Minutes
Undergraduate Council Special Meeting
February 12, 2003

#6

Called to Order: at 2:30 PM in Harrigan Hall, RM 212.

Members present: Emilio Garcia-Merenko, Pat Mutch, Susan Zork, Merlene Ogden, Doug Jones, Brad Sheppard, Lynelle Weldon, Delmer Davis, Ann Gibson, Rob Zdor, Ben Maguad, Gary March, April Summitt, and Randy Graves.
11 voting members were present and one (Bill Richardson) voted via proxy.

Motion: Wes Schultz moved that the Undergraduate Council approve the Engineering Major proposal as presented by the Engineering faculty and the special committee, chaired by Bob Kingman, with attached addendums that were approved by the College of Technology Faculty affirming that additional funding for developing this program would come from external sources. Seconded by Gary Marsh.

Discussion: Several questions were raised, including the impact of outsourcing on enrollment, library funding issues, international students, and marketing plans. Ron Johnson stated that the estimated initial library costs would be around $25,000 and an additional $10,000 per year after startup. However, if this amount of money is not raised, the program can start with a much lower library budget. Dort College, with a similar program, spends approximately $5,500 per year on library costs.

The Engineering faculty also explained that they plan to aggressively recruit students for the program by purchasing ACT/SAT lists, phone campaigns, school visits, and creating a database of information to reference during the recruiting process. The Engineering department would also like to seek articulation agreements with other institutions.

Vote: After all present were satisfied with the discussion, a vote was taken via secret ballot. Results counted by the chair and verified by the secretary.
Motion passed, 11 yeas to 2 nays.

Adjourned: 4:00 PM

April Summitt, Chair

Lynelle Weldon

Lynelle Weldon, Secretary

PROPOSAL FOR THE INITIATION OF A FOUR YEAR ENGINEERING CURRICULUM

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I. Proposal Summary

This proposal is to restructure the existing two year pre-engineering curriculum and the Bachelor of Science in Engineering Technology (BSET) degree to form a Bachelor of Science in Engineering (BSE) degree. The BSET currently has emphases in Computer Engineering Technology and in Mechatronics Engineering Technology and the proposed BSE program will offer concentrations in Computer/Electrical Engineering and Mechanical Engineering. This restructuring can be done with the existing facilities and faculty without increasing the number of credits offered. The BSET would be phased out over the next three years.

II. The Need for this Change

The following considerations provide a compelling rational for this change.

- **There has been a declining enrollment in our engineering technology program.** Over the past decade there has been a steady decline in enrollment in the Andrews' technology bachelors degree program until it is now below the level of financial feasibility. A graph of the number of students enrolled in the program is shown in Fig. 1 for the years 1994 - 2002. This decline mirrors that reported by Louis Frenzel in a summary of a survey of 25 community colleges and 24 four-year technology schools with programs in Electronic Technology. He reported that 77% reported decreased enrollment "with most indicating an estimated 50% decrease" during the past ten years. In the United States the number of undergraduates in an engineering bachelors degree program is about ten times the number in engineering technology bachelors degree programs. So efforts to increase enrollment by recruitment is much more promising for an engineering program than for engineering technology.

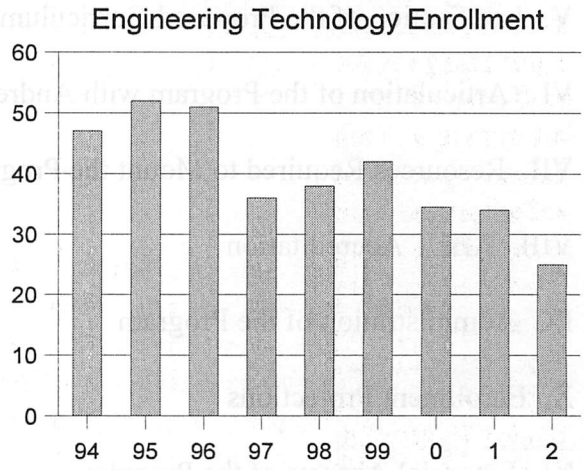

Figure 1

- **There is a need for an additional Adventist engineering training center.** The engineering program at Walla Walla College is accredited and its graduates are well prepared to enter the job market and complete graduate study in engineering schools in the United States. It primarily serves students in the western states, drawing about 70% of its students from that area and only about 20% from midwest and eastern states. The Cooperative Institutional Research Program (CIRP) 1999 data indicates that of the students in non-Seventh-day Adventist Colleges and Universities who indicate their religious preference as Seventh-day Adventist, about 4% are studying engineering. Considering that there were13,695 undergraduate students in North American Seventh-day Adventist colleges

in the year 2000-2001, 4% gives a potential of about 547 students. Walla Walla College has an engineering enrollment of about 230 students. The 1999 CIRP data also indicates that for the US population at large the percentage choosing engineering is 7 to 8% which makes the likely pool of engineering students much larger. Considering the emphasis in professional programs in the Adventist educational system this percentage would be expected to be higher than this 8% representing more than 1,000 students. At Walla Walla College the percentage of undergraduates studying engineering is 16%.

- **Andrews University is the best located Adventist school for an engineering program.** About two-thirds of the Adventist membership is in the midwest and eastern states. About three-fourths of engineering enrollment and engineering practice is also in the midwest and eastern states. Thus Andrews is located ideally to these demographics.

- **The areas proposed represent more than half of undergraduate engineering enrollment.** The number of bachelors degrees awarded in Computer/Electrical areas in 2001 was 21,289 or 32.7% of the total. In Mechanical Engineering those numbers were 13,348 or 20.5%. Thus the two concentrations proposed represent about 53% of the Engineering bachelors.

- **The areas proposed are projected to have strong job growth in this decade.** The US Department of Labor projects the following employment growth over this decade.

Area	Employment Growth Projection
Electrical and Electronic Engineers	10% to 20%
Computer Software Engineers	greater than 36%
Computer Hardware Engineers	21% to 35%
Mechanical Engineers	10% to 20%

Table 1 Projected Growth Rates for Various Areas of Engineering

- **Existing faculty and facilities are adequate to mount the program.** Existing laboratory, classroom and library facilities could accommodate more than 100 students and acceptances would be limited appropriately. The existing four teachers could offer the required courses for the first two of the five year start up period. A fifth teacher is proposed for the third year and is needed to provide for additional teaching resources and for program and coop coordination. Additional staff resources are available by utilizing local engineering professionals as adjunct professors.

- **The program would attract Adventist students who would otherwise study in other colleges and universities.**
  Since about two-thirds of Adventist students study in public and other private colleges and universities and about 4% of these study engineering there are about 1,100 of these students who could benefit from the Andrews University environment. Only about 20% of Walla Walla College's engineering students come from the midwest and eastern states where Andrews would be an attractive option. Cooperation with the Walla Walla College engineering faculty in recruitment of engineering students enrolled in other schools would be expected to more than compensate for any engineering students that they might lose to Andrews.

- **This proposal strongly supports our mathematics and science departments.**
  Engineering students will complete 15 credits of freshman and sophomore mathematics, 4 credits of General Chemistry and 10 credits of the calculus based Physics for Scientists. Most of these students would not otherwise come to Andrews. Except for an occasional additional laboratory section these students will be accommodated in existing classes, substantially improving the productivity ratios of these departments. The mathematics and science faculties strongly support this proposal and have been pro-active in initiating and participating in the study that led to it.

- **This strategic restructuring is financially favorable.**
  Over a period of seven years financial projections from this proposal indicate an improvement in financial performance as compared to the existing Engineering Technology programs with the productivity ratio increasing from about 1 to 1.9 with 100 students in the program. The university enrollment in the more pessimistic scenarios would lose two student in the first year. Because the engineering majors take few engineering courses their first two years, concentrating on math, science and general education while engineering technology students enroll in a more uniform way, the first year could result in a reduction of tuition credit to the College of Technology of about $30,000 in the first two years in this pessimistic projection. All other years indicate increases compared to the current operation.

The Andrews University Strategic Planning Committee has long recognized the importance of a greater emphasis in Engineering education in our educational system. Cooperative promotion of engineering education could benefit programs both here and at Walla Walla College. Effective marketing of the program is expected to yield an increase in enrollment to 100 students. A long term vision would include other areas of engineering and anticipate possible expansion of the program to more than 300 students. Such an increase would require an Engineering building so that for the present, acceptances would be limited to levels that can be accommodated in the existing facilities.

As one of the largest professions with about 1.5 million practicing engineers and given the degree to which engineers shape and lead the future of our economy, the mission of our educational system can ill afford to place such a minimal emphasis in this important area.

III. *Objectives of the Proposed Program*

The objective of this program is to offer course work leading to a Bachelor of Science in Engineering (BSE) degree with two concentrations, one in computer/electrical engineering and the other in mechanical engineering. The goal is to provide an opportunity for Seventh-day Adventists in the midwestern and eastern states of the United States that will more effectively attract them to study engineering at a Seventh-day Adventist school and to promote engineering as a profession in which they can contribute to the well being of our society and to the fulfillment of the mission of this church. This mission is central to that of Andrews University and is expressed in the following mission statement:

> To be a place of choice for engineering education where dedicated students and faculty grow together to reach their God-given potential for service to society and the church.
>
> Accordingly, students are challenged:
>
> - To apply the theories of science and mathematics to meeting human needs,
> - To be creative in finding economical solutions to practical problems,
> - To practice critical thinking and effective communication,
> - To develop broad competencies and focused proficiencies in their chosen discipline,
> - To prepare themselves to advance the engineering discipline through research and internships,
> - To achieve a well-rounded life perspective through the integration of the entire curriculum.

The proposed areas were selected in a sharply focused way to meet the needs of the largest number of engineering students with the smallest requirement of faculty in order to assure strategic and financial viability. The number of engineering bachelors degrees awarded in 2001 was 65,113 which includes 21,289 graduates in electrical/computer engineering (32.7%) and 13,348 graduates in mechanical engineering (20.5%), the two largest areas in engineering education. The number of full time students enrolled in a four year engineering program in the fall of 2000 was 353,118 while the similar number for technology was 30,224. This data is clear evidence that the proposed program gives the best opportunity to attract a robust enrollment in a program that can be deployed with existing facilities and with the addition of one faculty member.

This proposal is to form a BSE by restructuring the existing two year pre-engineering and BSET curricula. Excluding computer classes that are already offered, the number of credits required for the proposed engineering core and two emphases is about 90, 10 less than the number presently used in the combination of pre-engineering and engineering technology.

This program will articulate with the pre-engineering programs on other Seventh-day Adventist colleges.

The proposed deployment of the program would phase out the engineering technology programs over the next three years and in six to seven years increase enrollment in the engineering program to the level that can be accommodated in the existing facilities. Planning has already begun to achieve ABET accreditation by the end of this time.

It is expected that as the program becomes established, student demand will justify an engineering building, expansion of engineering faculty and the introduction of other areas of engineering in the curriculum.

IV. Proposed Curriculum

The proposed BSE consists of 34 credits of general education, 35 credits of mathematics and natural sciences, an engineering core of 30 credits and a concentration of 33 credits in either Mechanical Engineering or Electrical and Computer Engineering as described below.

General Studies	34
Religion (RELT100, RELT340, and 6 credits from RELB210, RELT250, RELT225, and RELP400 (senior seminar area))	12
Arts and Humanities (HIST118, ARTH220, ENGL255, IDSC211, MUHL214, or PHIL224)	3
Social Sciences (ANTH200, BHSC220, 235, ECON225, or PYSC101)	3
ENGL115, 215 or 220, COMM104 - Language and Communication	8
CPTR125 - Introduction to Computer Programming	3
HLED130 - Essentials of Wellness plus 2 activity PE courses	3
BHSC100 - Philosophy of Service	2
Math and Natural Science	35
MATH141, 142, 240 - Calculus I, II, III	12
MATH286 - Differential Equations	3
CHEM131 - General Chemistry I	4
PHYS241, 242, 271, 272 - Physics for Scientists and Lab	10
Math/Science Electives (Choose 6 credits from the following)	6
CHEM132 - General Chemistry II (4)	
MATH215 - Introduction to Linear Algebra (3)	
STAT340 - Probability and Statistics (3)	
MATH405 - Applied Mathematics (3)	

Engineering Core	30
Introduction to Engineering with Engineering Drawing (2 + 2)	4
Engineering Mechanics (Statics and Dynamics)	5
Circuit Analysis (Lab)	3
Material Science (Lab)	4
Linear System Analysis	3
Electronics I (Lab)	4
Engineering Economy	3
Senior Design (2 + 2)	4
Mechanical Engineering Concentration	33
Manufacturing Processes (Lab)	3
Sensors and Actuators (Lab)	3
Strength of Materials	3
Thermodynamics	3
Fluid Dynamics	3
Feedback Control Systems (Lab)	4
Programmable Controllers (Lab)	2
Machine Design	3
Mechanical Engineering Lab	2
Engineering Electives	7
Electrical and Computer Engineering Concentration	33
Computer Science I and II	6
Electronics II (Lab)	4
Virtual Instrumentation	3
Electromagnetic Fields	3
Communication Systems (Lab)	4
Logic Circuit Design	3
Microprocessor Systems (Lab)	4
Engineering/Computer Science Electives	6
Total Credits for the Program	132

V. Justification of the Proposed Curriculum

General Market Demands for Engineering

The Occupational Outlook Handbook published by the U.S. Department of Labor characterizes the current engineering job market by the following bullets taken from their website.

- Overall job opportunities in engineering are expected to be good, but to vary by specialty.
- A bachelor's degree is required for most entry-level jobs.
- Starting salaries are significantly higher than those of college graduates in other fields.
- Continuing education is critical to keep abreast of the latest technology.

As indicated in part II, employment in engineering areas is projected to grow over the period of this decade by amounts ranging from over 10% to over 36%.

The following quotations from the Occupational Outlook Handbook support the projection of a continuing robust job market. "Competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Employers will rely on engineers to further increase productivity, as investment in plant and equipment increases to expand output of goods and services. New computer and communications systems have improved the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past and to collaborate on designs with other engineers throughout the world. Despite these widespread applications, computer technology is not expected to limit employment opportunities. Finally, additional engineers will be needed to improve or build new roads, bridges, water and pollution control systems, and other public facilities."

"Although only a relatively small proportion of engineers leaves the profession each year, many job openings will arise from replacement needs. A greater proportion of replacement openings is created by engineers who transfer to management, sales, or other professional occupations than by those who leave the labor force. Most industries are less likely to lay off engineers than other workers. Many engineers work on long-term research and development projects or in other activities that continue even during economic slowdowns."

Unemployment among engineers has been typically much less than among the general population. Cutbacks in defense spending in the early 1990's caused a short term surge as has the present recession and restructuring in major industrial corporations. Even at these times unemployment has remained below that of the national average. The pre-eminence of the US economy has been supported to a major degree by the engineering workforce. If a significant decrease occurred in this workforce there would be a concomitant decrease in our standard of living. The engineering workforce is very likely to remain strong for the foreseeable future.

Need for Adventist Engineering Education in the Eastern and Midwestern United States

In a study done in 1992 based on data in the Walla Walla College Mask, Harold Lang showed that the only four-year engineering program in Seventh-day Adventist education draws most of its students from regions in close proximity to the school, 71% came from the North Pacific and Pacific Unions and from western Canada, 11% came from the Mid-American and Southwestern Unions and 11% came from the Midwestern and eastern states and eastern Canada.

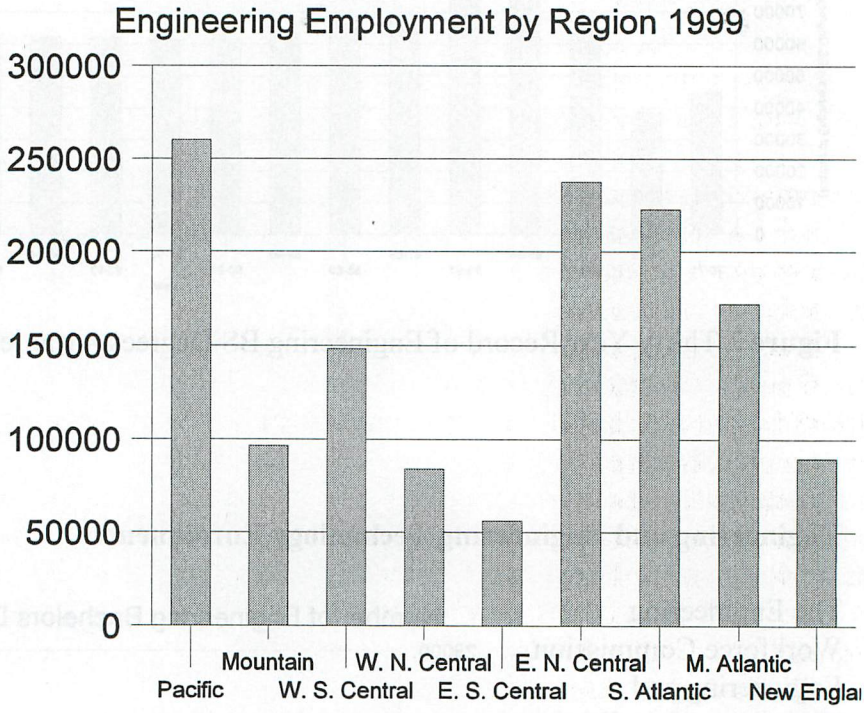

Figure 2 Proximity of Engineering Employment to Andrews University.

The concentration of engineering employment in the United States is much closer to Andrews University than to Walla Walla College as is illustrated by Fig. 2, Walla Walla being closest to the Pacific and Mountain regions and Andrews closest to the rest. Engineering enrollment displays similar trends. Opportunities to develop co-op experiences are much closer to Andrews than to Walla Walla. A two hundred mile radius from Andrews includes major engineering areas such as Chicago, Gary, Indianapolis and Detroit.

Stability of Engineering Enrollment

The number of bachelors degrees awarded in the United States over the past 15 years has been very steady in spite of major disruptions such as shifts in defense spending after the collapse of the Soviet Union. Fig. 3 shows the number awarded over the past thirty years. Some recent statements in the press refer to the declines in enrollments in the 1980's to imply a declining engineering job market. Traditionally engineering unemployment has been low, less than half that of the general job market, which with this graph indicates a balanced supply and demand in the engineering workforce.

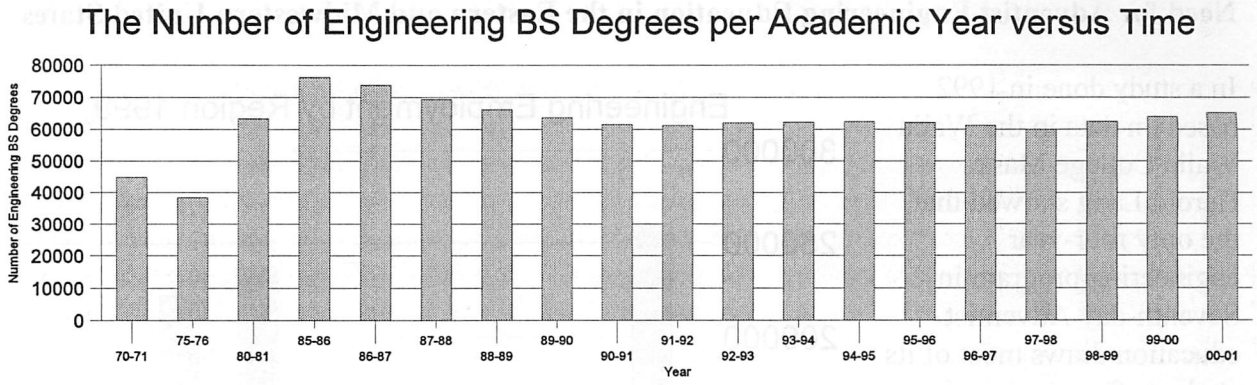

Figure 3 Thirty Year Record of Engineering BS Degrees Awarded.

Engineering and Engineering Technology Enrollments.

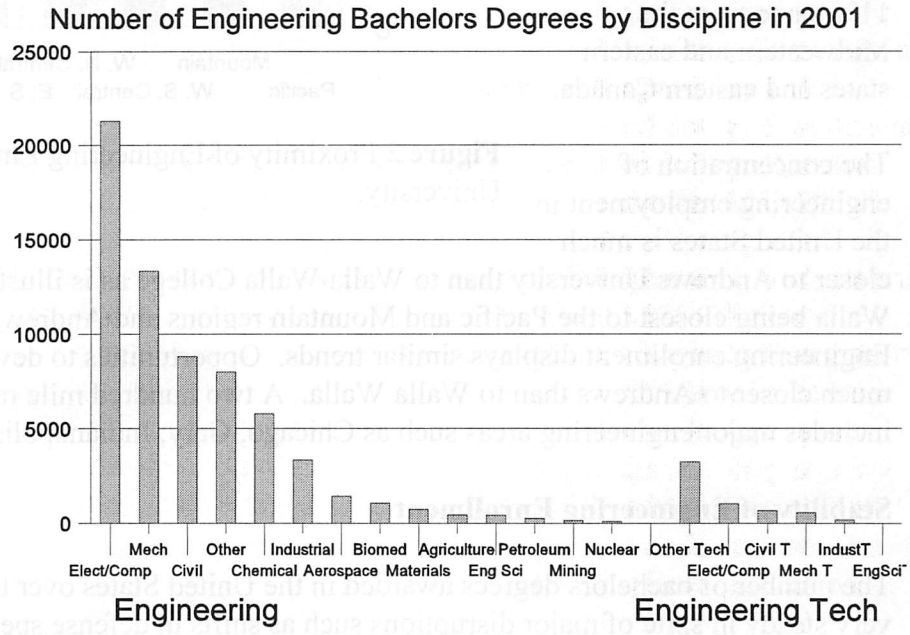

Figure 4

The Engineering Workforce Commission Engineering and Technology Enrollments Fall 2000 publication indicates 353,118 full time undergraduate engineering students and 30,224 full time undergraduate engineering technology in four-year technology programs. This tenfold greater market in engineering education as compared to engineering technology enrollment is mirrored also in the number of BS degrees awarded in engineering and in engineering technology in 2001 as is shown in Fig. 4. The number of BS engineering degrees awarded in the areas of electrical/computer and mechanical engineering (first two bars on left) is 34,637 as compared to 1,578 for the comparable engineering technology degrees, a twenty-two fold ratio.

Local Needs for Engineering Education

Community leaders have long expressed a need for engineering education in Southwestern Michigan. Since ABET accreditation is site specific universities cannot export undergraduate engineering programs to local areas making it difficult for our nearest universities such as Western Michigan University to fill the local need. One of the members of the current engineering study committee, Gale Cutler, a past vice-president at Whirlpool Corporation has long encouraged Andrews University to look at this need.

Priority

Over the past ten years the Strategic Planning Committee has identified the development of an Engineering program as one of the most strategically important steps that Andrews could do to serve its constituency. The financial operation of the existing technology programs require restructuring now, the most feasible is this engineering proposal. Engineering students are recruited from the top third of their high school class. They would take 35 credits of mathematics and science thus contributing to the financial operation of these departments. The mathematics and science faculty strongly support this proposal and their chairs have been active participants in the engineering study committee that has drafted it.

VI . Articulation of the Program with Andrews University and other Adventist Colleges

The only four-year engineering program in Adventist education is located at Walla Walla College which offers a Bachelor of Science in Engineering with a concentration in one of four areas. These areas are Civil Engineering, Computer Engineering, Electrical Engineering and Mechanical Engineering. This is a mature ABET accredited program that has existed for about fifty years. Other Seventh-day Adventist colleges and universities offer a one- or two- year pre-engineering programs that are affiliated with Walla Walla College. The two-year affiliations are difficult to mount for many of these schools due to their lack of a calculus based physics course. Students in these programs from the eastern half of the US usually do not go on to Walla Walla College, choosing instead to enroll at other college and university engineering programs. A program at Andrews would be attractive to these students and is designed to accommodate them.

VII. Resources Required to Mount the Program

Facilities

The facilities required for this engineering program are very similar to those in place that are in use by the existing pre-engineering and engineering technology programs. These include a materials testing laboratory/classroom (HYH307), that has seating for 40 students and also serves as a lab space, a second classroom with seating for 30 students (HYH321), an electro-mechanical engineering laboratory (HYH325), an electronics lab that can serve 16 (expandable to 20) students at a time (HYH319), and a shared computer laboratory that has 30 PC computers and

space to accommodate an additional 20 PC computers for a possible total of 50 computer stations (HYH316). These spaces and the equipment in place are adequate to serve up to about 120 engineering students in addition to the computer science majors. The additional computers could be added as increased enrollment demands.

Eight teacher offices are available on the third floor of Haughey Hall, of which four are presently occupied by faculty teaching the pre-engineering and engineering technology courses and two by computer science faculty. Since these existing programs are housed in the same department with computer science the existing secretary's office would continue to serve both the engineering and computer science areas. If two additional computer science faculty and one engineering faculty are added in the next few years one more office will be needed.

As noted in section II and described in detail in section X of this proposal the potential exists to attract 150 to 300 students into these engineering programs. Existing facilities would not be adequate to handle this number of students so that if necessary, enrollments would be limited to the existing capacity. Given sufficient demand for this program, it would be a pleasant challenge to obtain funding for a building to permit the expansion to include several other areas and a student population of about 300.

Faculty and Staff

At present there are four faculty with degrees in engineering, including two with PhD degrees, one with a Master of Science in Electrical Engineering and one near the completion of the PhD. This is sufficient to teach the required curriculum for the first several years. As the enrollment increases above fifty a fifth teacher will be needed. It is expected that as the enrollment increases above seventy-five it will be necessary to hire a half time technician to support the teaching equipment in the laboratories. Similarly the secretarial support will be increased from 0.5 to 0.6 budgets.

More computer support of student learning will also be required. Some of this will be supported by increased funding of the computer science portion of the department's student labor budget as justified by increased enrollment in computer science classes by engineering students. The engineering portion of the student labor budget is projected to increase from the present level of $5,000 to $10,000 as the engineering enrollment approaches the 100 student level.

Equipment

Existing equipment is adequate to start the program. The shared computer laboratory is well equipped to serve the program. Equipment in the science departments and the Physics Enterprises robotic "pick and place" machine are available for use by engineering students. As enrollment is built the equipment budget will need to be increased to about $20,000 a year to replace, update and expand the existing equipment and computer software. The financial projections assume an expenditure of $20,000 per year for equipment which with grants and in

kind contributions from corporate friends of engineering at Andrews University should be adequate to provide equipment needs for a vigorous engineering program.

Library Resources

The present level of library funding for books and periodicals will need to be increased substantially from the existing low levels. The proposed levels and start up schedule are shown in Table 2. Engineering monographs cost about $100 each and individual periodicals are about $1,200 per year. The annual fee for the Engineering Index is $4,500.

Item	Existing	Year 1	Year 2	Year 3	Year 4	Year 5
Books	$700	$6,000	$6,000	$6,000	$6,000	$6,000
Periodicals	$1,300	$26,000	$26,000	$26,000	$26,000	$26,000
Total	$2,000	$32,000	$32,000	$32,000	$32,000	$32,000

Table 2 Projection of Required Library Allocations

VIII. ABET Accreditation

The existing engineering technology programs are not at present accredited. The consensus of the engineering faculty is that the resources that would be required to improve the engineering technology to a level at which it could be accredited would be better spent developing the engineering program described in this proposal. The engineering graduate's employability is greatly enhanced by a degree from an ABET accredited engineering program. Most state boards require graduation from an accredited program as a prerequisite for writing the licensing examinations. In designing this program we have looked closely at schools with engineering programs of a size similar to what we envisage, schools such as Walla Walla, Dort and Hope. Programs that offer a Bachelor of Science in Engineering with a core and emphases in a few areas are accredited with as few as five faculty. Given the articulation with Computer Science and the anticipated expansion of the engineering faculty to five, adequate faculty resources should be available to satisfy accreditation requirements.

IX. Administration of the Program

Since engineering is housed in the same department as computer science it will be necessary to have a program coordinator for the engineering curriculum. It will also be important to develop an advisory board to provide guidance for the program. These structures will ensure that program decisions are effected by engineering professionals which is one of the important factors influencing accreditation.

X. Enrollment Projections

The 1999 CIRP data indicates nearly 7% of first time - full time freshman were enrolled in engineering. If the same fraction in North American Seventh-day Adventist colleges were enrolled in engineering this would represent over 900 students. For those students outside our schools indicating Seventh-day Adventist belief this number was 4.1% . If only one-third of Adventist students study in our colleges the number of potential students is 2,700. The engineering enrollment at Walla Walla College in the fall of 2002 was 230 students, about 16% of the 1,418 undergraduate students enrolled in 2000-2001. An engineering program at Andrews would be attractive to members of our community and to other persons who would like to study engineering in a Christian environment. This program targets the interests of a majority of these engineering students. Thus with an effective marketing plan it should be possible to attract more students than our facilities can serve, making it realistic to expect that we can achieve an enrollment of over 100 students.

There are six freshman and one sophomore in our current pre-engineering track. In these projections it is assumed that three-fourths of the freshman class continue in the program since this reflects the national pattern. We have also assumed slight attrition for each successive year although national trends show a 25% increase in enrollment from the junior to senior years, a result of the fact that students often need 4.5 years to complete the program. In the 1992 engineering proposal Harold Lang showed that three schools that had recently started an engineering program had increases in enrollment from 0% to near 6% of undergraduate enrollment over a period of five years.

XI. Financial Aspects of the Program

The financial performance of the proposed program is summarized below in Table 3. It includes projections for a fast and a slow ramping to an enrollment of 101 students, and projections for enrollments to 75 and 49 students. The expenses in all four scenarios includes $20,000 per year for equipment. The Net Gain is Income - Expense and the Productivity Ration (Prod R) is the ration of the Income to the Expense. The numbers in the third column, labeled "Existing" give numbers typical of the current pre-engineering and engineering technology programs.

Proj.		Existing	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Fast Ramp	Enroll	31	46	59	74	84	93	99	101
	Income	329470	334375	397870	519640	610225	694285	759895	781675
	Expense	322084	322084	327184	370300	375900	399900	401900	401900
	Net Gain	7386	12291	70686	149340	234325	294385	357995	379775
	Prod R	1.02	1.04	1.22	1.40	1.62	1.74	1.89	1.94
Slow Ramp	Enroll	31	34	40	48	55	76	89	95
	Income	329470	308635	330055	369340	416680	566530	672325	715930
	Expense	322084	322084	327784	335484	373900	398900	401900	401900
	Net Gain	7386	-13449	2271	33856	42780	167630	270425	314030
	Prod R	1.02	0.96	1.01	1.10	1.11	1.42	1.67	1.78
Three-fourths Ramp	Enroll	31	34	38	45	53	62	70	73
	Income	329470	308635	326365	369385	412720	486070	558835	591775
	Expense	322084	322084	326784	329784	333184	336184	336184	336184
	Net Gain	7386	-13449	19581	59601	79536	149886	222651	255591
	Prod R	1.02	0.96	1.06	1.19	1.24	1.45	1.66	1.76
Half Ramp	Enroll	31	34	36	39	40	45	48	49
	Income	329470	308635	322675	347335	354265	401740	434545	445435
	Expense	322084	322084	326784	329784	331784	333184	333184	333184
	Net Gain	7386	-13449	-4109	17551	22481	68556	101361	112251
	Prod R	1.02	0.96	0.99	1.05	1.07	1.21	1.30	1.34

Table 3 Financial Projections Comparing the First Seven Years to Next Year with No Change in 2003-2004 Constant Dollars.

In the fast ramping case the Net Gain is always positive and by the third year the productivity ratio has reached 1.4, the nominal minimum for being financially successful. In the slow ramping case where the enrollment is projected as growing slowly the net gain shows a $13,449 loss the first year and is positive thereafter. By the fifth year the productivity ratio has reached 1.4. In the projection where the enrollment grows only to 75 students, about three-fourths of the expected 101, there is again a $13,449 loss the first year and the productivity ratio reaches the 1.4 level in the fifth year. In the projection where the enrollment grows only to 49 students, about half of the expected 101, there is again a $13,449 loss the first year, a loss of $4109 the second year and the productivity ratio reaches only the 1.3 level. While

this level is barely financially sustainable it represents a major improvement to the existing operation with a productivity ratio of 1. These projections show that even the most pessimistic projections represent significant improvement above the present operation of the pre-engineering and engineering technology programs and that expected projections make an appropriate contribution to the financial operation of the University, giving as much as 1.4 million dollars above expenses over the seven year start up period with an annual Net Gain in the seventh year as much as $380,000.

XII. Launch Plan for the Program

It will be important to aggressively market this program to its intended student population. This will be done in the following ways:

- Work closely with the Enrollment Management team and with the mathematics and science departments in their recruitment efforts,
- Advertise in church papers such as the Adventist Review and in the union conference publications,
- Build relationships with academy guidance counselors and mathematics and science teachers,
- Work with local high school guidance counselors and mathematics and science teachers,
- Actively recruit high school students that are enrolled in the Berrien County Intermediate Science and Mathematics Center,
- Utilize ACT and SAT data bases to contact Seventh-day Adventist students with interests in engineering,
- Cooperate with local industry to make the program accessible to persons desiring engineering training.

The plan is to develop a database of potential student interest early in their high school years and to prepare an array of materials that can be sent in reply to student responses. A tracking system will be used to record ongoing contacts with each student and materials sent. Andrews students and faculty will communicate with potential students by email, phone and postal service. Trips to high schools and academies will be made to expand the pool of interests. The program coordinator will be charged with the responsibility to coordinate recruiting efforts of the engineering faculty.

February 3, 2003

Dear Undergraduate Committee Members:

The Engineering proposals will be discussed at today's meeting. The College of Technology faculty took the following action on January 17, 2003:

It was **VOTED**: To approve the following Engineering Proposal recommended by the Academic Policies and Curricula Committee and the department chairs:

1. Phase out the present Engineering Technology degree programs and accept only engineering students for the 2003-2004 school year.

2. Phase in a four-year General Engineering degree program beginning with the 2003-2004 school year with the explicit understanding that all funds needed for the new engineering program, that are not included in the 2002-2003 engineering budget including equipment, library resources, marketing and additional space must be funded from external sources to avoid financially impacting other College of Technology departments.

Thanks for your careful consideration of this historic proposal.

Sincerely,

M. W. Shultz, Dean
College of Technology

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