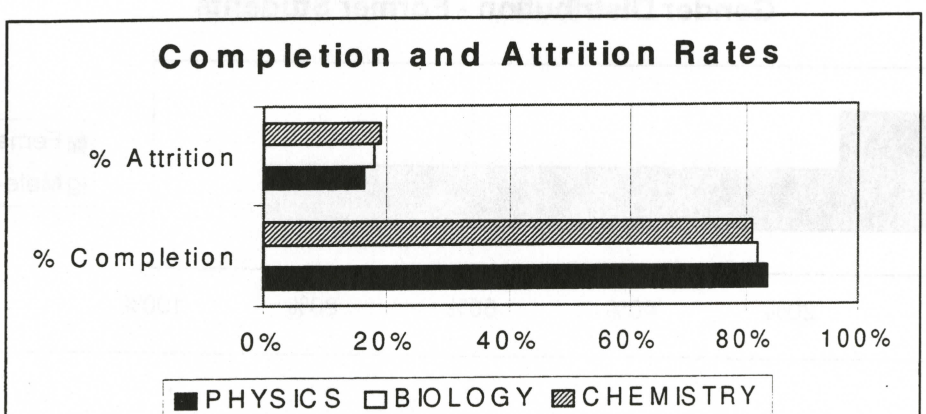
APPENDIX C
PHYSICS PROGRAM COMPLETION RATES

Completion rates may be determined by subtracting "fail" (F), "did not complete" (DNC), "withdrew" (W), "audit" (AUD) from enrollment numbers. Hence, over the period of Fall 1997, Winter 1998, Fall 1998, Winter 1999, Fall 1999 and Winter 2000 the following completion and attrition rates are found:

	Total Registrants	Total Passes	Total Attrition	% Completion	% Attrition
1ST year courses	2390	2007	383	84%	16%
2nd year courses	174	155	19	89%	11%
3rd/4th year courses	151	104	47	69%	31%
Total	2715	2266	449	84%	16%

Completion rates compared to other Science disciplines:

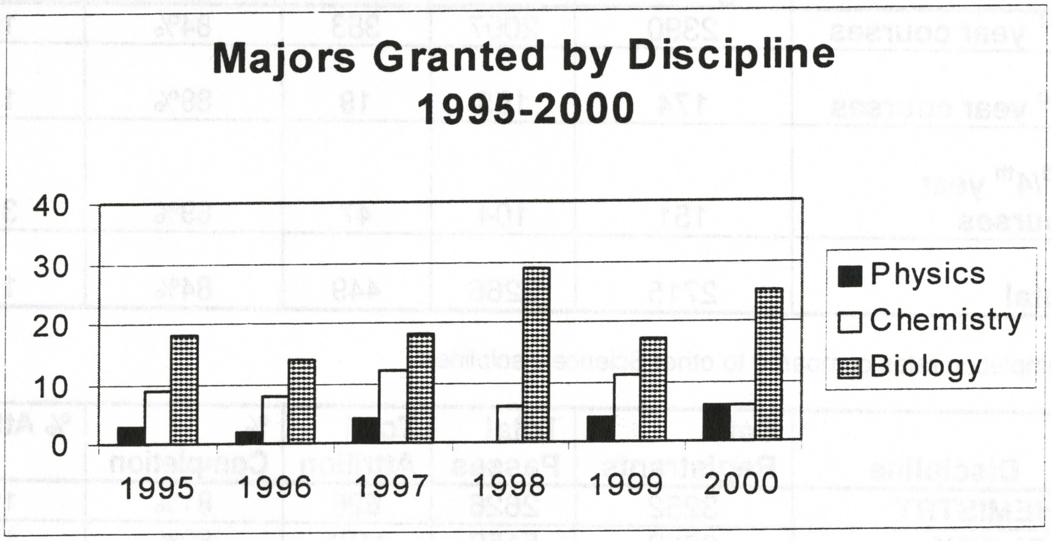
Discipline	Total Registrants	Total Passes	Total Attrition	% Completion	% Attrition
CHEMISTRY	3252	2626	626	81%	19%
BIOLOGY	6259	5158	1101	82%	18%
PHYSICS	2715	2266	449	84%	16%



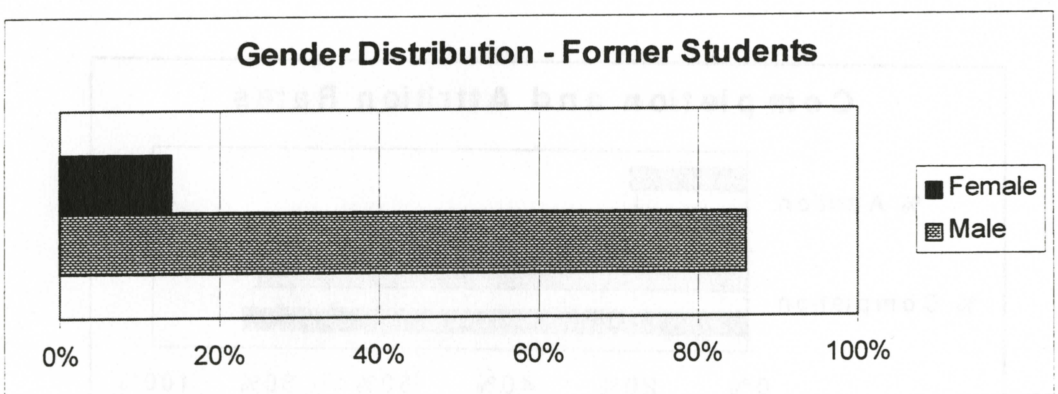
APPENDIX D
GRADUATION HEADCOUNTS

The following table reflects numbers of majors granted by discipline since 1995:

	1995	1996	1997	1998	1999	2000	Total
PHYSICS	3	2	4	0	4	6	19
CHEMISTRY	9	8	12	6	11	6	52
BIOLOGY	18	14	18	29	17	25	121



APPENDIX E
GENDER RATIO



APPENDIX F
EMPLOYMENT PROSPECTS[1]

PHYSICISTS

Nature of the Work

Physicists conduct theoretical and applied research to extend knowledge of 'natural phenomena'. They also develop new processes and devices in fields such as electronics, communications, power generation and distribution, aerodynamics, optics and lasers, remote sensing, medicine and health. They are employed in a variety of industries, including electronic, electrical and aerospace manufacturing companies, in computer and telecommunications companies, in power utilities, in university and government research laboratories, in hospitals, and in a wide range of other processing, manufacturing, research and consulting firms.

This occupational group also includes metallurgists, soil scientists, and physical science occupations which are not elsewhere classified and involve the conduct of theoretical and applied research in fields of physical science. They are employed by governments, educational institutions and a wide range of industrial establishments.

Astronomers conduct observational and theoretical research to extend knowledge of the universe. They are employed by government agencies and universities.

Main Duties

Physicists design and conduct research in experimental and theoretical Physics, carry out analysis of research data and prepare research reports. They also participate in both research and development teams that work on the design and development of experimental, industrial or medical equipment, as well as instrumentation and procedures.

Astronomers design and conduct observational surveys, conduct detailed analyses, and develop numerical models to extend knowledge of celestial bodies and radiation received from the component parts of the universe. They also help develop instrumentation and software for astronomical observation and analysis.

Education and Training

Persons in this field generally require at least a bachelor's degree in a relevant discipline such as Physics, astronomy, chemistry, biochemistry, geology, geochemistry, geoPhysics or meteorology. A master's or doctoral degree is usually required for physicists, astronomers, geophysicists, and research positions such as research chemist and research meteorologist. Accumulated experience or further education is necessary in order to remain competitive. Familiarity with computer programs relevant to the particular discipline is required.

Working Conditions

Physicists usually work regular hours in offices and/or laboratories but may be required to work longer hours if they are intensely involved in their research. In general, the work is not hazardous. Some physicists may spend time working away from home in order to use national or international facilities with unique equipment.

Astronomers who make observations may need to travel and routinely work at night in remote locations where observatories are located.

[1]Source: BC Work Futures (NOC 211)

In 1994, the average annual earnings for all workers in this occupational group (Physical Science Professionals) were $45,600 with the 93% who worked full time for the full year receiving $57,300. The respective all-occupation averages were $28,700 and $39,800.

The number of employed workers rose from 2,250 in 1990 to 2,820 in 1995. Nearly half (49%) of this group are geologists, geochemists or geophysicists, 31% are chemists and 10% are physicists or astronomers.

The rate of unemployment for the entire group is about the same as the all-occupation average, but it is higher among geologists, geochemists and geophysicists, lower among physical science professionals such as metallurgists, soil scientists and materials scientists, and it is non-existent among physicists, astronomers and meteorologists.

Physical scientists are employed in a wide range of industries but the largest concentrations work in professional business services (30%), education (11%), the federal government (11%) and services incidental to mining (e.g. contract drilling) (10%). About 62% of this group are located in the Lower Mainland, 23% are on Vancouver Island, 11% are in the Okanagan/Kootenay and 5% (a proportion which may have risen with the opening of the University of Northern B.C. in Prince George) are in Northern B.C.

Women make up only 16% of the entire group and account for a mere 6% of physical science professionals such as metallurgists, soil scientists and materials scientists, but they make up 29% of chemists.

Employment Prospects

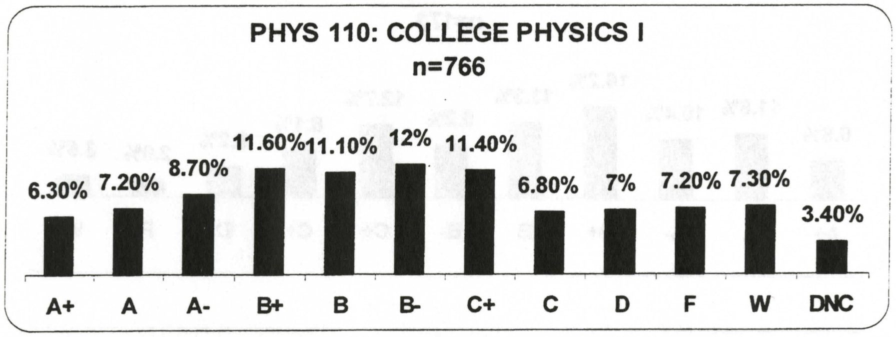
Employment growth between 1995 and 2005 for professionals in the physical sciences is expected to be generally close to or slightly above the average for all occupations. Certainly scientists will be faced with government restraint in funding for research but technology is opening up many areas for development and industrial use. Any field that has commercial applications will see employment levels rise and receive private sector support.

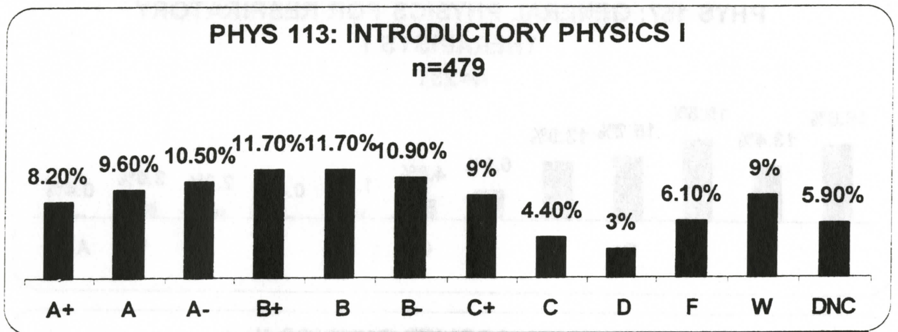
Physicists and astronomers as well as chemists are expected to see a growth rate that is about as fast as the average. The occupational outlook is reasonably positive for chemists because of the growing importance being given to the environment, water quality, quality control, and occupational health and safety. Communication and information involving quality control in health and the environment along with national and international consultation are new areas that could create work for chemists. In addition, those who have acquired extensive experience can direct their careers toward leading projects with junior scientists and groups of technicians.

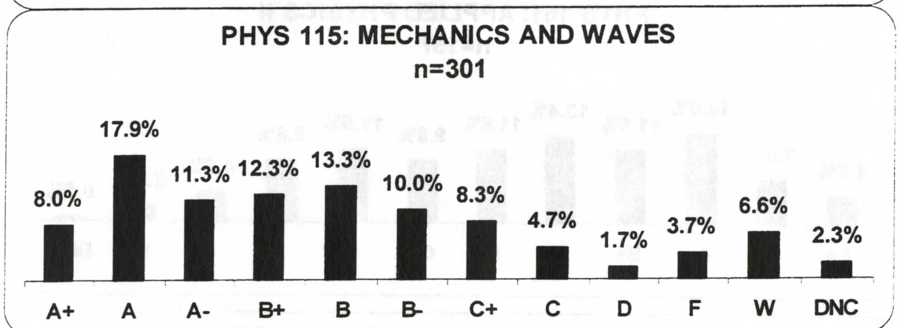
Trends and Projections

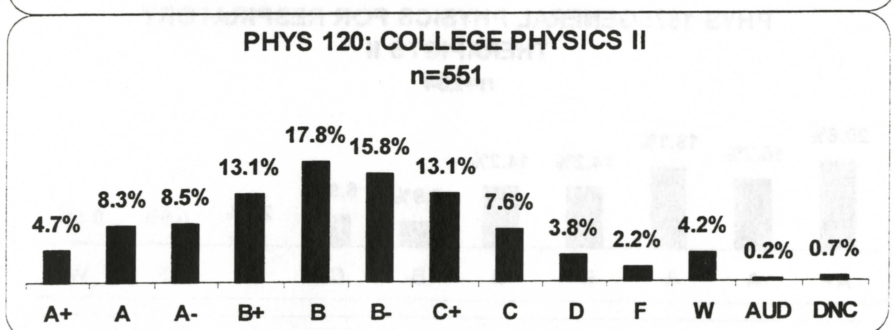
	1990	1995	2005
Number Employed	2250	2820	3540
Estimated Openings 1995-2005	**Growth (Net)**	**Attrition**	**Total**
	710	590	1300
Annual Growth 1995-2005	2.3%		
Main Industries of Employment			
Professional Business Services	30%		
Education	11%		
Federal Administration	11%		
Employment by Region			
Lower Mainland	62%		
Vancouver Island	23%		
Northern BC	5%		
Okanagan/Kootenay	11%		
Self-employment	18%		

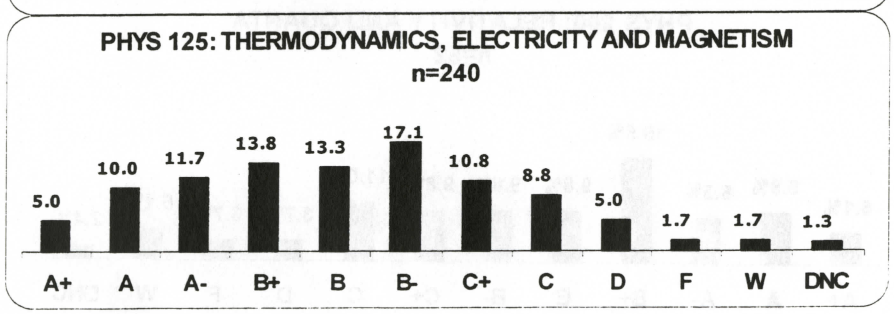
APPENDIX G
GRADE DISTRIBUTIONS: 95/FA – 00/WI BY COURSE











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PHYS 151: APPLIED PHYSICS I
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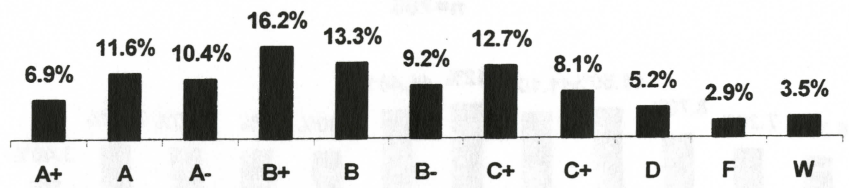
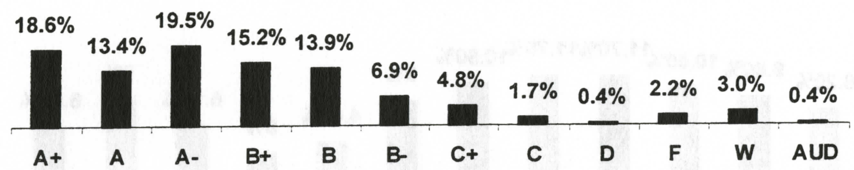
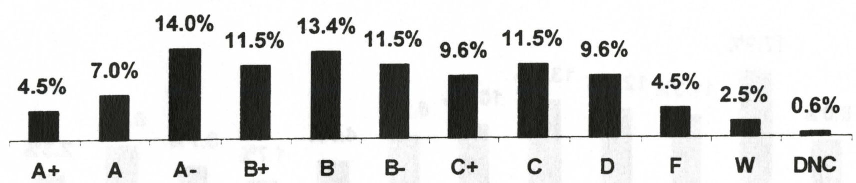


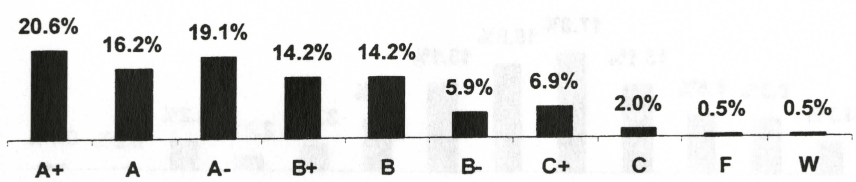
PHYS 157: GENERAL PHYSICS FOR RESPIRATORY THERAPISTS I
n=231



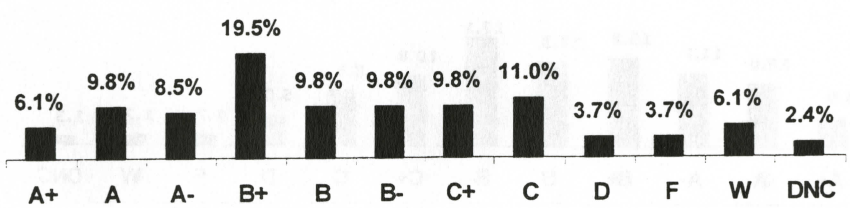
PHYS 161: APPLIED PHYSICS II
n=157



PHYS 167: GENERAL PHYSICS FOR RESPIRATORY THERAPISTS II
n=204



PHYS 200: RELATIVITY AND QUANTA
n=82



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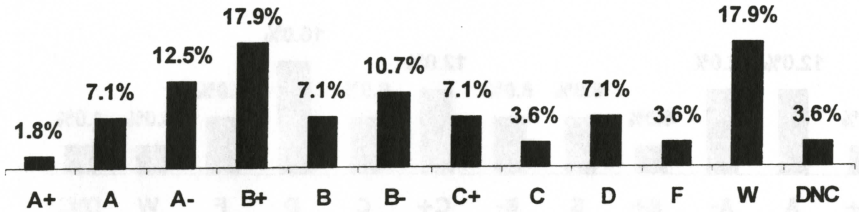
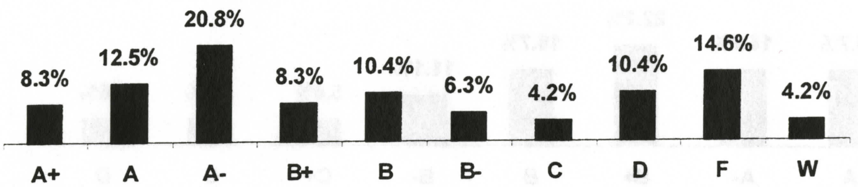
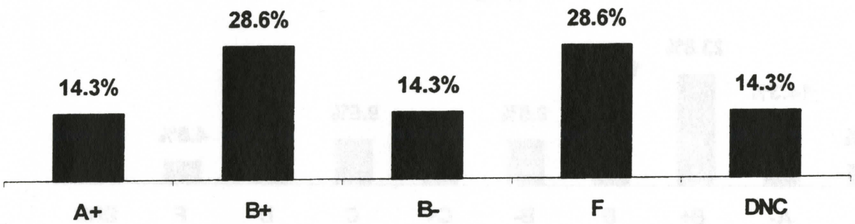
PHYS 209: METHODS OF MEASUREMENT
n=56



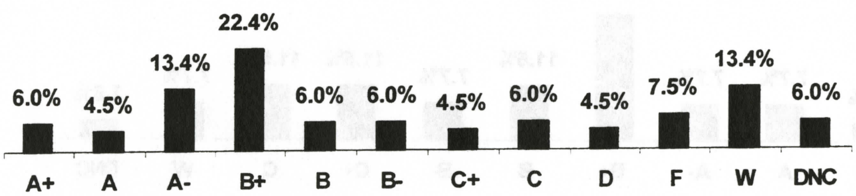
PHYS 215: CIRCUIT ANALYSIS
n=48



PHYS 217: HEAT AND THERMODYNAMICS
n=7



PHYS 220: MECHANICS
n=67



PHYS 308: OPTICS
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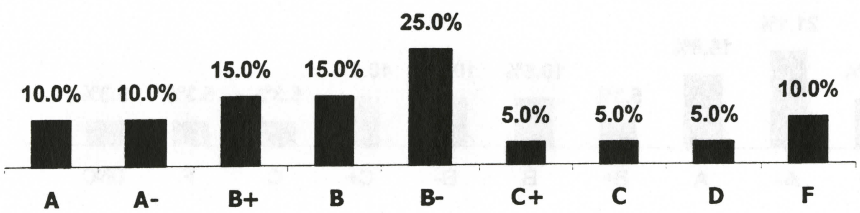

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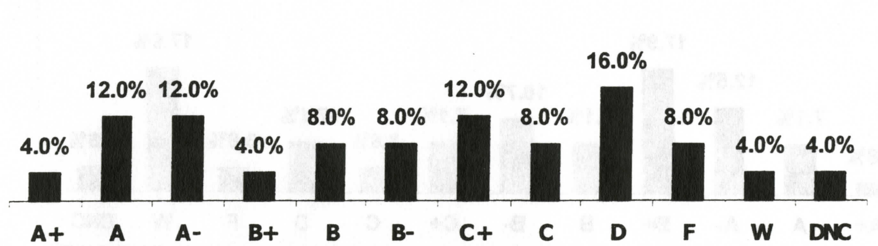
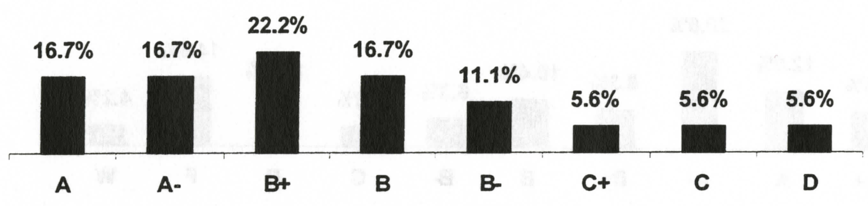
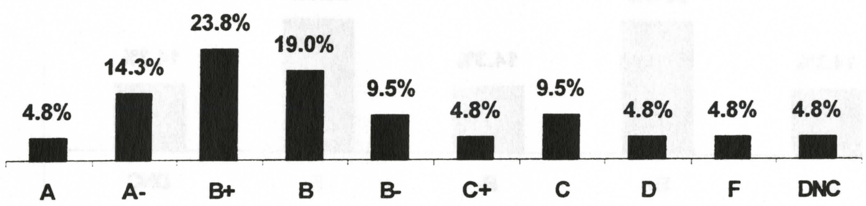
PHYS 311: ELECTRICITY AND MAGNETISM
n=25



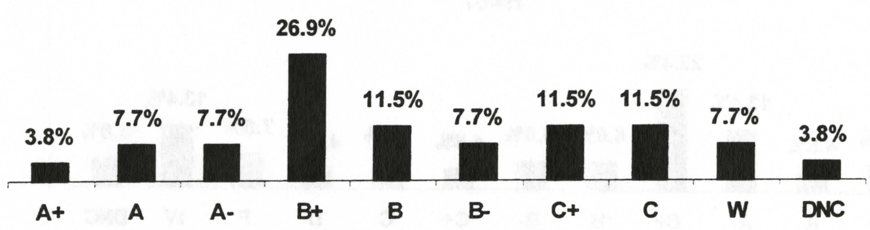
PHYS 313: THERMODYNAMICS
n=18



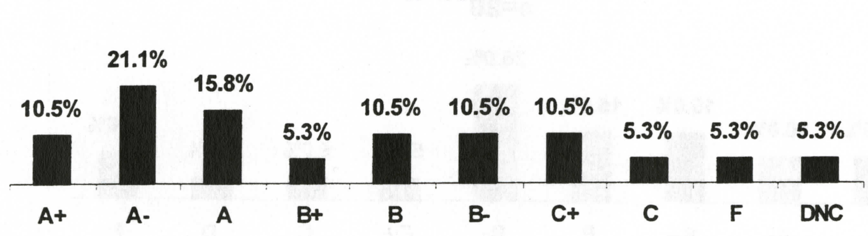
PHYS 314: FLUIDS
n=21



PHYS 315: PHYSICS OF MATERIALS
n=26



PHYS 318: ACOUSTICS
n=19



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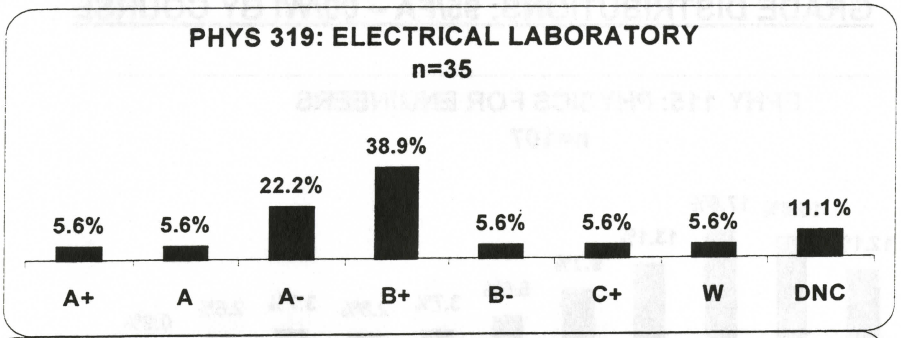

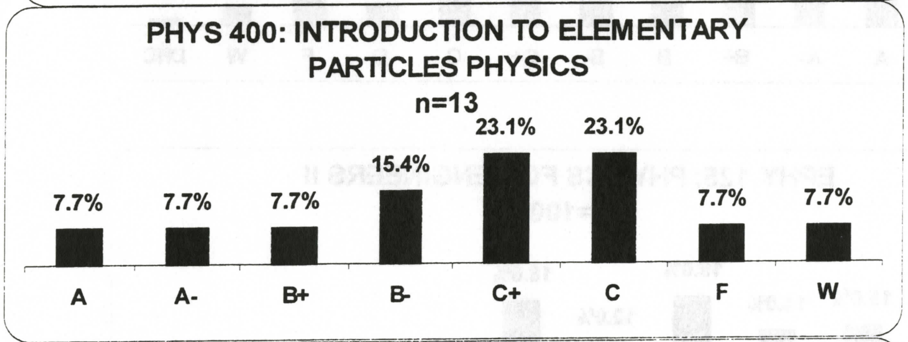

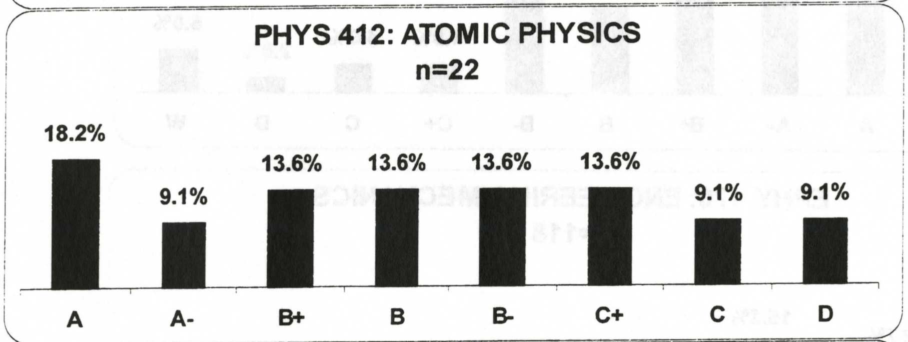

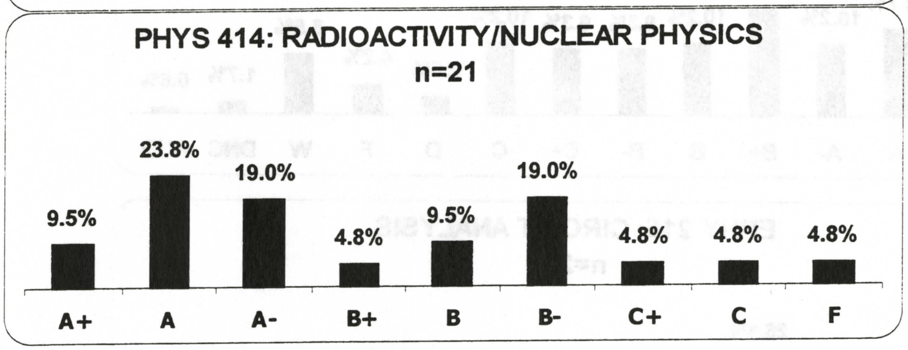

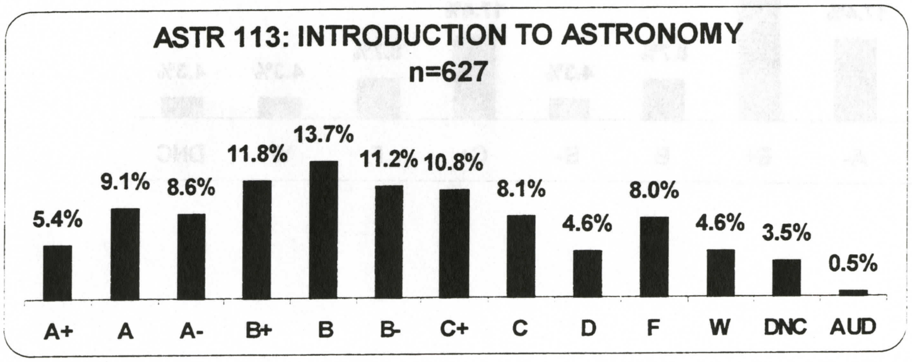

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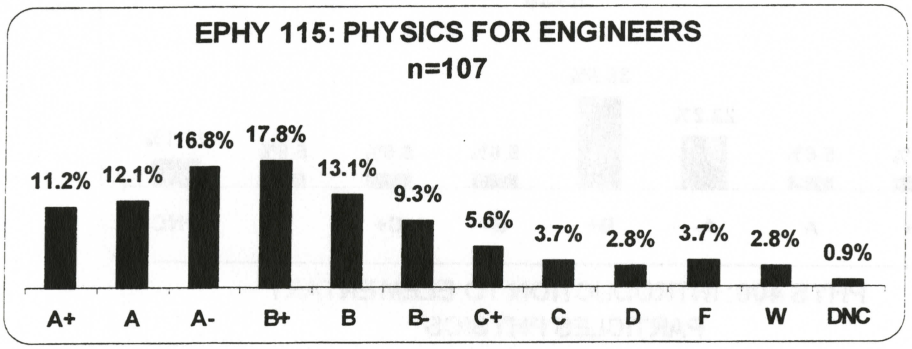

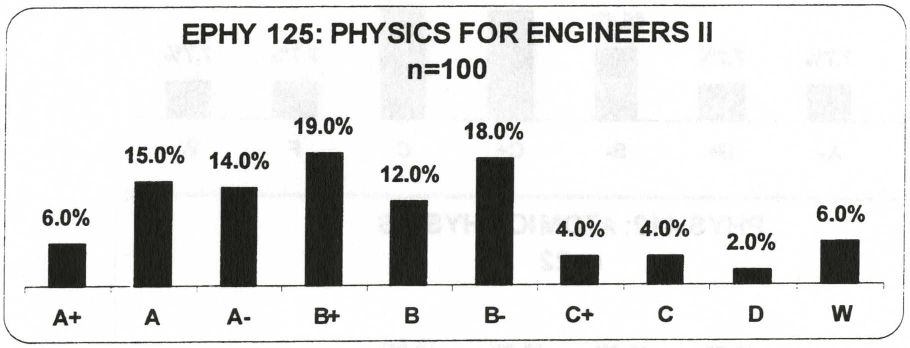

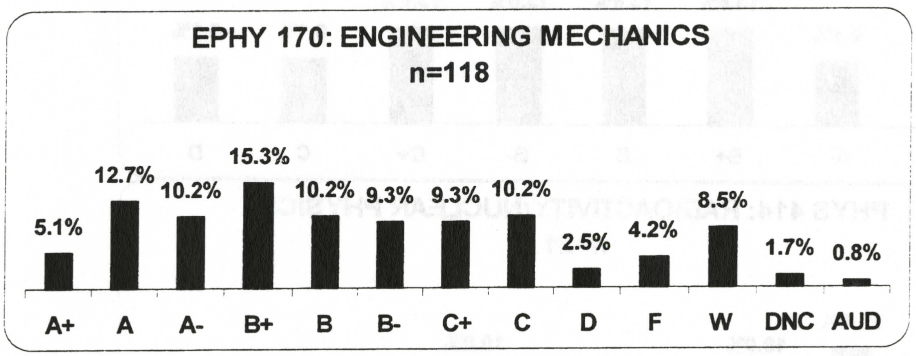

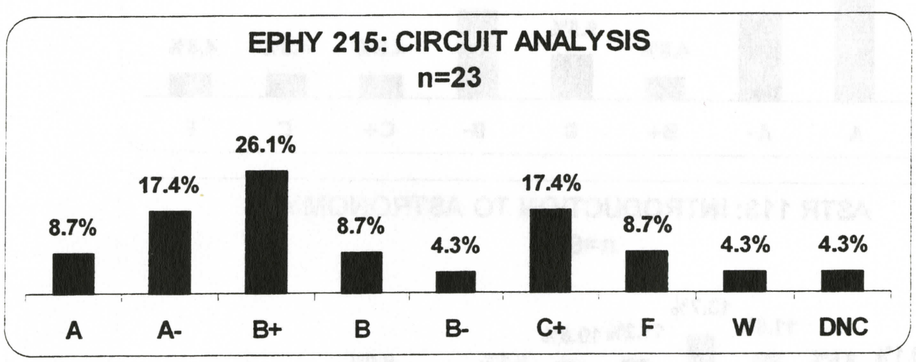

APPENDIX H

Physics capital equipment with replacement costs and anticipated replacement costs

ITEM	QUANTITY	AGE (yr)	REPLACEMENT COST each	REPLACEMENT COST set	ANTICIPATED REPLACEMENT YEAR
Acceleration of "g" Timers	12	20	$ 360.00	$ 4,320.00	2001
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2001=				$ 4,320.00	
Acoustic Impedance Tube	1	7	$ 12,000.00	$ 12,000.00	2002
Amplifier, Stereo	1	20	$ 300.00	$ 300.00	
Computer	1	6	$ 2,500.00	$ 2,500.00	
Computer	1	9	$ 2,500.00	$ 2,500.00	
Computers	11	3	$ 2,500.00	$ 27,500.00	
Computers	9	11	$ 2,500.00	$ 22,500.00	
Counter / Timer Boards	5	11	$ 240.00	$ 1,200.00	
Counter / Timer Boards	5	1	$ 240.00	$ 1,200.00	
Data Acquisition Boards	2	2	$ 1,400.00	$ 2,800.00	
Data Acquisition Boards	9	11	$ 1,400.00	$ 12,600.00	
Digital Interface Board	1	3	$ 320.00	$ 320.00	
Hydrogen Discharge Tubes	8	2, 10	$ 460.00	$ 3,680.00	
Ray Boxes	13	25	$ 194.00	$ 2,522.00	
Tesla Coil	1	25	$ 350.00	$ 350.00	
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2002=				$ 91,972.00	
Amplifiers, Audio	2	8	$ 270.00	$ 540.00	2004
Microphone Amp/ DAC to VCO Buffer	1	8	$ 500.00	$ 500.00	
Printers, Ink-Jet	2	5	$ 200.00	$ 400.00	
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2004=				$ 1,440.00	
Boyle's Law/Absolute Zero Apparatus	6	15	$ 320.00	$ 1,920.00	2005
Bridge, Universal	1	25	$ 440.00	$ 440.00	
Camera, Digital	1	2	$ 1,200.00	$ 1,200.00	
Chart Recorder, Strip	1	25	$ 1,800.00	$ 1,800.00	
Computer	1	1	$ 3,500.00	$ 3,500.00	
Current Sources, Dual Output	10	7	$ 200.00	$ 2,000.00	
Data Acquisition Board	1	15	$ 400.00	$ 400.00	
Decade Capacitor Boxes	6	25	$ 190.00	$ 1,140.00	
Decade Resistance Box	1	20	$ 230.00	$ 230.00	
Decade Resistance Boxes	3	25	$ 230.00	$ 690.00	
Decade Resistance Boxes	10	25	$ 230.00	$ 2,300.00	
Deflection Tubes	6	25	$ 3,815.00	$ 22,890.00	
Electronics Trainer	1	20	$ 500.00	$ 500.00	
Electronics Trainer	10	15	$ 500.00	$ 5,000.00	
Field Mapping Apparatus	6	25	$ 510.00	$ 3,060.00	
Lasers, Low Power	6	5,15	$ 525.00	$ 3,150.00	
Light Sources	2	25	$ 350.00	$ 700.00	
Light Sources	2	10	$ 350.00	$ 700.00	
Multichannel Analyzer	1	30	$ 7,500.00	$ 7,500.00	
Multimeter, Digital	1	20	$ 1,200.00	$ 1,200.00	
Multimeters, Digital	1	15	$ 200.00	$ 200.00	
Multimeters, Digital	15	20	$ 200.00	$ 3,000.00	
Multimeters, Digital	10	20	$ 300.00	$ 3,000.00	
Object Boxes	16	20	$ 155.00	$ 2,480.00	

Physics capital equipment with replacement costs and anticipated replacement costs

Plotter, Graphics	1	7	$ 1,100.00	$ 1,100.00	
Power Supplies, AC/DC	3	25	$ 420.00	$ 1,260.00	
Power Supplies, AC/DC	3	25	$ 420.00	$ 1,260.00	
Power Supply, +/- 12V	1	8	$ 200.00	$ 200.00	
Tubes, Fine Beam	10	11	$ 1,200.00	$ 12,000.00	
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2005=				$ 84,820.00	
Printer, Laser	1	2	$ 600.00	$ 600.00	2006
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2006=				$ 600.00	
Air Tables	4	25	$ 2,200.00	$ 8,800.00	2010
Air Tracks	5	30	$ 675.00	$ 3,375.00	
Amplifier, Audio	1	8	$ 1,050.00	$ 1,050.00	
Balance, Double - Pan	1	25	$ 290.00	$ 290.00	
Balance, Triple - Beam	1	20	$ 260.00	$ 260.00	
Balances, Triple - Beam	12	25	$ 175.00	$ 2,100.00	
Bandsaw	1	20	$ 350.00	$ 350.00	
Calibrator, Sound Level	1	4	$ 520.00	$ 520.00	
Chart Recorder	1	20	$ 1,800.00	$ 1,800.00	
Chart Recorder, X-Y	1	20	$ 2,400.00	$ 2,400.00	
Compressor, Air Track	1	20	$ 10,000.00	$ 10,000.00	
Counters, Radiation	10	5,15	$ 1,200.00	$ 12,000.00	
Decade Resistance Boxes	16	11	$ 230.00	$ 3,680.00	
Dewar Flask, 50L	1	15	$ 940.00	$ 940.00	
Dewar Flask, Large	1	15	$ 220.00	$ 220.00	
Drill Press	1	25	$ 400.00	$ 400.00	
Electromagnet/Power Supply	1	20	$ 5,000.00	$ 5,000.00	
Evaporator	1	30	$ 12,500.00	$ 12,500.00	
Frequency Counter	1	20	$ 1,000.00	$ 1,000.00	
Fume Extractor Unit	1	3	$ 1,250.00	$ 1,250.00	
Function Generator	1	20	$ 2,900.00	$ 2,900.00	
Function Generator	1	20	$ 2,900.00	$ 2,900.00	
Function Generators	8	11	$ 2,900.00	$ 23,200.00	
Function Generators	8	11	$ 2,900.00	$ 23,200.00	
Furnace, Muffle	1	20	$ 1,530.00	$ 1,530.00	
Gyroscope and accessories	1	25	$ 750.00	$ 750.00	
Hall Probes	9	11	$ 230.00	$ 2,070.00	
Laser Head, High Power 20 mW	1	1	$ 900.00	$ 900.00	
Lasers, High Power 5 mW	2	10	$ 1,150.00	$ 2,300.00	
LCR Meter	1	11	$ 1,200.00	$ 1,200.00	
Linear Expansion Apparatus	10	20	$ 320.00	$ 3,200.00	
Load Cell	2	1,15	$ 3,000.00	$ 6,000.00	
Lux Meter, Digital	1	10	$ 170.00	$ 170.00	
Mechanical Vibrators	10	8	$ 300.00	$ 3,000.00	
Microphone	1	8	$ 450.00	$ 450.00	
Microphone	2	8	$ 450.00	$ 900.00	
Microphone	1	8	$ 450.00	$ 450.00	
Microphone	1	8	$ 450.00	$ 450.00	
Microphone	1	8	$ 450.00	$ 450.00	
Microphone Signal Processor	1	8	$ 1,200.00	$ 1,200.00	

Physics capital equipment with replacement costs and anticipated replacement costs

Microwave Optics Set	4	20	$ 1,240.00	$ 4,960.00	
Millikan Apparatus	2	25	$ 1,940.00	$ 3,880.00	
Observatory Dome	1	28	$ 20,000.00	$ 20,000.00	
Oscilloscope, Digital Storage	1	11	$ 8,500.00	$ 8,500.00	
Oscilloscopes	12	11	$ 2,900.00	$ 34,800.00	
Oscilloscopes	10	11	$ 6,800.00	$ 68,000.00	
Power Meter, Laser	1	10	$ 800.00	$ 800.00	
Power Supplies, +/- 15V	2	8	$ 200.00	$ 400.00	
Power Supplies, +/- 15V	12	10	$ 200.00	$ 2,400.00	
Power Supplies, 0-400 V DC	8	11	$ 950.00	$ 7,600.00	
Power Supplies, 5 kV DC	5	25	$ 1,500.00	$ 7,500.00	
Power Supplies, DC	15	20	$ 500.00	$ 7,500.00	
Power Supplies, Spectral Lamp	10	2, 20	$ 1,350.00	$ 13,500.00	
Power Supply, Discharge Tube	1	20	$ 1,260.00	$ 1,260.00	
Power Supply, Laser	1	1	$ 260.00	$ 260.00	
Power Supply, Three Output	1	5	$ 260.00	$ 260.00	
Pressure Gauges, Absolute	10	new	$ 140.00	$ 1,400.00	
Pressure Gauges, Electronic	12	3	$ 600.00	$ 7,200.00	
Pumps, Miniature gear	12	8	$ 160.00	$ 1,920.00	
Reading Telescope	1	25	$ 500.00	$ 500.00	
Rotating Coils	7	11	$ 250.00	$ 1,750.00	
RTD Probes	10	11	$ 300.00	$ 3,000.00	
RTD Probes	5	11	$ 300.00	$ 1,500.00	
Sound Pressure Level Meter	1	8	$ 950.00	$ 950.00	
Spark Source	2	25	$ 570.00	$ 1,140.00	
Spark Sources	3	25	$ 570.00	$ 1,710.00	
Spark Sources	3	25	$ 570.00	$ 1,710.00	
Spark Sources (Master)	2	25	$ 570.00	$ 1,140.00	
Spectroscaler	1	25	$ 2,500.00	$ 2,500.00	
Ultimate Strength Apparatus	1	30	$ 15,000.00	$ 15,000.00	
Van De Graaf Generator	1	30	$ 660.00	$ 660.00	
Variacs	10	11	$ 200.00	$ 2,000.00	
Variacs, Large	5	20	$ 800.00	$ 4,000.00	
Wattmeters	5	11	$ 225.00	$ 1,125.00	
White Noise Generator	1	8	$ 1,000.00	$ 1,000.00	
TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2010=				$ 376,980.00	
Balances, Triple - Beam	8	4	$ 175.00	$ 1,400.00	2015
Drill Press	1	3	$ 280.00	$ 280.00	
Inductors, Earth	9	11	$ 1,000.00	$ 9,000.00	
Inductors, Mutual	5	11	$ 250.00	$ 1,250.00	
Interferometers	2	30	$ 5,100.00	$ 10,200.00	
Lathe	1	30	$ 2,500.00	$ 2,500.00	
Microscope, Stereo	1	4	$ 310.00	$ 310.00	
Resonance Chamber	1	8	$ 1,000.00	$ 1,000.00	
Rotator	1	20	$ 1,390.00	$ 1,390.00	
Spatial Filter, Laser Mounted	1	10	$ 750.00	$ 750.00	
Spatial Filter, Pin Mounted	2	10	$ 750.00	$ 1,500.00	
Spectroradiometer System	1	10	$ 8,000.00	$ 8,000.00	

Physics capital equipment with replacement costs and anticipated replacement costs

TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2015= $ 37,580.00

Air Table, Student	1	30	$ 660.00	$ 660.00	2020
Air Track, 2.5 m	1	30	$ 1,200.00	$ 1,200.00	
Air Track, 3 m	1	30	$ 3,600.00	$ 3,600.00	
Balance, Gravitational Torsion	1	30	$ 2,600.00	$ 2,600.00	
Balance, Heavy Duty	1	20	$ 500.00	$ 500.00	
Balances, Triple - Beam	4	30	$ 235.00	$ 940.00	
Coils, Field	18	20	$ 300.00	$ 5,400.00	
Coils, Helmholtz	8	11	$ 800.00	$ 6,400.00	
Current Balances	2	25	$ 640.00	$ 1,280.00	
Function Generators	2	2	$ 2,900.00	$ 5,800.00	
Heliostat	1	20	$ 15,000.00	$ 15,000.00	
Helmholtz Coils	8	11	$ 1,000.00	$ 8,000.00	
Hot Plates	9	20	$ 300.00	$ 2,700.00	
Hot Plates	2	15	$ 300.00	$ 600.00	
Hot Plates	2	20	$ 300.00	$ 600.00	
Hot Plates	2	15	$ 300.00	$ 600.00	
Microscope, Travelling	1	25	$ 500.00	$ 500.00	
Milling Machine	1	20	$ 4,500.00	$ 4,500.00	
Multimeters, Digital	10	9	$ 300.00	$ 3,000.00	
Multimeters, Digital	20	11	$ 570.00	$ 11,400.00	
Optical Rails	20	25	$ 400.00	$ 8,000.00	
Optical Rails, Aluminium	5	10	$ 320.00	$ 1,600.00	
Optical Table	1	10	$ 12,000.00	$ 12,000.00	
Oscillator, Reference	1	5	$ 2,000.00	$ 2,000.00	
Power Supplies, 5 kV DC	1	10	$ 1,500.00	$ 1,500.00	
Power Supplies, DC	10	11	$ 260.00	$ 2,600.00	
Power Supplies, DC	8	11	$ 1,200.00	$ 9,600.00	
Power Supplies, DC	10	9	$ 500.00	$ 5,000.00	
Power Supplies, Discharge Tube	6	20	$ 1,260.00	$ 7,560.00	
Pyrometer	1	10	$ 2,000.00	$ 2,000.00	
Rotational Inertia Apparatus	6	20	$ 1,500.00	$ 9,000.00	
Spark Sources	5	8	$ 570.00	$ 2,850.00	
Spectrometer Apparatus	1	6	$ 2,500.00	$ 2,500.00	
Spectrometers	10	2, 25	$ 7,600.00	$ 76,000.00	
Telescope, 12.5" Reflector	1	28	$ 6,500.00	$ 6,500.00	
Telescope, 8" Reflector	1	28	$ 1,200.00	$ 1,200.00	
Vacuum Pump	1	25	$ 1,950.00	$ 1,950.00	
Vacuum Pump	1	25	$ 1,950.00	$ 1,950.00	

TOTAL ANTICIPATED EQUIPMENT RPLACEMENT COST FOR YEAR 2020= $ 229,090.00

COMMENTS: Up to 2006, replacement year is +/- one year. After 2006, the anticipated replacement year becomes more and more speculative. The year has been rounded off to the nearest 5th year. In fact, some items appearing for 2015 and 2020 may not need to replaced at all, depending upon wear and tear, and availabilty of replacement parts.

APPENDIX I

MEMORANDUM

To: Neil Russell, Vice-President, Instruction and Student Services

From: Colin James, Dean of Sciences and Health Sciences

Re: Non-replacement of Retiring Physics Faculty Member

Date: March 21, 2000

Neil, this memo is in response to your memo dated February 28, 2000, in which you indicated that the executive was considering the non-replacement of Tom Walton when he retires at the end of this academic year.

The physics faculty collectively has prepared a response to your memo, and this is intended to supplement their response.

In preparing this commentary I have collected data from other institutions, provided some historical data from UCC, and tried to assess the implications of the loss of the faculty position on the department and the physics program. I have also tried to identify some options for the faculty.

The members of the department have given you a historical perspective on the department. In 1996 the department was reduced by two faculty members, and two others voluntary gave up their scholarly activity. At that time the 300 and 400 level courses were placed on a biannual rotating basis, and Paul Egan, the Dean a that time, indicated that the number of students expected in upper level courses should not drop below a minumim of 8.

Student Numbers:

The data in Appendix 1 (registration figures for 1997/98, 1998/99, 1999/2000 from Ray Pillar) indicate that registration in upper level physics courses has been consistenly above 8 until this year.

Appendix 2 shows numbers in upper level physics courses from the University College of the Fraser Valley. The numbers are all below 8 with the exception of four courses this year. A conversatiom with Wayne Welsh, Dean of Sciences, indicates that they have introduced a number of upper level physics courses that are open to Arts students and that enrolments are high in these courses (There are no lower level physics pre-requisites). It is not clear whether UCVF alternates courses.

A telephone conversation with Ahmed Hussein, chair of the Physics Department at UNBC has shown that typical numbers in upper level cousrses at UNBC are 4 to 5 students, and this is accepted and expected. They do not alternate upper level courses.

At OUC physics enrolments have been typically 10 to 15, with a few less than 8, and with the exception of PHYS 330, which has enrolemnts as high as 40. This is again a general interest physics course open to Arts students with no lower level physics pre-requsite (see Appendix 3 and 4)

Other information about student numbers in physics comes from SFU (Appendix 5) which shows that of the 980 students in science programs, only 43 were in physics programs. The UCC ratio is much higher than this. At UNBC there are 25 students in the physics degree program (in all four years). Again, the ratio at UCC is higher than this.

The data collected by Onkar Rajora, and submitted with the faculty response, indicates that there are significant numbers in years 1 and 2 intending to take upper level physics courses.

The total number of graduates in physics from UCC is: (Appendix 5A and 5B)

1994: 4
1995: 3
1996: 2
1997: 3
1999: 4
2000: will be 6

UCFV has not graduated any physics majors yet

UNBC has graduated 'about 10' according to the chair

I do not have solid data from OUC, but they indicate typically 3-4

Physics Faculty:

At UCC we have a total of 6FTEs in physics, with some part time laboratory instructors - 4 teaching faculty, 2 with 16 unit loads and 2 with 12 hr loads, and 2 lab demionstrators.

At OUC they have 6.5 FTEs, instructional faculty and 3.5 FTS lab demonstrators (in terns of peeple - 7 faculty and 5 lab demos - Appendix 6)

At UCFV they have 4 FTEs teaching faculty and 2 lab demos

At UNBC they have 5 FTEs teaching faculty,. one lab instructor, and they also use 2 grad students and senior undergrad students to teach in the laboratories.

Thus UCC is on a par with all of the interior institutions with regard to faculty numbers, but below OUC

Courses Taught:

At UCC a total of 26 - 28 sections are typically taught per year. This includes service courses for Respiratory Therapy (PHYS 157/167) and EDDT (PHYS 151/161). (Appendix 1). ASTR 113 is not included in the tables in Appendix 1 - this course always has large numbers of students enrolled. Each year we offer 4 upper level courses.

The data from UCFV do not indicate clearly how many upper level courses are taught per year, but the memo from Wayne Welsh (Appendix 7) indicates that usually three course are taught per year.

The data from OUC indicate that they teach 8 upper level course per year.

The response from UNBC indicated a total of 12 upper level courses per year, but they do not rotate any courses, whereas, OUC, UCFV and we do rotate courses.

The Impact of the loss of one FTE:

The loss of the FTE will cut the instructional faculty by 25%, and hence reduce the number of courses that the faculty are able to teach. One most likely outcome will be an impact on the physics major.

Some possible scenarios:

The Respiratory Therapy faculty at a meeting last Friday decided that they only need one physics course instead of two. This frees up one lecture section and two lab sections.

I agree with the assessment of the faculty that the course offered for EDDT cannot be replaced. for this will have an impact on accreditation

We offer PHYS 115/125 to Williams Lake by Distance - this course should be reviewed for viability (this year there are only 4 students in Williams Lake)

We offer PHYS 113 which could be deemed as overlapping with PHYS 050/060. I have to agree with the faculty assessment that these cater to different groups of students. However, it might be possible to only offer one section of PHYS 113 and still meet student demand.

Colin Taylor has a M.Sc. in physics and has taught 'ghosted sections' of PHYS 110/120. I think it is appropriate that the faculty include Colin as part of their regular scheduling of this course.

However, even with all of these reductions, there is insufficient saving to maintain a full slate of upper level courses.

Consequently, I have to conclude that the offerieng of the major in the current format would not be possible to continue.

Impact of the loss of the Major

The faculty have identified the impact of the loss of the Major in their submission. I agree with many of their conclusions, and especially with the impact on the Strategic Plan. The faculty have been working for some time with Coop Education to have a Coop option for the Physics program. This looked as though it would become a reality this year with the approval of an additional coop education coordinator with responsibilty for physics and computing.

They have also been working diligently with the Trades Division to develop an Applied Physics - Electronics degree. Both of these initiatives dovetail with the Strategic Plan. The High Technology sector is seen as one of the growth areas for Canada, and this field is so depedent upon a physics base. The letter of Support from Ben Guidici (Appendix 8) highlights this.

Thus, I agree with the faculty that the loss of the Major would be detrimental to the institution.

The alternative of having students spend a year at UBC as a 'visiting student' would work for some students, but would act as a deterrant to others - there could simply be a loss of students through inertia.

Immediate concerns:

There are a number of students in 3rd year who still need to complete their 4th year here, so whatever decision is made, we would still need an additional FTE for this coming year to enable the full slate of courses to be delivered. Theoretically this person could be a sessional instructor.

However, I would recommend the following course of action Neil:

Given that UCC is in line with all other interior institutions, with the exception of OUC, that efforts be made to promote and grow the physics program on the understanding that there be a time-limit to bring the upper level course numbers up to an acceptable level - originally 8, but now 10.

That the physics position be maintained

That the physics faculty actively engage in promotion of the program in schools and other colleges

That the physics faculty develop a strong articulation agreement with schools within the region and beyond

That the physics faculty establish a 'physics competion' along the lines of the annual chemsitry competition

That physics faculty enrol in the 'Scienctists in the Schools' program

That physics faculty ensure that the coop program come on line this year if possible, and that every effort is made to finalize the Applied Physics Degree

That physics faculty explore the possibility of a three year rotation (instead of two) that would match the coop program

That physics faculty explore the possibility of introducing ‘popular’ upper level physics courses that would enrol Arts students

That physics faculty explore the possibility of enhancing the Astronomy program (Joanne is already planning a second year science course) to include some upper level courses

I also suggest that we review the decision to have two types of faculty - those with and those without scholarly activity. I feel that the program will be better served if all teaching faculty have scholarly activity as part of their contract (Joanne is engaged in S.A. but is not contractually required to do so)

However, all of this comes at a price which would not be noticable until next year anyway, since there would be the need of a sessional instructor to deal with the students currently in the B.Sc. program. Perhaps the price is a commitment from the faculty to really actively promote the program, with the understanding that there is an expectation that the numbers in upper level courses meet the institutional criteria. However, even OUC notes that there are ‘lean’ years and these need to be considered.