ELECTRICAL AND COMPUTER

		2002	2003	2004	2005	2006	2007	2008	Avg-5 year
Section I: Part A: Academic Instruction Expenditures (fiscal year)	1. Salaries/Benefits	$1,317,542.00	$1,380,467.00	$1,399,236.00	$1,501,201.00	$1,475,715.00	$1,347,858.59	$1,160,300.94	
	5 Year Average								$1,376,862.31
	2. Other Operating Exp.	$62,236.00	$72,053.00	$110,846.00	$75,673.00	$27,982.00	$134,145.87	$173,888.78	
	5 Year Average								$104,507.13
	3. Total	$1,379,778.00	$1,452,520.00	$1,510,082.00	$1,576,874.00	$1,503,697.00	$1,482,004.46	$1,334,189.72	
	5 Year Average								$1,481,369.44
Section I: Part B: Student Credit Hour Production (fiscal year)	1. Lower Division	2812	2611	2344	2523	2406	2106	2268	
	5 Year Average								2329.4
	2. Upper Division	2260	2645	2659	2098	2514	2117	2188	
	5 Year Average								2315.2
	3. Masters	4043	3458	3179	2679	2700	3614	2993	
	5 Year Average								3033
	4. Doctoral	134	120	153	224	163	116	188	
	5 Year Average								168.8
	5.Total	9249	8834	8335	7524	7783	7953	7637	
	5 Year Average								7846.4
Section I: Part D: Percentage of Departmental SCH taken by: (fall)	1. Their Undergraduate Majors	44.2	47.9	53.7	54.9	50.1	41.8	44.3	
	5 Year Average								48.96
	2. Their Graduate Majors	43.1	40	36	30.6	36	47.1	43.3	
	5 Year Average								38.6
	3. Non-Majors	12.7	12.1	10.3	14.5	13.9	11.1	12.4	
	5 Year Average								12.44
Section I: Part E: Departmental Faculty (fall)	1. Tenured/Tenure Track Faculty Head Count	8	10	12	13	12	9	9	
	5 Year Average								11
	2. Tenured/Tenure Track Faculty with Terminal Degrees	8	10	12	12	11	9	9	
	5 Year Average								10.6
	3. Total Tenured Faculty	8	8	8	7	6	7	9	
	5 Year Average								7.4
	Total Instructional Faculty FTE in Department	10	10	11	12	12	11	11	
	5 Year Average								11.4
Section I: Part F: Actual Instructional FTE (fall)	1. Tenured/Tenure Track Faculty	7.89	9.5	11.25	13	12	10	10.5	
	5 Year Average								11.35
	2a. Instructor of Record (IOR)	0	1.55	1.83	1.03	0	0.45	2.5	
	5 Year Average								1.162
	2b. Not Instructor of Record	2.2	2.5	2.34	2.04	2.23	1.95	1.1	
	5 Year Average								1.932
	3. Other Instructional FTE	5.17	2.83	1.25	1.67	2.25	2.33	1.3	
	5 Year Average								1.76
	4.Total FTE	15.26	16.38	16.67	17.74	16.48	14.73	15.4	
	5 Year Average								16.204
	5. SCH generated by Tenured/Tenure Track Faculty	2260	2102	2706	2387	2158	3031	2765	
	5 Year Average								2609.4
	6. SCH generated by GTA's (IOR)	0	744	834	755	0	425	820	
	5 Year Average								566.8

7. SCH generated by Other Instructional Faculty	2253	1539	668	914	2005	702	466	
5 Year Average								951
8. Total SCH	4513	4385	4208	4056	4163	4158	4051	
5 Year Average								4127.2
9. Average SCH per Tenured/Tenure Track Faculty	2206.46	1832.53	1547.47	1339.15	1450.75	1740.90	1658.00	
5 Year Average								1547.25
10. Average SCH per GTA (IOR only)		2308.39	1955.19	3473.79		7951.11	1431.20	
5 Year Average								2962.26
11. Average SCH per Other Instructional Faculty	1653.19	3020.14	6837.60	5117.96	3798.67	3668.24	6574.62	
5 Year Average								5199.42
12. Average Overall SCH per FTE	1935.39	1803.05	1771.69	1664.83	1792.11	2005.02	1917.79	
5 Year Average								1830.29

Program Review Program Report

ENGINEERING

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Note: Year is fiscal year (summer, fall, spring). If data are from the fall only, it is from the fall of the fiscal year. For example, FY 2008 is Fall 2007 data.

COMPUTER ENGINEERING

		2002	2003	2004	2005	2006	2007	2008	Avg-5 year
Section II: Part A: Majors in the Discipline (fall)	1. Freshmen/Sophomores (optional)	107	91	81	73	71	62	74	
	5 Year Average								72.2
	2. Jrs., Srs., 5th Year Majors	88	83	99	103	68	61	64	
	5 Year Average								79
	3. Masters	0	0	0	0	0	0	0	
	5 Year Average								0
	4. 1st Prof / Specialist / Certif.	0	0	0	0	0	0	0	
	5 Year Average								0
	5. Doctoral	0	0	0	0	0	0	0	
	5 Year Average								0
	6. Total	195	174	180	176	139	123	138	
	5 Year Average								151.2
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs (fall)	1. Average ACT Composite	22.8	23.8	23.3	23.5	24.6	24.5	26.3	
	5 Year Average								24.44
	2. Low ACT	13	13	13	12	15	13	17	
	5 Year Average								14
	3. High ACT	32	34	34	35	35	33	33	
	5 Year Average								34
	4. Number Reporting an ACT Score	47	45	57	47	28	29	26	
	5 Year Average								37.4
	5. Percent Reporting ACT Score	53.41%	54.22%	57.58%	45.63%	41.18%	47.54%	40.63%	
	5 Year Average								46.51%
Section II: Part C: Degrees Conferred (fiscal year)	1. Associate	0	0	0	0	0	0	0	
	5 Year Average								0
	2. Baccalaureate	21	23	21	34	21	14	21	
	5 Year Average								22.2
	3. Masters	0	0	0	0	0	14	0	
	5 Year Average								2.8
	4. First Prof / Specialist / Certificate	0	0	0	0	0	0	0	
	5 Year Average								0
	5. Doctorate	0	0	0	0	0	0	0	
	5 Year Average								0
	6. Total	21	23	21	34	21	28	21	
	5 Year Average								25

ENGINEERING

ELECTRICAL AND COMPUTER

Note: Year is fiscal year (summer, fall, spring). If data are from the fall only, it is from the fall of the fiscal year. For example, FY 2008 is Fall 2007 data.

ELECTRICAL ENGINEERING

		2002	2003	2004	2005	2006	2007	2008	Avg-5 year
Section II: Part A: Majors in the Discipline (fall)	1. Freshmen/Sophomores (optional)	90	95	75	67	74	77	65	
	5 Year Average								71.6
	2. Jrs., Srs., 5th Year Majors	135	156	160	147	137	130	121	
	5 Year Average								139
	3. Masters	251	288	267	207	217	272	237	
	5 Year Average								240
	4. 1st Prof / Specialist / Certif.	0	0	0	0	0	0	0	
	5 Year Average								0
	5. Doctoral	20	14	26	24	24	19	28	
	5 Year Average								24.2
	6. Total	496	553	528	445	452	498	451	
	5 Year Average								474.8
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs (fall)	1. Average ACT Composite	22.3	22.3	21.9	21.8	21.7	23	22.9	
	5 Year Average								22.26
	2. Low ACT	9	13	13	12	12	13	12	
	5 Year Average								12.4
	3. High ACT	30	34	34	35	35	33	33	
	5 Year Average								34
	4. Number Reporting an ACT Score	55	59	82	68	62	55	44	
	5 Year Average								62.2
	5. Percent Reporting ACT Score	40.74%	37.82%	51.25%	46.26%	45.26%	42.31%	36.36%	
	5 Year Average								44.29%
Section II: Part C: Degrees Conferred (fiscal year)	1. Associate	0	0	0	0	0	0	0	
	5 Year Average								0
	2. Baccalaureate	30	28	45	45	39	47	37	
	5 Year Average								42.6
	3. Masters	30	68	124	91	73	72	151	
	5 Year Average								102.2
	4. First Prof / Specialist / Certificate	0	0	0	0	0	0	0	
	5 Year Average								0
	5. Doctorate	3	1	2	4	2	0	3	
	5 Year Average								2.2
	6. Total	63	97	171	140	114	119	191	
	5 Year Average								147

Wichita State University
College of Engineering
FY 2008-2009 KBOR Program Review
Dean's Response
BS, MS and PhD in Electrical Engineering
BS in Computer Engineering
BS and MS in Computer Science

College of Engineering Academic Program Review Process Overview

During academic year 2005-2006 the College of Engineering (CoE) underwent an extensive and inclusive strategic planning process with input from the College Industry Advisory Board (IAB), leadership, faculty, staff and students. The final outcome of this process was a ten-year strategic plan for the College. From this plan and based on the Wichita State University (WSU) mission, the mission and vision of the College of Engineering, as stated below, were developed and approved by the Wichita State University Provost and Vice President for Academic Affairs and Research.

Vision

The College of Engineering at Wichita State University will be recognized nationally and internationally for its: experience-based undergraduate and graduate degree programs; collaborative efforts with industry; and research programs to support the economic development and global competitiveness of the Wichita metropolitan area, the state of Kansas, and the nation.

Mission

The College of Engineering at Wichita State University is committed to:

- *Prepare graduates who will engage effectively and responsibly in the practice of the engineering profession in a global economy and in pursuing advanced engineering education.*
- *Conduct applied and basic research to support and contribute to the social and economic well-being of citizens and organizations in the Wichita metropolitan area, the state of Kansas and beyond.*
- *Cultivate the spirit of entrepreneurship and the connection between engineering and business that encourages technology commercialization.*
- *Improve continuously the engineering pedagogical methods employed in delivering its academic programs.*
- *Foster and value diversity of ideas and people through early student recruitment, outreach programs, and the recruitment and development of faculty role-models.*
- *Encourage scholarship in all its dimensions.*
- *Evolve thoughtfully in response to the needs of industry and the changing world.*

The Department of Electrical Engineering and Computer Science (EECS) mission is in complete alignment with the CoE vision and mission above.

College Assessment Process

The purpose of the assessment process at the college level is to ensure that the college follows a strategic direction that serves well all its constituents and that there is a system in place that allows for continuous improvement in the achievement of the college mission and vision. The input in this process is gathered from a College IAB and Student and Faculty Advisory Boards to the Dean. The College IAB provides input to the Dean and Chairs at least twice per academic year on college and departments strategic direction matters and overall engineering education issues. In addition, this board assists in the establishment or revision of the college's mission and vision and the evaluation of the achievement of these. The other two boards interact with the dean at least twice a semester to discuss topics such as laboratory infrastructure needs and overall quality of the educational or job experience. An additional tool used by the Dean to gather input from the faculty is the College of Engineering Faculty Survey of Department Chairperson.

Every undergraduate program in the CoE has its educational objectives and outcomes. The program objectives are statements that describe the expected accomplishments of graduates during the first few years after graduation while outcomes are statements that describe what students are expected to know and able to do by the time of graduation.

The primary assessment tools for the program objectives are the Alumni Surveys, Employer Survey and Industrial Advisory Board meetings. There is a process to establish or determine the objectives, how the program ensures that the objectives are achieved, and a system of ongoing evaluation that leads to continuous improvement of the program.

The process for determining and evaluating program objectives involves the program faculty, alums, employers, program or department IAB and the Program Curriculum and Assessment Committee and students. This process is repeated every year in most of the programs.

As part of the process to ensure the achievement of objectives, the Dean's Office administers the Alumni Survey every fall and sends the data gathered to the departments. Every fall the departments analyze the Alumni Survey data from the previous year, along with the Employer Survey data and the input received in the IAB Spring meeting. The Curriculum and Assessment Committee of the program consider this information and revise or update the program objectives and objective target levels and recommends curriculum changes and laboratory upgrades or enhancements. The recommendations are further reviewed by the IAB and approved or modified by the departmental faculty.

The desired outcomes of the academic programs are for the most part observed as attributes of the program graduates. These were developed by the faculty with input from the IAB and the students. The outcomes of every program essentially replicates the (a) through (k) outcomes of criterion 3 of Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering Technology (ABET).

Assessment tools for the program outcomes vary by program but may include: Fundamentals of Engineering Examination, core knowledge exams developed by program faculty, prerequisite exams,

course folders or portfolios, alumni surveys, graduating senior exit surveys and interviews, senior project evaluation by faculty and professional engineers, specific class exam questions and projects and co-op experience evaluation by employers and students. Every outcome is assessed by at least one tool but on the average three tools are used per outcome.

The process to ensure the achievement of the program outcomes is repeated every year and involves data collection and analysis by the program Curriculum and Assessment Committee, recommendations of changes from the committee, consideration of those changes by the IAB of the program and approval of the changes by the departmental faculty. The final step in closing the loop in the process is the implementation of faculty approved changes and modification to the catalog.

Bachelor of Science in Electrical Engineering, Bachelor of Science in Computer Engineering and Bachelor of Science in Computer Science

The Department of EECS was formed in summer 2008 when the then Department of Computer Science (CS) was moved to the CoE from the Fairmount College of Liberal Arts and Sciences to join the then Department of Electrical and Computer Engineering (ECE). The EECS Department offers three undergraduate programs: a Bachelor of Science (BS) in Electrical Engineering (EE), a Bachelor of Science (BS) in Computer Engineering (CE) and a Bachelor of Science (BS) in Computer Science (CS). The EECS Department has established two objectives for each one of the three undergraduate programs it offers. The program objectives are evaluated, assessed, and revised by the department on a regular basis as part of the ABET continuous improvement process. All program constituents; students, alumni, faculty and employers are involved in the process. There are also five outcomes associated with each one of the three undergraduate programs offered by the EECS Department.

The assessment of the undergraduate programs in the College of Engineering is the responsibility of the department offering the program. However, there is a coordinating body at the College level called the ABET Task Force in which each department has at least two representatives; the department chair plus a faculty member. This task force is chaired by the College ABET Coordinator and its charge includes the maintenance and updating of the assessment tools common to all programs (e.g., the Alumni Survey and the Cooperative Education Employer Survey), sharing of information and best practices and review of data collection methods and schedules. The ABET Task Force has been in place at least since the year 2001 but it has been meeting consistently since fall 2005. The Dean of the College of Engineering meets with this task force at least twice a year on regular years and at least four times during the year before an ABET visit.

The success in meeting the EE, CE and CS program objectives is a function of how well graduating students master the program outcomes. The mastery of the program outcomes is assessed through multiple tools including but not limited to: Knowledge Probes, Senior Teamwork and Exit Survey, Senior Interview, Open House Survey and Cooperative Education Employer Survey. Most of these assessment tools are applied every year. Therefore, the EECS Department is assessing the undergraduate students' mastery of the BS in EE, CE and CS program outcomes continuously.

In spring 2007, the BS in EE and CE programs were subjected to a mock ABET accreditation visit conducted by experienced evaluators who reviewed the self-study report, curriculum content, laboratory facilities, college and institution support for each program, program objectives and outcomes' review and assessment processes, and faculty size and credentials. Recommendations were provided by the EE program mock visitor on program objectives, how to present some of the assessment results in the self-study report, and the use of some assessment tools. In the case of the CE, the mock visitor gave high marks to everything the department was doing and no recommendations were offered. The actual ABET accreditation visit for both of these programs took place in fall 2007 and the College was informed of the full accreditation of both programs (six years) in August 2008. By the time the KBOR BSEE and BSCE program reviews are over, these two programs would have been under some sort of comprehensive review for 24 months while the BSCS program would have been through one review. As it is required by ABET, all these program reviews have involved not only the department chair but all the faculty members in the department.

Master of Science in Computer Science, Master of Science and Doctor of Philosophy in Electrical Engineering

The EECS Department offers three graduate programs namely, Master of Science (MS) in Computer Science (CS), Master of Science (MS) and Doctor of Philosophy (PhD) in Electrical Engineering (EE). The mission of the MS in CS is *to prepare students either for careers at advanced skill levels in industry, or to continue their graduate education in a PhD Program*. On the other hand, the MS in EE exists *to prepare students for carriers in electrical engineering and related fields, as well as further graduate study* while the PhD *prepares students for highest-level electrical engineering careers in academia, research, and industry*.

There are seven objectives associated with both the graduate programs in EE and two with the MS in CS program. The department has identified six, three and four program outcomes for the MS in EE, MS in CS and PhD in EE, respectively. The program outcomes are used in measuring the student mastery of program content or skills developed.

The assessment of the graduate programs in the College of Engineering is the responsibility of the department offering the program. However, there is a coordinating body at the College level called the Graduate Committee (GC) in which each department is represented. This committee is chaired by the College Associate Dean and is in charge of overseeing the development and implementation of the assessment plans for the individual graduate programs, sharing information and best practices on assessment, recruitment and operation of the programs. The GC meets on a regular basis and also handles common challenges and opportunities to multiple graduate programs.

One of the main sources of data for the assessment of the success in meeting the EECS Department graduate programs' objectives is the Graduate School Exit Survey which provides feedback on the degree of satisfaction of the graduates with the educational experience they received at WSU. Information on admissions to these graduate programs serves as another source of data in assessing the achievement of the programs' objectives.

The mastery of the Department of EECS graduate programs' outcomes is assessed through multiple tools including but not limited to: MS Exit Exam; information on student performance on specific courses provided by faculty; information from students' graduate plan of studies; Dissertation, Thesis and Final Project Presentations; and Dissertations, Theses, and Final Reports. Most of these assessment tools are applied every year. Therefore, the EECS Department is assessing the graduate students' mastery of the MS and PhD in EE and MS in CS program outcomes continuously.

Use of Data

In reviewing the six academic programs offered by the EECS Department, multiple sources of information and data were used including the report provided by the WSU Office of Institutional Research for Program Review, benchmarking analysis of WSU EECS Department and the equivalent department at Kansas State University and the University of Kansas, faculty activity reports and productivity analysis covering years 2003 to 2007, the assessment data for the six programs as well as the most recent Graduate School Exit Survey results. The assessment data for the BS in EE and CE is based on the application of direct and indirect assessment tools. The data comes from surveys, interviews, assessment exams, senior project reports, and faculty as well as employers evaluation of senior design projects. Different constituents including faculty, students, employers and alumni are sources of input in this assessment process.

The recommendations included below as well as the fiscal implications of these are based on all the data analyzed as part of the program review process and the College of Engineering productivity measures included in Table 1. It is important to point out that Table 1 does not include information on the former CS Department due to the fact that the information available includes all the courses that were offered by the department, however, all CS courses below the 200 level were retained in the Fairmount College of Liberal Arts and Sciences.

Table 1. College of Engineering Productivity (Five-Year Average).

Measure\Department	AE	ECE	IME	ME
# of undergraduate students/Faculty	20.13	31.74	6.8	26.24
# of MS students/faculty	5.83	21.05	11.61	10.94
# of PhD students/faculty	1.35	2.12	1.78	1.29
# of journal articles/faculty	0.5	?	1.27	1.18
# of conference proceedings	1.58	?	2.53	2.12
external funds awarded/faculty ($/year)	$208,529	$111,592	$85,225	$51,591
Credit hours/faculty	372.16	688.28	420.94	446.73
Degrees awarded/faculty	4.27	15.09	5.84	8.27

Significant Program Changes

The changes implemented by the EECS Department within the last five years to close the loop in the continuous improvement process of its academic programs are included as follows.

- A new department was created to house the undergraduate and graduate programs in EE, the undergraduate program in CE and the undergraduate and graduate programs in CS.
- Six new tenure track faculty members were hired during academic years 2006-2007 and 2007-2008. Expertise in the areas of: signal processing and communication systems; data storage and computer network security; quantum computing and architecture; computer networking and sensor networks; energy measurement in sensor networks and wireless networks; and mobile computing and distributed systems was added to the department with these hires.
- A new academic program, MS in Computer Networking, was developed and approved by the KBOR. Its offering will start the latest in fall 2009.
- An investment of more than $250,000 has been made to enhance the Electronic Circuit and Digital Design Laboratory, and the Electric Machinery and Power Electronic Laboratory.
- The Engineer 2020 program was implemented.

The Engineer 2020 program requires that to fulfill the requirements for a BS in EE, CE or CS degree at WSU, each student completes at least three of the following: a. Undergraduate Research, b. Cooperative Education or Internship, c. Global Learning or Study Abroad, d. Service Learning, e. Leadership, and f. Multidisciplinary Education. With the Engineer 2020 program the students will:

a) develop
    a. ability to design and conduct experiments, as well as to analyze and interpret data;
    b. ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
    c. ability to function on multi-disciplinary teams;
    d. ability to identify, formulate, and solve engineering problems;
    e. understanding of professional and ethical responsibility;
    f. ability to communicate effectively; and
    g. ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
b) obtain
    a. the broad education necessary to understand the impact of engineering solutions in a global, economic, environment, and societal context; and
    b. knowledge of contemporary issues.
c) recognize the need for, and an ability to engage in, life-long learning.

Summary and Recommendations

From the data presented in both program reviews, undergraduate and graduate, it is clear that the EECS Department qualifications are adequate to support the six academic programs: BS and Ms in CS; BS in CE; and BS, MS and PhD in EE. The productivity of the EECS faculty as it is measured by the last five year average for the number of BS students/instructional faculty (31.7/faculty member), MS

students/instructional faculty (21/faculty member), the number of PhD students/faculty member (2.1/faculty member), credits hours/instructional faculty (688/faculty member), degrees awarded/instructional faculty (15/faculty member), among others, should be commended. The College of Engineering heavily depends on the release money generated by the faculty in the College to conduct its operations. Therefore, it is strongly encouraged that the level of research funded research and specifically faculty release generated by the EECS be increased.

It is clear that the programs offered by the EECS Department supports the WSU mission as an urban research serving institution and contribute to the economy of the city of Wichita, the state of Kansas and the nation. Further, the undergraduate PEOs and the graduate program objectives are being met. There is only one graduate program objective, the percentage of the faculty with full graduate faculty membership, that is not being fully met. However, the hiring of the new six faculty members should address this situation. There is also evidence that the undergraduate and graduate programs' outcomes are being mastered by the graduates from all the programs.

As part of undergraduate programs' continuous improvement process it is recommended that:

- The work in progress to strengthen the advising system continue.
- More industry based projects be integrated across the curriculum.
- The implementation of the teaching laboratory enhancement and development plan continue.
- The efforts to further enhance the undergraduate educational process including the classroom experience be expanded.
- The BS in CS is ready for accreditation by the Computing Accreditation Commission (CAC) of ABET four years from now.
- More synergy and collaboration is fostered between the BS in CE and CS.

All the academic programs in the EECS Department could benefit from an expansion of the system in place to follow up the placement of graduates. The MS in CS could benefit if more courses in the areas of networking, software engineering, systems programming, and web related applications are available to students in the program.

The expansion of the Engineer 2020 program should continue. It is also recommended that as many EECS faculty members as possible continue to be involved in the College of Engineering Faculty Enhancement program with the objective of improving, even further, the quality of the educational experience offered by the department. The work of the First Year Engineering Program Task Force should also continue with active participation of the EECS faculty.

Fiscal Implications of Recommendations

Table 6 in the Department of EECS Undergraduate Programs' Review, which is Table 4 in the Graduate Programs' Review, deserves some clarification. The decrease in the department budget from fiscal year

2006 to 2007 was due to the fact that the technician, and therefore the technician's salary, allocated to the department was moved to another organization within the College with the purpose of consolidating the technical support offered to all College's departments. On the other hand, the reason for the decrease in the budget from fiscal year 2007 to 2008 was the four faculty positions that became unfilled in 2008. It is policy in the CoE that when a department has an unfilled position, it receives 50% of the salary allocated to the position to be used as other operating expenditures and the other 50% is used to pay for the shrinkage; therefore this last 50% is not reflected as expenditures in the department. These four faculty positions are currently filled.

The EECS Department is encouraged to maintain its commitment to academic excellence and program objectives as well as the continuous improvement process of its academic programs. The EECS faculty is well qualified to support the goals of the department and its six academic programs.

The EECS Department currently has five faculty positions unfilled including a position that was allocated to the department as part of the institution's commitment with the accreditation of the BS in EE and CE programs, one retirement and one faculty who left at the beginning of academic year 2008-2009, and two positions to replace lecturers in CS whose terms expired at the end of last year. If the recommendations above are to be implemented successfully, these faculty positions must be filled. Another potential fiscal implication of implementing the above recommendations is the need for additional information technology and non-information technology laboratory support. The College of Engineering did have four persons providing support in these areas, however, since summer of 2008 that number went down to two when some of the information technology responsibilities were moved to UCATS. If providing additional technical support becomes an imperative, a combination of resources from research projects and faculty release will be a potential source of funding to cover the cost of such support.

Wichita State University
GRADUATE SCHOOL
KANSAS BOARD OF REGENTS 2009 PROGRAM REVIEW
Doctor of Philosophy in Electrical Engineering
Master of Science in Electrical Engineering
Master of Science in Computer Science

Review process: The Graduate Council prepared, discussed and reviewed these materials.

Program: The MS in both EE and CS has three options. The thesis option requires 24 hours of graduate course work plus a minimum of 6 thesis hours. The directed project option requires a minimum of 30 hours of graduate work plus a minimum of 3 hours of directed project work. The all course work option requires a minimum of 33 hours and an exit exam for EE, or 36 hours for CS, of graduate course work. The PhD degree requires 33 hours of graduate course work beyond the MS degree and 24 dissertation hours. Each PhD student must complete a comprehensive examination which covers the student's major and minor fields and all other information deemed necessary by the PhD advisory committee. From 2004 to 2008, an average of 240 students were enrolled in the MS EE program, with an average of 102 degrees conferred each year. During that same time period, an average of 24 students were enrolled in the PhD EE program, averaging 2.2 degrees granted each year. The MS CS averaged 98 students during this time period, with an average of 31 graduates per year.

Mission: The self-study describes separate mission statements for the three programs. The linkage between these missions and the related program objectives and the university's teaching and research mission is apparent but is not explicated. However, linkages with service aspects of the university's mission are not apparent.

Program faculty: The department currently has sixteen full-time faculty members, fifteen of whom have PhDs in their respective areas of specialization. Compared to other regional universities, the degree productivity per faculty at the MS and PhD levels is high. No data were provided about percent of graduate courses taught by full-time tenured-track faculty, about teacher/student ratios, or about external funding support for graduate students, so the adequacy of these criteria cannot be discerned.

Curriculum and Student Outcomes: Some data (for 2008 only) were provided for frequency of course offerings, but no data were provided to support the adequacy of course frequency or sequencing. We note that program satisfaction data will be obtained at a future time. No evidence was provided as to student diversity. Admission standards for MS EE and PhD programs appear adequate, but standards for the MS CS program were not provided. Admission outcomes for the MS EE program were adequate, but GRE score requirements for the PhD EE program were met by only 25% of admit. No data were provided about student presentations. The EE & CS Department seems to have a solid process and structure for program and objective evaluation in place. Few data were provided concerning what particular changes have been made as a result of these. Stated objectives for the three programs were met, with the sole exception of an inadequate number of graduate-qualified faculty. Objectives concerning student achievement appear to simply reflect program requirements rather than assessing the extent of

mastery of various aspects of the curriculum. That is, data are not provided as mastery of program content. Concerning the MS EE Competency outcome (A), achievement was signified by "advisers were satisfied with the progress of their graduating students." How was this measured?

Student Needs/Employer Demands: Employer demand is well-documented for each program. However, placement data are sparse and give only an anecdotal picture of how well the department prepares students for their goals.

Recommendations: We recommend that the department address service criteria for each program, and that the linkages between program mission facets and college and university's missions are made more explicit. The GRE admissions standard for the PhD program is problematic. We recommend that the EE & CS Department either alter the GRE standard for PhD admission, or enforce it. The department would be better able to document the extent and quality of student placement by collecting empirical data to supplement and support the anecdotal data already provided.

Submitted by Abu Masud, Associate Dean of the Graduate School
Approved by the Graduate Council on November 20, 2008

KANSAS BOARD OF REGENTS PROGRAM REVIEW

GRADUATE PROGRAMS

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

WICHITA STATE UNIVERSITY

2008

1. *A statement that describes how the program relates to the mission and role of the college and the university.*

The Department of Electrical Engineering and Computer Science (EECS) offers comprehensive programs that lead to undergraduate (BS) and graduate (MS and Ph.D.) degrees in fulfilling and promoting the missions and roles of the university and college. Electrical engineers and computer scientists play a lead role in developing the modern technologies in a wide variety of specialties including electronics, power systems, controls, networking, software development, software engineering, computer architecture, and communications. Graduates from the EECS Department at Wichita State University serve Wichita companies, Kansas companies and companies through out the nation.

The mission of Wichita State University, as approved by the Kansas Board of Regents, states in part:

> Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship, and public service, the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national, and global community.
>
> High-quality teaching and learning are fundamental goals in all undergraduate, graduate, and continuing education programs. Building on a strong tradition in the arts and sciences, the University offers programs in business, education, engineering, fine arts, and health professions, as well as in the liberal arts and sciences. Degree programs range from the associate to the doctoral level and encompass 75 fields of study; non-degree programs are designed to meet the specialized educational and training needs of individuals and organizations in south central Kansas.
>
> Scholarship, including research, creative activity, and artistic performance, is designed to advance the University's goals of providing high quality instruction, making original contributions to knowledge and human understanding, and serving as an agent of community service. This activity is a basic expectation of all faculty members at Wichita State University.
>
> Public and community service activities seek to foster the cultural, economic, and social development of a diverse metropolitan community and of the state of Kansas. The University's service constituency includes artistic and cultural agencies, business and industry, and community educational, governmental, health, and labor organizations.

In response to the mission statement of Wichita State University, the College of Engineering has developed and adopted the following mission statement:

The College of Engineering at Wichita Sate University is committed to the following:

- Preparing graduates who will engage effectively and responsibly in the practice of the engineering profession in a global economy and in pursuing advanced engineering education.
- Conducting applied and basic research to support and contribute to the social and economic well-being of citizens and organizations in the Wichita metropolitan area, the state of Kansas and beyond.
- Cultivating the spirit of entrepreneurship and the connection between engineering and business that encourages technology commercialization.
- Improving continuously the engineering pedagogical methods employed in delivering academic programs.
- Fostering and valuing diversity of ideas through early student recruitment, outreach programs, and the recruitment and development of faculty role-models.
- Encouraging scholarship in all its dimensions.
- Evolving thoughtfully in response to the needs of industry and the changing world.

Aligned with the mission of the university and the vision of the college, the Department of Electrical Engineering and Computer Science has adopted the following mission statements for our graduate programs.

MS EE Mission Statement:

To prepare students for carriers in electrical engineering and related fields, as well as further graduate study.

MS CS Mission Statement:

To prepare students either for careers at advanced skill levels in industry, or to continue their graduate education in a PhD. Program.

PhD EE Mission Statement:

To prepare students for highest-level electrical engineering careers in academia, research, and industry.

2. *A statement that analyzes the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty.*

The department currently has seventeen full-time faculty members in permanent lines and one temp faculty member; including the chair, Dr. Sawan, (who is 50% academic), one full-time instructor, Mr. Jackson, and one full-time administrator, Dr. Pendse. Sixteen faculty members have Ph.D. degrees and all teach courses at the graduate and undergraduate level. Faculty expertise is balanced into prominent areas of electrical and computer engineering and computer science including electrical power systems, controls, communications, computer networking, sensor networks, computer architecture, and data management systems.

The current faculty, along with faculty rank and graduate faculty rank of each is given in Table 1, along with carrier scholarly activities and industrial experience. As seen, the department has a very good distribution of faculty rank, indicating an experienced yet growing department.

Table 1 – Career Industrial Experience and Scholarly Activities of EECS Faculty

Faculty Name	Rank (Grad. Faculty)	Years in Industry	# Journal Papers	# Confer. Present.	External $ Received
E. Sawan, PhD (1979) Univ. of Ill.-Urbana	Professor (Full)	3	30	70	$0
J. Watkins, PhD (1995) Ohio State Univ.	Assoc. Prof. (Full)	0	11	53	$873,000
W. Jewell, PhD (1986) Oklahoma State Univ.	Professor (Full)	4	28	80	$3,007,000
A. Teshome, PhD (1980) Cornell Univ.	Assoc. Prof. (Full)	8	12	48	$500,000
R. Pendse, PhD (1994) Wichita State Univ.	Professor. (Full)	0	13	100	$12,600,000
R. Bagai, PhD (1990) Univ. of Victoria	Assoc. Prof. (Full)	2	7	23	$332,800
H. Kwon, PhD (1984) Univ. of Michigan	Professor (Full)	5	28	116	$2,500,000
P. Ramanan, PhD (1984) Univ. of Illinois	Assoc. Prof. (Full)	0	19	10	$275,000
B. Tang, PhD (2007) Stony Brook Univ.	Assist. Prof. (Associate)	0	3	6	$0
P. Kumar, PhD (2007) Wichita State Univ.	Assist. Prof. (Associate)	0	4	6	$40,000
S. Skinner, PhD (1991) Univ. of Iowa	Professor (Full)	4	16	55	$2,275,000
S. Song, PhD (2001) Univ. of Minnesota	Assist. Prof. (Associate)	10	2	18	$50,000
V. Namboodiri, PhD (2008) U. Mass. Amherst	Assist. Prof. (Associate)	0	2	7	$0
C. Cetinkaya, PhD (2003) Rice Univ.	Assist. Prof. (Full)	0	4	8	$406,300
N. Jaggi, PhD (2007) Rensselaer Polytech. Inst.	Assist. Prof. (Associate)	4	3	8	$0
Yanwu Ding, PhD (2007) McMaster Univ.	Assist. Prof. (Associatee)	5	4	4	$0
K. Jackson, MS (1970) Wichita State Univ.	Instructor	0	0	0	$0
Totals		**49**	**186**	**612**	**$22,859,100**

The strengths, productivity, and qualifications of the faculty can first be determined by the amount of scholarly activity of each faculty member. Table 1 also presents the scholarly activity of each faculty member in regards to journal publications, conference proceedings and presentations, and grant activity. As seen in the table, all faculty are active in research regardless of their specialized area. The journal publications have appeared in leading refereed journals such as IEEE Transactions on Communications, IEEE Transactions on Neural Networks, IEEE Transactions on Signal Processing, Physical Review, International Journal of Electric Power & Energy Systems, Optics Letters, IEEE Journal of Quantum Electronics, IEEE Transactions on Energy Conversion, IEEE Transactions on Power Delivery, IEEE Transactions on Automatic Control, Journal of Algorithms, Information Processing Letters, ACM Transactions on Sensor Networks, and Journal of Discrete Algorithms. Many of the journal articles are co-authored by graduate students of the department. External grants have come from a variety of government and industry sources including the National Science Foundation, Office of Naval Research, Federal Aviation Administration, Kansas Electric Utility Research Program, and US Army. In addition to the activity listed in Table 1, Dr. Kwon has been awarded 12 patents and Dr. Song has been awarded 7 patents.

The faculty has also strived for excellence in teaching and research and, as a result, has won several awards. These awards include:

- WSU Academy of Effective Teaching Award (two awards)
- College of Engineering Wallace Continuing Educator Award
- College of Engineering Wallace Excellence in Teaching Award (Multiple Awards)
- College of Engineering Wallace Excellence in Research Award (Multiple Awards)
- Institute of Electrical and Electronic Engineers (IEEE) Third Millennium Award
- Cisco Fellow
- IEEE Fellow
- Boeing Fellow (Multiple Awards)
- Bombardier/Learjet Fellow (Multiple Awards)
- NCR Corporation Award for Excellence in Academic Achievement
- Mortar Board Award for Outstanding Inspiration and Student Support
- NASA-ASEE (American Society for Engineering Education) Summer Faculty Fellow

The faculty of the Electrical Engineering and Computer Science Department are very active in service to the profession. All EECS faculty are members of the professional society which covers their respective area and have been involved with reviewing articles for technical journals and serving as session chairs to various professional conferences. Below is a sample of some other services to the profession that have been performed by EECS faculty members during their tenure at WSU:

- Chairman - IEEE Wichita Section
- Vice Chair – IEEE Wichita Section
- Treasurer - IEEE Wichita Section
- Secretary - IEEE Wichita Section
- Proposal Review Board - National Science Foundation

- Technical Program Chair – IEEE Wichita Conf. on Commun., Netw. and Signal Process.
- Associate Editor of IEEE Signal Processing Magazine
- Registration Chair, American Control Conference
- Chair, Wichita Chapter of the IEEE Power Engineering Society (PES)
- Secretary, IEEE Power and Energy Society (PES) Energy Development Subcommittee
- Secretary, IEEE PES Working Group on Photovoltaic

The quality of the graduate programs are excellent as assessed by the strength, productivity and qualifications of the faculty. It is poised to continue its development in the future. We are currently searching for five new faculty members. These new faculty members will have credentials placing them at the forefront in their area of expertise.

3. *A statement that analyzes the quality of the program as assessed by the regularly offered curriculum and the effect of the curriculum on the students.*

The mission of the EECS Department is to provide our students with a strong foundation in the traditional and contemporary areas of electrical engineering, computer engineering and computer science. The objective of the graduate program is to prepare students for jobs in industry, government and academics.

The electrical engineering program offers graduate degrees at the MS and Ph.D. level. The computer science graduate program offers an MS degree. The quality of the graduate program is set by the breadth and depth of courses and research experiences the program offers in several areas of specialization.

The MS degrees in EE and CS require the completion of the Plan of Study approved by the student's advisor and the department graduate coordinator, which must be filed within the first 12 credit hours of graduate course work. Three options are available:

(1) the *thesis option* requires a minimum of 24 hours of graduate level course work plus a minimum of 6 hours of thesis,
(2) the *directed project option* requires a minimum of 30 hours of graduate level course work plus a minimum of 3 hours of directed project, and
(3) the *course work option* requires a minimum of 33 hours and an exit exam for EE, or 36 hours for CS, of graduate level course work.

The Ph.D. degree requires 33 hours of graduate level course work beyond the MS degree and 24 hours of dissertation hours. In addition, each Ph.D. student must complete a comprehensive examination given by their Ph.D. advisory committee. The exam covers the students major and minor fields along with anything else the committee deems necessary.

The program objectives of the MS EE degree are:

a. To ensure the admission of qualified students into the program each year.
b. To provide qualified faculty for the program.
c. To provide appropriate laboratories for the program.

d. To provide an appropriate variety of graduate courses for the program.
e. To enroll a sufficient number of students to support the courses offered.
f. To achieve an acceptable placement rate within one year of graduation either in jobs or in graduate programs for further study.
g. To ensure graduates are satisfied with the program (three years after graduation).

The program objectives of the MS CS degree are:

a. To provide students with advanced level knowledge and skills required for productive employment in industry and government.
b. To provide students with the academic skills required for employment in research and for further graduate study in computer science.

The program objectives of the Ph.D. EE degree are:

a. To ensure the admission of qualified students into the program each year.
b. To provide qualified faculty for the program.
c. To provide appropriate laboratories for the program.
d. To provide an appropriate variety of graduate courses for the program.
e. To enroll a sufficient number of students to support the courses offered.
f. To achieve an acceptable placement rate within one year of graduation.
g. To ensure graduates are satisfied with the program (three years after graduation).

The outcomes for the MS EE program are:

a. Students with a research emphasis will demonstrate competency in their one selected emphasis area.
b. Students with a research emphasis will demonstrate report-writing skills.
c. Students with a research emphasis will demonstrate presentation skills.
d. Students with an industrial emphasis will demonstrate a broad knowledge within two selected areas of emphasis.
e. Students will demonstrate critical and analytical skills necessary for research and industry.
f. Students will demonstrate familiarity and skills with modern computer tools necessary for research and industry.

Students in the thesis or directed project options are considered to have a research emphasis. They will have at least one area identified for their emphasis of study. Students in the courses-only option are considered to have an industrial emphasis. They will have at least two areas of emphasis for a broad knowledge of electrical engineering and for preparation for the MS exit exam.

The outcomes for the MS CS program are:

a. The student will gain advanced knowledge of the mathematical foundations of computer science.
b. Graduates will have depth of knowledge in an area of specialty within computer science.
c. Graduates will have one of the following:
   1. advanced skills in software development
   2. skills and experience in conducting research
   3. breadth of knowledge in Computer Science

The outcomes for the PhD program are:

a. Students will demonstrate competency in their major and minor areas.
b. Students will demonstrate report-writing skills.
c. Students will demonstrate presentation skills.
d. Students will demonstrate critical and analytical skills necessary for research in their major area.

Assessment of Objectives for MS EE Programs:

a. **<u>Program Objective (a) – Admission of qualified students</u>:**

Admit fewer than 20% of the qualified applicants into categories other than "full standing". Admission to full standing requires a Bachelor of Science degree in electrical or computer engineering or related field with a minimum GPA of 3.00 out of 4.00 in the last two years or approximately 60 hours of their undergraduate studies.

This objective was achieved. 97% of the graduate students who were recommended for admission in the fall 2006 were granted admission in full standing. (The graduate students who were granted admission in tentative standing were excluded in the percentile calculation.)

Admit only international applicants who meet the minimum TOEFL score of 550 paper-based and 213 computer-based or 79 internet-based.

This objective was achieved. 100% of the admitted students met the minimum TOEFL requirement.

b. **<u>Program Objective (b) – Providing qualified faculty for the program</u>:**

More than 80% of the line faculty must be full members of the graduate faculty.

This objective is not presently met. 62.5% of the ECE faculty members have full membership status. The department hired six new faculty members in

the last two years who were given graduate faculty associate membership. As these new faculty start graduating MS students, there status will change.

c. **Program Objective (c) – Providing appropriate laboratories:**

Appropriate technical personnel must be available for service and maintenance of the department laboratories.

This objective has been achieved. Two full time technicians are employed by the College of Engineering for the service and maintenance of the college laboratories.

On the Graduate School Exit Survey, students indicate that access to the laboratories was appropriate for their areas of specialty.

92% of the Engineering students indicated that access to the laboratories was appropriate.

d. **Program Objective (d) – Appropriate variety of graduate courses:**

The department must offer 10 or more graduate level courses in each semester, excluding thesis, directed project, and dissertation hours.

This objective was achieved. In the spring 2008 semester, the departments offered 12 courses at, or above, the 700 level. In the fall 2008 semester, the department offered 13 courses at, or above, the 700 level.

e. **Program Objective (e) – Enrolling Sufficient Number of Students:**

The department must enroll more than 50 degree-bound students per semester.

This objective was achieved. In FY 2008, the department had 311 students in the MS programs.

The department must grant in excess of 10 Master of Science degrees per academic year.

This objective was achieved. In 2007 fiscal year, the departments granted 100 MS degrees.

f. **Program Objective (f) – Placement rate and graduate school admission:**

More than 85% of the graduates of the program must be placed within six months of graduation either in jobs or in graduate programs for further study.

Data is not available at this time. A survey will be conducted to determine the achievement of this objective.

g. **Program Objective (g) – Satisfaction with the program:**

More than 85% of program graduates, surveyed three years after graduation, will indicate satisfaction with the program.

Data is not available at this time. A survey will be conducted to determine the achievement of this objective

Assessment of Objectives for MS CS Programs:

a. **Program Objective (a) – Advanced level knowledge and skills required for productive employment:**

This outcome was assessed through an alumni survey conducted in 2007, in which eleven alumni responded. Results indicated that there is a need for courses related to networking, software engineering, systems programming, and web related applications. In response, a new faculty hire in computer networking was made.

b. **Program Objective (b) – Academic skills required for employment in research and for further graduate study:**

Data is not available at this time, as no MS CS graduates have gone on to PhD programs.

Assessment of Objectives for PhD Program:

a. **Program Objective (a) – Admission of qualified students:**

Admit fewer than 20% of the qualified applicants into categories other than "full standing". Admission to full standing requires a Master of Science degree in electrical engineering or related field with a minimum GPA of 3.25 out of 4.00 in graduate studies.

This objective was achieved. 88% of the students who were admitted in the fall 2006 were granted admission in full standing.

At least 80% of those admitted into the PhD program will have the following minimum GRE scores: 5 for analytical writing, 500 for verbal reasoning, and 650 for quantitative reasoning.

This objective was not achieved. 25% of the students who were admitted in the fall 2006 satisfied these GRE requirements.

Admit only international applicants who meet the minimum TOEFL score of 550 paper-based and 213 computer-based or 79 internet-based.

This objective was achieved. 100% of international students who were admitted in the fall 2006 met this TOEFL requirement.

b. **Program Objective (b) – Providing qualified faculty for the program:**

More than 80% of the line faculty must be full members of the graduate faculty.

This objective is not presently met. 62.5% of the ECE faculty members have full membership status. The department hired six new faculty members in the last two years who were given graduate faculty associate membership. As these new faculty start graduating MS students, there status will change.

c. **Program Objective (c) – Providing appropriate laboratories:**

Appropriate technical personnel must be available for service and maintenance of the department laboratories.

This objective has been achieved. Two full time technicians are employed by the College of Engineering for the service and maintenance of the college laboratories.

On the Graduate School Exit Survey, students indicate that access to the laboratories was appropriate for their areas of specialty.

This objective has been achieved. 92% of the Engineering graduate students indicated that access to the laboratories was appropriate.

f. **Program Objective (d) – Appropriate variety of graduate courses:**

The department must offer 10 or more graduate level courses in each semester, excluding dissertation hours.

This objective was achieved. In the spring 2008 semester, the departments offered 12 courses at, or above, the 700 level. In the fall 2008 semester, the department offered 13 courses at, or above, the 700 level.

g. **Program Objective (e) – Enrolling Sufficient Number of Students:**

The department must enroll more than 5 degree-bound students per semester.

This objective was achieved. In the fall 2006 semester, the department had 19 students in the Ph.D. program.

The department must grant in excess of 2 PhD degrees per academic year.

This objective was achieved. From FY 2004 through FY 2008, the department graduated 11 PhD students, averaging 2.2 graduates per year

h. **Program Objective (f) – Placement rate:**

More than 85% of the graduates of the program must be placed within one year of graduation.

The objective has been achieved. We had three graduates in FY 2008, all of who are gainfully employed. Thus, 100% of the FY 2008 graduates have obtained jobs.

i. **Program Objective (g) – Satisfaction with the program:**

More than 85% of program graduates, surveyed three years after graduation, will indicate satisfaction with the program.

Data is not available at this time. A survey will be conducted to determine the achievement of this objective.

Assessment of Outcomes for MS EE Program:

a. **Educational Outcome (a) – Competency in selected emphasis area:**

For those with either a thesis or directed project option (research emphasis), their progress will be monitored to ensure satisfactory mastery in their area of emphasis. Satisfactory mastery is indicated by receiving grades of B or better in each course in their selected emphasis area.

This outcome has been achieved. Advisers were satisfied with the progress of their graduating students.

b. **Educational Outcome (b) – Report writing:**

Students with a research emphasis will demonstrate report-writing skills. This will be assessed via the required written thesis for those with the thesis option, and via the required project report for those with the directed project option.

This outcome has been achieved. All theses and project reports were accepted.

c. **Educational Outcome (c) – Presentation skills:**

Students with a research emphasis will demonstrate presentation skills. This will be assessed via the required oral defense of the thesis for those with the thesis option, and via the required oral exam and project presentation for those with the directed project option.

This outcome was achieved. All students in the thesis or project option passed their oral defense or oral project exams.

d. **Educational Outcome (d) – Broad knowledge of electrical engineering:**

Students with an industrial emphasis will demonstrate a broad knowledge within two selected areas. Satisfactory mastery is indicated by students (i) receiving grades of B or better in each of the four courses in their selected emphasis areas, and (ii) by successfully passing the MS exit exam over the subject matter of two selected areas (contents of two courses of his/her two areas (two courses for each area)).

All graduating students in the coursework option passed the MS exit exam.

e. **Educational Outcome (e) – Critical and analytical skills:**

Students will demonstrate critical and analytical skills necessary for research and jobs in industry. This will be assessed via the (i) successful completion of courses with critical and analytical components (all graduate level courses within the ECE department), (ii) successful completion of a thesis for those with the thesis option, (iii) successful completion of a project for those with a directed project option, and (iv) successful completion of the MS exit exam for those with the courses-only option.

This outcome was achieved. All of the four criteria listed above were met.

f. **Educational Outcome (f) – Modern computer tools:**

Students will demonstrate familiarity and skills with modern computer tools necessary for research and employment in industry. This will be assessed in courses that require computer usage, verifying that the students demonstrate skill (course grades of B or better) in at least two modern computer tools.

All graduating students had at least two courses on their plans of study that required computer usage.

Assessment of Outcomes for MS CS Program:

a. **Educational Outcome (a) – Advanced knowledge of the mathematical foundations of computer science:**

Students must complete CS 720, Theoretical Foundations of Computer Science.

This outcome has been achieved. All graduates have passed CS 720.

c. **Educational Outcome (b) – Depth of knowledge in an area of specialty within computer science:**

Students must graduate with a cumulative G.P.A. of 3.0 or hirer.

This outcome has been achieved. All graduates have graduated with a cumulative G.P.A. of 3.0 or hirer.

d. **Educational Outcome (c) – Graduates will have one of the following: 1) advanced skills in software development; 2) skills and experience in conducting research; or 3) breadth of knowledge in Computer Science:**

Students must graduate with either: 1) project option; 2) thesis option; or 3) extra coursework option.

This outcome was achieved.

Assessment of Outcomes for PhD Program:

a. **Educational Outcome (a) – Competency in major and minor areas:**

Progress will be monitored to ensure satisfactory mastery in their major and minor areas. Satisfactory mastery is indicated by receiving grades of B or better in each course in their major and minor areas.

This outcome has been achieved. Advisers were satisfied with the progress of their students in their major and minor areas.

b. **Educational Outcome (b) – Report writing:**

Students will demonstrate report-writing skills. This will be assessed via the required written dissertation, conference papers, and journal papers.

This outcome has been achieved. Advisers were satisfied with the dissertations and conference and journal papers published by their graduate students.

c. **Educational Outcome (c) – Presentation skills:**

Students will demonstrate presentation skills. This will be assessed via the required oral defense of the dissertation, and by seminars, and paper presentations.

This outcome has been achieved. Advisers were satisfied with the oral defense of the dissertation, and by seminars, and paper presentations of their graduate students.

d. **Educational Outcome (d) – Critical and analytical skills:**

Students will demonstrate critical and analytical skills. This will be assessed via the (i) successful completion of courses with critical and analytical components (all graduate level courses within the ECE department), and (ii) successful completion of the dissertation.

This outcome has been achieved.

For either graduate degree, specialization fields are offered, each with a breadth of courses offered. The areas of specialization, along with the number of regularly scheduled graduate level courses in that area, are shown below. As seen, sufficient numbers of courses are offered to provide MS and Ph.D. students adequate depth and selection in their chosen field:

(1) control systems - 6
(2) communications - 9
(3) signal processing - 7
(4) computers and digital systems - 8
(5) energy and power systems – 7
(6) computer science – 23

To graduate students in their research and graduate and undergraduate students in their coursework, the department has assembled several laboratories. These laboratories are located in Wallace Hall, Jabara Hall, and the Engineering Research Building.

4. *A Statement that addresses student needs, employer demands, and how well the program prepares the students for their goals.*

According to *Job Outlook 2008*, an annual survey of college recruiters published by the National Association of Colleges and Employers (NACE), employers plan to hire 16 percent more new college graduates in 2007-08 than they did in 2006-07. The top 5 degrees in demand by employers for 2008 MS graduates, according to *Job Outlook 2008*, are:

- M.B.A

- Electrical Engineering
- Mechanical Engineering
- Computer Science
- Accounting

The department offers graduates with two of the five most sought after graduates with an MS degree. The top 5 degrees in demand by employers for 2008 PhD graduates, according to *Job Outlook 2008*, are:

- Computer Engineering
- Electrical Engineering
- Computer Science
- Mechanical Engineering
- Business Administration/Management

Thus, the department offers the second most sought after graduate with a PhD degree. It should be noted, however, that many of our EE graduates specialize in computer engineering.

Graduates with advanced degrees in electrical engineering and computer science also have some of the best starting salaries. According to the NACE's *Salary Survey 2006*, graduates with a PhD's in Electrical Engineering and Computer Science have the top two average starting salaries at $82,000 and 76,300, respectfully. Graduates with master's degrees enjoy average starting salaries of $67,800 and $71,500, respectfully, both among the top offers given.

These salaries and demand for our students is seen by the EECS faculty. Virtually all of our graduates have jobs by the time they graduate, and the few that do not, find them soon after. The demand for engineers, both graduate and undergraduate, is also very strong locally. According to a September 20, 2008 article in the Wichita Eagle entitled *Program seeks millions to get kids into science to keep industry, Wichita needs to build up a skilled work force:*

> Kansas Senate President Stephen Morris said he and other legislators are concerned about what might happen if Wichita's aircraft companies, or engineer-reliant Kansas City-area companies like Black & Veatch, Garmin and Burns & McDonnell, leave Kansas or outsource.
>
> Those companies are at least 1,500 engineers short, said Morris, R-Hugoton. "Part of the reason our state is not growing as fast as other states is because of this shortage," Morris said.

And:

> "The shortage is so severe that when I show up at career fairs and talk to company representatives I become almost uncomfortable," said Stuart Bell, KU's dean of engineering. "They are so desperate for engineers. We're not meeting their needs."

5. *A statement that describes the service the program provides to the discipline, other programs at the university, the metropolitan area or Kansas, or other matters as appropriate.*

The Electrical Engineering and Computer Science Department strongly serves the needs of the Wichita metropolitan area. Approximately 34% of the engineers employed in Wichita, Kansas, the center of industrial activity in the state, received their engineering training at Wichita State University. Many of these engineers continue their education as part-time graduate students. As mentioned above, most graduate level courses are frequently offered in the evening to cater to the special needs of the working students.

6. *An assessment of the program's cost effectiveness as measured by such matters as cost per credit hour, peer comparisons, and other indicators.*

The Department of Electrical Engineering and Computer Science is a cost effective program in regards to cost per credit hour and cost per graduate. Appendix A provides financial costs and credit hour production of the department. Table 4 is a summary, over the past five years, of the cost per credit hour. Because the Department of Computer Science and the Department of Electrical and Computer Engineering have recently merged, program data is separated between the two. Table 5 shows the students enrollment per major. Although the enrollments have been declining slightly, the programs have become more efficient and the cost per credit hour has also declined.

Table 4 – Cost per credit hour

	FY 2006	FY 2005	FY 2006	FY 2007	FY 2008	Average
	Electrical and Computer Engineering					
Salaries/Benefits	$1,399,236	$1,501,201	$1,475,715	$1,347,859	$1,160,301	$1,376,862
Other Operating Expenditures	$110,846	$75,673	$27,982	$134,146	$173,889	$104,507
Total	$1,510,082	$1,576,874	$1,503,697	$1,482,004	$1,334,190	$1,481,369
SCH	8,335	7,524	7,783	7,953	7,637	7,846
Cost/SCH	$181	$210	$193	$186	$175	$189
	Computer Science					
Salaries/Benefits	$913,220	$910,270	$856,155	$874,552	$851,803	$881,200
Other Operating Expenditures	$60,550	$64,856	$56,307	$58,894	$50,514	$58,224
Total	$973,770	$975,126	$912,462	$933,447	$902,317	$939,424
SCH	6,789	5,421	4,562	4,202	4,804	$5,156
Cost/SCH	$143	$180	$200	$222	$188	$187

Table 5 – Student Enrolment per Major

	FY 2006	FY 2005	FY 2006	FY 2007	FY 2008	Average
	Undergraduate					
BS EE	235	214	211	207	186	211
BS CE	180	176	139	123	138	151
BS CS	361	273	263	234	227	272
Total UG	776	663	613	564	551	633
	Graduate					
MS EE	267	207	217	272	237	240
PhD EE	26	24	24	19	28	24
MS CS	140	117	86	74	74	98
Total Grad	433	348	327	365	339	362
	Total Students					
Total	1209	1011	940	929	890	996

Credit hour production for peer institutions in Kansas is difficult to come by. However, the American Society for Engineering Education keeps statistics on the number of degrees awarded by programs throughout the US. Table 6 shows a FY2006 comparison of effectiveness, with regard to degrees awarded per faculty member, between the Electrical Engineering and Computer Science Department at WSU and the corresponding departments at peer institutions Kansas State University and University of Kansas. As seen in Table 6, when compared with KSU and KU, WSU is very cost effective.

Table 6 - FY2006 comparison of degrees awarded per faculty

	WSU	KSU	KU
BS Degrees Awarded: EE	40	48	35
CE	21	31	33
CS	30	26	39
IS	NA	11	NA
Total BS Degrees Awarded	91	126	107
MS Degrees Awarded: EE	73	19	11
CE	NA	NA	15
CS	27	24	15
Total MS Degrees Awarded	100	43	41
PhD Degrees Awarded: EE	2	4	2
CS	NA	0	2
Total PhD Degrees Awarded	2	4	4
Total Degrees Awarded	193	163	152
Faculty	16	45*	36
Degrees/Faculty	12.0	3.6	4.2

* 23 in ECE and 21 in CIS

The EECS Department also has significant income with regards to research grants. Research awards granted to faculty of the department, during calendar year 2008 alone, is over $4,200,000. This includes grants from NASA EPSCoR ($447K), Army DEPSCoR ($406K), NIS ($160K), Cisco Systems ($2,800K), and Department of Energy ($213K). Given the research nature of our department and the research dollars that we bring into the university, we are extremely cost effective and beneficial to the university system.

Appendix A

SECTION	DISCIPLINE	DESCRIPTION	2004	2005	2006	2007	2008
Electrical and Computer							
Section I: Part A: Academic Instruction Expenditures		1. Salaries/Benefits	$1,399,236	$1,501,201	$1,475,715	$1,347,859	$1,160,301
		2. Other Operating Exp.	$110,846	$75,673	$27,982	$134,146	$173,889
		3. Total	$1,510,082	$1,576,874	$1,503,697	$1,482,004	$1,334,190
Section I: Part B: Student Credit Hour Production		1. Lower Division	2,344	2,523	2,406	2,106	2,268
		2. Upper Division	2,659	2,098	2,514	2,117	2,188
		3. Masters	3,179	2,679	2,700	3,614	2,993
		4. Doctoral	153	224	163	116	188
		5.Total	8,335	7,524	7,783	7,953	7,637
Section I: Part D: Percentage of Departmental SCH taken by:		1. Their Undergraduate Majors	53.7	54.9	50.1	41.8	44.3
		2. Their Graduate Majors	36	30.6	36	47.1	43.3
		3. Non-Majors	10.3	14.5	13.9	11.1	12.4
Section I: Part E: Departmental Faculty		1. Tenured/Tenure Track Faculty Head Count	12	13	12	9	9
		2. Tenured/Tenure Track Faculty with Terminal Degrees	12	12	11	9	9
		3. Total Tenured Faculty	8	7	6	7	9

		Total Instructional Faculty FTE in Department	11	12	12	11	11
Section I: Part F: Actual Instructional FTE		1. Tenured/Tenure Track Faculty	11.25	13	12	10	10.5
		2a. Instructor of Record (IOR)	1.83	1.03	0	0.45	2.5
		2b. Not Instructor of Record	2.34	2.04	2.23	1.95	1.1
		3. Other Instructional FTE	1.25	1.67	2.25	2.33	1.3
		4.Total FTE	16.67	17.74	16.48	14.73	15.4
		5. SCH generated by Tenured/Tenure Track Faculty	2,706	2,387	2,158	3,031	2,765
		6. SCH generated by GTA's (IOR)	834	755	0	425	820
		7. SCH generated by Other Instructional Faculty	668	914	2,005	702	466
		8. Total SCH	4,208	4,056	4,163	4,158	4,051
		9. Average SCH per Tenured/Tenure Track Faculty	240.53	183.62	179.83	303.10	263.33
		10. Average SCH per GTA (IOR only)	455.74	733.01	0.00	944.44	328.00
		11. Average SCH per Other Instructional Faculty	534.40	547.31	891.11	301.29	358.46
		12. Average Overall SCH per FTE	252.43	228.64	252.61	282.28	263.05

Section II: Part A: Majors in the Discipline	**COMPUTER ENGINEERING**	1. Freshmen/Sophomores (optional)	81	73	71	62	74
		2. Jrs., Srs., 5th Year Majors	99	103	68	61	64
		3. Masters	0	0	0	0	0
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	0	0	0	0	0
	ELECTRICAL ENGINEERING	1. Freshmen/Sophomores (optional)	75	67	74	77	65
		2. Jrs., Srs., 5th Year Majors	160	147	137	130	121
		3. Masters	267	207	217	272	237
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	26	24	24	19	28
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs	**COMPUTER ENGINEERING**	1. Average ACT Composite	23.3	23.5	24.6	24.5	26.3
		2. Low ACT	13	12	15	13	17
		3. High ACT	34	35	35	33	33
		4. Number Reporting an ACT Score	57	47	28	29	26
		5. Percent Reporting ACT Score	57.58%	45.63%	41.18%	47.54%	40.63%
	ELECTRICAL ENGINEERING	1. Average ACT Composite	21.9	21.8	21.7	23	22.9
		2. Low ACT	13	12	12	13	12

		3. High ACT	34	35	35	33	33
		4. Number Reporting an ACT Score	82	68	62	55	44
		5. Percent Reporting ACT Score	51.25%	46.26%	45.26%	42.31%	36.36%
Section II: Part C: Degrees Conferred	**COMPUTER ENGINEERING**	1. Associate	0	0	0	0	0
		2. Baccalaureate	21	34	21	14	21
		3. Masters	0	0	0	14	0
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	0	0	0	0	0
	ELECTRICAL ENGINEERING	1. Associate	0	0	0	0	0
		2. Baccalaureate	45	45	39	47	37
		3. Masters	124	91	73	72	151
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	2	4	2	0	3

SECTION	DISCIPLINE	DESCRIPTION	2004	2005	2006	2007	2008
Computer Science							
Section I: Part A: Academic Instruction Expenditures		1. Salaries/Benefits	$913,220	$910,270	$856,155	$874,552	$851,803
		2. Other Operating Exp.	$60,550	$64,856	$56,307	$58,894	$50,514
		3. Total	$973,770	$975,126	$912,462	$933,447	$902,317
Section I: Part B: Student Credit Hour Production		1. Lower Division	2,363	2,022	1,709	1,565	1,774
		2. Upper Division	3,161	2,405	2,240	1,860	2,409
		3. Masters	1,265	994	613	777	621
		4. Doctoral	0	0	0	0	0
		5.Total	6,789	5,421	4,562	4,202	4,804
Section I: Part D: Percentage of Departmental SCH taken by:		1. Their Undergraduate Majors	43.7	36.2	42.7	41.8	42.4
		2. Their Graduate Majors	24.7	24.6	21.9	18.8	20.3
		3. Non-Majors	31.6	39.2	35.4	39.4	37.3
Section I: Part E: Departmental Faculty		1. Tenured/Tenure Track Faculty Head Count	7	6	5	4	3
		2. Tenured/Tenure Track Faculty with Terminal Degrees	7	6	5	4	2
		3. Total Tenured Faculty	3	3	3	3	2

		Total Instructional Faculty FTE in Department	8	7	7	8	7
Section I: Part F: Actual Instructional FTE		1. Tenured/Tenure Track Faculty	7	6	5	4.06	3.3
		2a. Instructor of Record (IOR)	0.36	0.45	0.52	0.11	1
		2b. Not Instructor of Record	0.27	0.08	0	0	0
		3. Other Instructional FTE	3.44	7.35	5.14	6.07	6.6
		4.Total FTE	11.07	13.88	10.66	10.24	10.9
		5. SCH generated by Tenured/Tenure Track Faculty	1,656	938	457	493	225
		6. SCH generated by GTA's (IOR)	0	0	66	0	159
		7. SCH generated by Other Instructional Faculty	1,366	1,493	1,434	1,436	1,686
		8. Total SCH	3,022	2,431	1,957	1,929	2,070
		9. Average SCH per Tenured/Tenure Track Faculty	236.57	156.33	91.40	121.43	68.18
		10. Average SCH per GTA (IOR only)	0.00	0.00	126.92	0.00	159.00
		11. Average SCH per Other Instructional Faculty	397.09	203.13	278.99	236.57	255.45
		12. Average Overall SCH per FTE	272.99	175.14	183.58	188.38	189.91
Section II: Part A: Majors in the Discipline	**COMPUTER SCIENCE**	1. Freshmen/Sophomores (optional)	126	104	104	87	92

		2. Jrs., Srs., 5th Year Majors	235	169	159	147	135
		3. Masters	140	117	86	74	74
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	0	0	0	0	0
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs	**COMPUTER SCIENCE**	1. Average ACT Composite	22.7	23	23.1	23.7	23.1
		2. Low ACT	7	13	13	10	7
		3. High ACT	33	33	33	33	33
		4. Number Reporting an ACT Score	113	81	71	76	71
		5. Percent Reporting ACT Score	48.09%	47.93%	44.65%	51.70%	52.59%
Section II: Part C: Degrees Conferred	**COMPUTER SCIENCE**	1. Associate	0	0	0	0	0
		2. Baccalaureate	42	41	30	29	30
		3. Masters	36	40	27	29	23
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	0	0	0	0	0

KANSAS BOARD OF REGENTS PROGRAM REVIEW

UNDERGRADUATE PROGRAMS

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

WICHITA STATE UNIVERSITY

2008

1. *A statement that describes how the program relates to the mission and role of the college and the university.*

The Department of Electrical Engineering and Computer Science (EECS) offers comprehensive programs that lead to undergraduate (BS) and graduate (MS and Ph.D.) degrees in fulfilling and promoting the missions and roles of the university and college. Electrical engineers, computer engineers and computer scientists play a lead role in developing the modern technologies in a wide variety of specialties including electronics, power systems, controls, networking, software development, software engineering, computer architecture, and communications. Graduates from the EECS Department at Wichita State University serve Wichita companies, Kansas companies and companies through out the nation.

The mission of Wichita State University, as approved by the Kansas Board of Regents, states in part:

> Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship, and public service, the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national, and global community.
>
> High-quality teaching and learning are fundamental goals in all undergraduate, graduate, and continuing education programs. Building on a strong tradition in the arts and sciences, the University offers programs in business, education, engineering, fine arts, and health professions, as well as in the liberal arts and sciences. Degree programs range from the associate to the doctoral level and encompass 75 fields of study; non-degree programs are designed to meet the specialized educational and training needs of individuals and organizations in south central Kansas.
>
> Scholarship, including research, creative activity, and artistic performance, is designed to advance the University's goals of providing high quality instruction, making original contributions to knowledge and human understanding, and serving as an agent of community service. This activity is a basic expectation of all faculty members at Wichita State University.
>
> Public and community service activities seek to foster the cultural, economic, and social development of a diverse metropolitan community and of the state of Kansas. The University's service constituency includes artistic and cultural agencies, business and industry, and community educational, governmental, health, and labor organizations.

In response to the mission statement of Wichita State University, the College of Engineering has developed and adopted the following mission statement:

The College of Engineering at Wichita Sate University is committed to the following:

- Preparing graduates who will engage effectively and responsibly in the practice of the engineering profession in a global economy and in pursuing advanced engineering education.
- Conducting applied and basic research to support and contribute to the social and economic well-being of citizens and organizations in the Wichita metropolitan area, the state of Kansas and beyond.
- Cultivating the spirit of entrepreneurship and the connection between engineering and business that encourages technology commercialization.
- Improving continuously the engineering pedagogical methods employed in delivering academic programs.
- Fostering and valuing diversity of ideas through early student recruitment, outreach programs, and the recruitment and development of faculty role-models.
- Encouraging scholarship in all its dimensions.
- Evolving thoughtfully in response to the needs of industry and the changing world.

In common with the mission of the university and the vision of the college, the Department of Electrical Engineering and Computer Science has adopted the following mission statement:

EECS Department Mission Statement:

> The mission of the EECS Department is to provide students with a strong foundation in the traditional and contemporary areas of electrical engineering, computer engineering and computer science so that they can conceive and solve technological problems in society. Social and humanistic issues are also emphasized in the general education component of the program to provide breadth in education. The program provides graduates with the knowledge, aptitudes, and attitudes which prepare them for corporate and governmental entry level jobs or to pursue further education at the graduate level.

If our mission is accomplished, we will have graduated a student with depth of knowledge and understanding, breadth of knowledge and awareness, and a professional approach to his/her career which will lead to successful employment or successful admission into graduate school. As such the EECS department has established two objectives for our undergraduate programs.

Objectives of the EECS Department's Undergraduate Programs, as adopted by its constituencies which include students and local industry representatives, are:

> **Objective 1**: To enable students to enter into the electrical engineering, computer engineering and computer science field by providing them with the fundamental knowledge necessary for the practice of electrical engineering, computer engineering, and computer science, including scientific principles, rigorous analysis and creative design, to meet the requirements of employer constituents.

Objective 2: To provide an undergraduate education that will enable qualified students to pursue graduate studies in electrical engineering, computer engineering, computer science and related fields.

To assess how well the programs are meeting their objectives, program graduates, within two or three years of graduation, are asked to respond to a biannual survey that requests data about their current job and the relevance and adequacy of their engineering education at Wichita State University. In the spring of 2007, the engineering college conducted a survey, including the EE and CE programs. The CS program will be included in the 2009 survey. The combined EE and CE responses from the spring 2007 Alumni Survey received to date are summarized below:

Spring 2007 Alumni Survey	
Number of alumni surveys received	30
Number currently employed as engineers	27
Number with employment pending (employment offer accepted)	1
No employment listed	2
Number accepted to graduate school	16
Number who attended graduate school (either part time or full time)	15

The data above indicates that educational objectives of the programs are being met. The Alumni Survey indicates that the alumni are employable (28 of 30 surveyed were employed as engineers or had such employment pending). Of the 30 respondents, a number of graduates (16 of 30) have been accepted to graduate school, and 15 of the 16 accepted to graduate school have attended graduate school.

2. *A statement that analyzes the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty.*

The department currently has seventeen full-time faculty members in permanent lines; including the chair, Dr. Sawan, (who is 50% academic), one full-time instructor, Mr. Jackson, and one full-time administrator, Dr. Pendse. Sixteen faculty members have Ph.D. degrees and all teach courses at the graduate and undergraduate level. Faculty expertise is balanced into prominent areas of electrical and computer engineering and computer science including electrical power systems, controls, communications, computer networking, sensor networks, computer architecture, and data management systems.

The current faculty, along with faculty rank and graduate faculty status of each is given in Table 1, along with carrier scholarly activities and industrial experience. As seen, the department has a very good distribution of faculty rank, indicating an experienced yet growing department.

The strengths, productivity, and qualifications of the faculty can first be determined by the amount of scholarly activity of each faculty member. Table 1 also presents the scholarly activity of each faculty member in regards to journal publications, conference proceedings and presentations, and grant activity. As seen in the table, all faculty are active in research regardless of their specialized area. The journal publications have appeared in leading refereed journals such as IEEE Transactions on Communications, IEEE Transactions on Neural Networks, IEEE

Transactions on Signal Processing, Physical Review, International Journal of Electric Power & Energy Systems, Optics Letters, IEEE Journal of Quantum Electronics, IEEE Transactions on Energy Conversion, IEEE Transactions on Power Delivery, IEEE Transactions on Automatic Control, Journal of Algorithms, Information Processing Letters, ACM Transactions on Sensor Networks, and Journal of Discrete Algorithms. Many of the journal articles are co-authored by graduate students of the department. External grants have come from a variety of government and industry sources including the National Science Foundation, Office of Naval Research, Federal Aviation Administration, Kansas Electric Utility Research Program, and US Army. In addition to the activity listed in Table 1, Dr. Kwon has been awarded 12 patents and Dr. Song has been awarded 7 patents.

The faculty has also strived for excellence in teaching and research and, as a result, has won several awards. These awards include:

- WSU Academy of Effective Teaching Award (two awards)
- College of Engineering Wallace Continuing Educator Award
- College of Engineering Wallace Excellence in Teaching Award (Multiple Awards)
- College of Engineering Wallace Excellence in Research Award (Multiple Awards)
- Institute of Electrical and Electronic Engineers (IEEE) Third Millennium Award
- Cisco Fellow
- IEEE Fellow
- Boeing Fellow (Multiple Awards)
- Bombardier/Learjet Fellow (Multiple Awards)
- NCR Corporation Award for Excellence in Academic Achievement
- Mortar Board Award for Outstanding Inspiration and Student Support
- NASA-ASEE (American Society for Engineering Education) Summer Faculty Fellow

The faculty of the Electrical Engineering and Computer Science Department are very active in service to the profession. All EECS faculty are members of the professional society which covers their respective area and have been involved with reviewing articles for technical journals and serving as session chairs to various professional conferences. Below is a sample of some other services to the profession that have been performed by EECS faculty members during their tenure at WSU:

- Chairman - IEEE Wichita Section
- Vice Chair – IEEE Wichita Section
- Treasurer - IEEE Wichita Section
- Secretary - IEEE Wichita Section
- Proposal Review Board - National Science Foundation
- Technical Program Chair – IEEE Wichita Conf. on Commun., Netw. and Signal Process.
- Associate Editor of IEEE Signal Processing Magazine
- Registration Chair, American Control Conference
- Chair, Wichita Chapter of the IEEE Power Engineering Society (PES)
- Secretary, IEEE Power and Energy Society (PES) Energy Development Subcommittee
- Secretary, IEEE PES Working Group on Photovoltaic

Table 1 – Career Industrial Experience and Scholarly Activities of EECS Faculty

Faculty Name	Rank (Grad. Faculty)	Years in Industry	# Journal Papers	# Confer. Present.	External $ Received
E. Sawan, PhD (1979) Univ. of Ill.-Urbana	Professor (Full)	3	30	70	$0
J. Watkins, PhD (1995) Ohio State Univ.	Assoc. Prof. (Full)	0	11	53	$873,000
W. Jewell, PhD (1986) Oklahoma State Univ.	Professor (Full)	4	28	80	$3,007,000
A. Teshome, PhD (1980) Cornell Univ.	Assoc. Prof. (Full)	8	12	48	$500,000
R. Pendse, PhD (1994) Wichita State Univ.	Professor. (Full)	0	13	100	$12,600,000
R. Bagai, PhD (1990) Univ. of Victoria	Assoc. Prof. (Full)	2	7	23	$332,800
H. Kwon, PhD (1984) Univ. of Michigan	Professor (Full)	5	28	116	$2,500,000
P. Ramanan, PhD (1984) Univ. of Illinois	Assoc. Prof. (Full)	0	19	10	$275,000
B. Tang, PhD (2007) Stony Brook Univ.	Assist. Prof. (Associate)	0	3	6	$0
P. Kumar, PhD (2007) Wichita State Univ.	Assist. Prof. (Associate)	0	4	6	$40,000
S. Skinner, PhD (1991) Univ. of Iowa	Professor (Full)	4	16	55	$2,275,000
S. Song, PhD (2001) Univ. of Minnesota	Assist. Prof. (Associate)	10	2	18	$50,000
V. Namboodiri, PhD (2008) U. Mass. Amherst	Assist. Prof. (Associate)	0	2	7	$0
C. Cetinkaya, PhD (2003) Rice Univ.	Assist. Prof. (Full)	0	4	8	$406,300
N. Jaggi, PhD (2007) Rensselaer Polytech. Inst.	Assist. Prof. (Associate)	4	3	8	$0
Yanwu Ding, PhD (2007) McMaster Univ.	Assist. Prof. (Associatee)	5	4	4	$0
K. Jackson, MS (1970) Wichita State Univ.	Instructor	0	0	0	$0
Totals		**49**	**186**	**612**	**$22,859,100**

The quality of the three undergraduate programs are excellent as assessed by the strength, productivity and qualifications of the faculty. It is poised to continue its development in the future. We are currently searching for five new faculty members. These new faculty members will have credentials placing them at the forefront in their area of expertise.

3. *A statement that analyzes the quality of the program as assessed by the regularly offered curriculum and the effect of the curriculum on the students.*

The mission of the EECS Department is to provide our students with a strong foundation in the traditional and contemporary areas of electrical engineering, computer engineering and computer science. The objective of the undergraduate program is to educate students in science and engineering so that they can conceive and solve technological problems in society. Social and humanistic issues are also emphasized in the general education component of the program to provide breadth in education. The program provides graduates with the knowledge, aptitudes, and attitudes which prepare them for corporate and governmental entry level jobs or to pursue further education at the graduate level. The objective of the graduate program is to prepare students for jobs in industry, government and academics.

The quality of the undergraduate programs in electrical and computer engineering is certified by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET), which accredits our engineering programs through rigorous requirements and examinations. The last successful examination of the electrical and computer engineering programs was in 2007, at which time the programs were re-accredited. The Computer Science (CS) Department and the Electrical and Computer Engineering Department were combined to form the EECS Department beginning in the Fall 2008 semester at which time CS Department was moved into the College of Engineering. The BS program in computer science will apply for ABET accreditation in the next ABET cycle, scheduled for the year 2013. Assessment of the CS program will be obtained by a process patterned after that used by the two engineering BS programs.

For ABET accreditation, the program must, in part, demonstrate that it is meeting its program objectives, listed above, through the impact the curriculum has on the students. In addition to meeting the two objectives, ABET sets a list of program outcomes, for engineering programs, which requires that the program's graduates demonstrate:

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

For computer science, ABET sets a list of program outcomes which requires that the program's graduates demonstrate:

a) an ability to apply knowledge of computing and mathematics appropriate to the discipline
b) an ability to analyze a problem, and identify and define the computing requirement appropriate t its solution
c) an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
d) an ability to function effectively on teams to accomplish a common goal on multi-disciplinary teams
e) an understanding of professional, ethical, legal, security and social issues and responsibilities
f) an ability to communicate effectively with a range of audiences
g) an ability to analyze the local and global impact of computing on individuals, organizations, and society
h) recognition of the need for and an ability to engage in continuing professional development
i) an ability to use the techniques, skills, and tools necessary for computing practice

Five outcomes, for each program, have been drafted and approved by the program faculty which, if achieved, assure the achievement of the ABET outcomes given above. The following outcomes are used to determine if the program is achieving its educational objectives and ABET outcomes.

For electrical engineering these outcomes are (the letters in parentheses following each of the above outcomes are the ABET outcomes that are included in each program outcome):

Outcome 1: Graduates will have a broad-based understanding of the fundamentals of electrical engineering, mathematics and science and their application in the solution of engineering problems **(a,e)**.

Outcome 2: Graduates will have developed an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability **(c)**.

Outcome 3: Graduates will have acquired skill in hands-on hardware and software laboratory design, experimentation and data analysis, and the use of a broad range of hardware and software tools for analysis and design of digital systems **(b,k)**.

Outcome 4: Graduates will have developed proficiency in critical workplace skills including teamwork, oral and written communication, and life-long independent learning **(d,g,i)**.

Outcome 5: Graduates will have an awareness of the complex, rapidly changing global environment (including professional and ethical issues) in which they will practice electrical engineering **(f,h,j)**.

For computer engineering, these outcomes are:

Outcome 1 Graduates will have a broad-based understanding of the fundamentals of computer engineering, mathematics and science and their application in the solution of engineering problems **(a,e)**.

Outcome 2 Graduates will have developed an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability **(c)**.

Outcome 3 Graduates will have acquired skill in hands-on hardware and software laboratory design, experimentation and data analysis, and the use of a broad range of hardware and software tools for analysis and design of digital systems **(b,k)**.

Outcome 4 Graduates will have developed proficiency in critical workplace skills including teamwork, oral and written communication, and life-long independent learning **(d,g,i)**.

Outcome 5 Graduates will have an awareness of the complex, rapidly changing global environment (including professional and ethical issues) in which they will practice computer engineering **(f,h,j)**.

For computer science, these outcomes are:

Outcome 1 Graduates will have a broad-based understanding of the fundamentals of computer science, including mathematics, algorithmic principles, and computer science theory in their application to computer based systems **(a,b)**.

Outcome 2 Graduates will have developed an ability to design software systems to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability **(c)**.

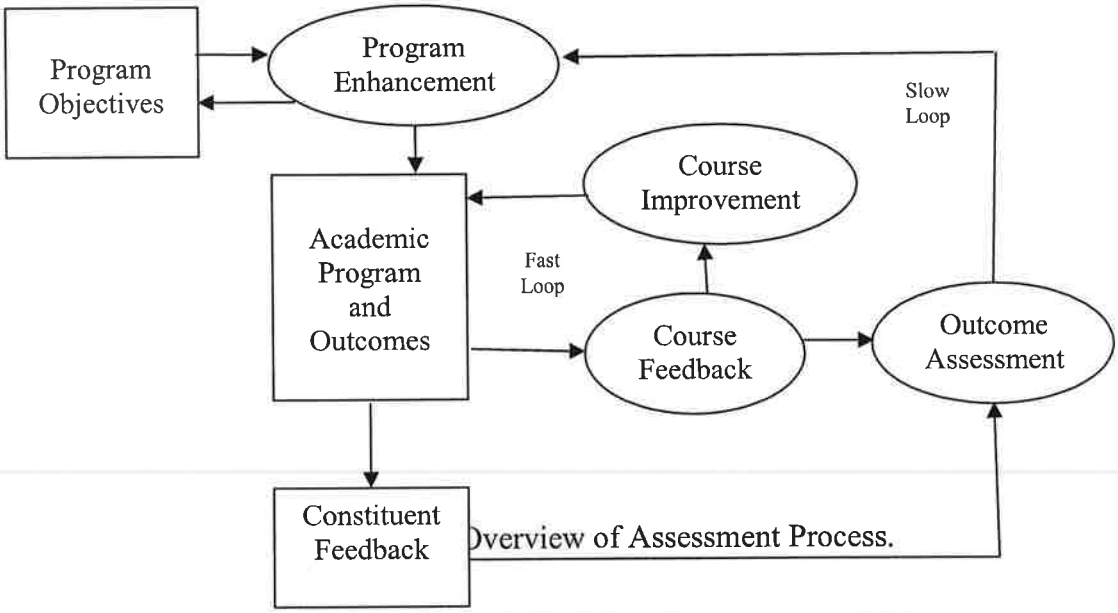
Outcome 3 Graduates will have acquired skill in hands-on hardware and software laboratory design, experimentation and data analysis, and the use of a broad range of hardware and software tools for analysis and design of computer systems **(i)**.

Outcome 4 Graduates will have developed proficiency in critical workplace skills including teamwork, oral and written communication, and life-long independent learning **(d,f,h)**.

Outcome 5 Graduates will have an awareness of the complex, rapidly changing global environment (including professional and ethical issues) in which they will practice computer science **(e,g)**.

To assure that the required curriculums for the three programs achieve the respective program objectives, the EECS Dept. has established an assessment process where performance criteria have been specified for each outcome. Sources of data have been identified for each of the performance criteria in order that the degree of achievement of the program outcomes can be determined. The diagram in Figure.1 gives an overview of the assessment process. The inner

loop (or fast loop) gives feedback at the course level. The outer loop (or slow loop) provides feedback at the program level, such as the Program Educational Objectives.



Overview of Assessment Process.

Program outcomes were assessed through the following sources of data:

- **Knowledge Probes**: Short quizzes that assess the knowledge acquired by the students from the prerequisites courses. Each ECE class that has prerequisites administers a knowledge probe.
- **Senior Teamwork and Exit Survey**: A survey that is given to graduating seniors shortly before graduation. This is an online survey that students must complete before passing the culminating senior project.
- **Senior Interview**: An interview conducted by the department chair during the first semester of the senior year. Students are given the interview during the senior check, the semester prior to the student's last semester.
- **Open House Survey**: A yearly open house, sponsored by the College of Engineering, in which those students involved in Senior Project present their endeavor to the public. Projects are judged for prizes by individuals from industry and professional societies, and are viewed by area employers, local K-12 teachers, and students. This survey is given to judges, employers, teachers, and students participating in the open house.
- **Cooperative Education Assessment**: An assessment done by the Office of Cooperative education that includes results of surveys from the students in the co-op program and their employers.
- **Survey of Software and Equipment**: A survey of software and equipment that is used in undergraduate courses in the Department of Electrical and Computer Engineering, conducted by a member of the ABET Committee.

- **Information from Courses**: Information from courses, including examples of student work.
- **Data from Capstone Design Courses**: Data from the capstone design courses, including design reviews and final reports.

Table 2 shows the mapping of assessment tools to program outcomes that they will measure.

Table 2. Assessment Tools Used to Assess Program Outcomes.

Assessment Tool	Program Outcomes				
	1	2	3	4	5
Knowledge Probe	√				
Senior Teamwork and Exit Survey			√	√	
Senior Interview				√	√
Open House Survey		√	√		
Co-Op Education Assessment	√	√	√	√	√
Equipment and Software Survey			√		
Course Information	√				√
Design Project Information		√		√	

The objectives and outcomes for the three programs are realized through the effect of the curriculum on the students. The electrical and computer engineering and computer science programs require 128 hours for completing the degree, which comprises of 9 hours of required English and verbal communication courses, 35 hours of required math and science courses, 66 hours of required and elective courses in the discipline, a required 3 hour engineering ethics course, and 15 hours of general education courses. The curriculum is designed so that all program objectives and outcomes are realized through the required courses. The general education courses are in the humanities, social sciences, and fine arts and are chosen to complement the technical aspect of the curriculum. The technical electives allow a student to specialize in a sub-discipline. Tables 3, 4, and 5 illustrate how the curriculum covers the program educational objectives and outcomes for the three degrees.

Table 3 - Required courses in 128-hour Electrical Engineering program and Program Outcomes they support

Course	Program Outcomes				
	1	2	3	4	5
English 101 (3 hrs)				X	
English 102 (3 hrs)				X	
Communication 111 (3 hrs)				X	
General Education Electives (15 hrs)					X
Engineering Ethics Phil 385 (3 hrs)*					X
Calculus I Math 242 (5 hrs)	X				
Calculus II Math 243 (5 hrs)	X				
Calculus III Math 344 (3 hrs)	X				
Linear Algebra MATH 511 (3 hrs)	X				
Differential Equations Math 555 (3 hrs)	X				
Probability and Statistics IE 254 (3 hrs)	X				
Physics I Physics 313 (4 hrs)	X				
Physics II Physics 314 (4 hrs)	X				
Chemistry I Chem 211 (5 hrs)	X				
Statics AE 223 (3 hrs)	X				
Thermodynamics ME 398 (3 hrs)	X				
Engineering Economics IE 255 (3 hrs)		X			X
Circuits 1 EE 282 (4 hrs)	X				
Circuits 2 ECE 284 (3 hrs)	X				
Signals and Systems ECE 383 (3 hrs)	X				
Electronic Circuits 1 ECE 492 (3 hrs)	X		X		
Electronic Circuits 2 ECE 493 (4 hrs) **OR** Power Electronics ECE 688 (4 hrs)	X		X		
Computing in C CS 211(4 hrs)	X	X	X		
Intro to Digital Design ECE 194 (4 hrs)	X		X		
Intro Control Systems Concepts ECE 684 (3 hrs) **OR** Mechanical Control Systems ME 659 (3 hrs)	X		X		
Intro to Communication Systems ECE 586 (4 hrs)	X		X		
Applied Engineering Electromagnetics ECE 463 (3 hrs)	X		X		
Senior Design Project I ECE 585 (2 hrs)		X	X	X	X
Senior Design Project II ECE 595 (2 hrs)		X	X	X	X
Technical Electives (14 hrs)	X				

General education credit is given for PHIL 385

Table 4 - Required courses in 128-Hour Computer Engineering program and Program Outcomes they support

Course	Program Outcomes				
	1	2	3	4	5
English 101 (3 hrs)				X	
English 102 (3 hrs)				X	
Communication 111 (3 hrs)				X	
General Education Electives (15 hrs)					X
Ethics and Computers PHIL 354 (3 hrs)*					X
Calculus I MATH 242 (5 hrs)	X				
Calculus II MATH 243 (5 hrs)	X				
Linear Algebra MATH 511 (3 hrs)	X				
Differential Equations MATH 555 (3 hrs)	X				
Probability and Statistics IE 254 (3 hrs)	X				
Discrete Mathematics Math 321 (3 hrs)	X				
Physics I PHYSICS 313 (4 hrs)	X				
Physics II PHYSICS 314 (4 hrs)	X				
Chemistry I CHEM 211 (5 hrs)	X				
Statics AE 223 (3 hrs)	X				
Thermodynamics ME 398 (3 hrs)	X				
Engineering Economics IE 255 (3 hrs)		X			X
Circuits 1 EE 282 (4 hrs)	X				
Circuits 2 ECE 284 (3 hrs)	X				
Signals and Systems ECE 383 (3 hrs)	X				
Electronic Circuits 1 ECE 492 (3 hrs)	X		X		
Computing in C CS 211 (4hrs)	X	X	X		
Intro to Digital Design ECE 194 (4 hrs)	X		X		
Digital Design Techniques ECE 294 (3 hrs)	X		X		
Intro to Computer Architecture ECE 394 (3 hrs)	X		X		
Assembly Language and System Programming (CS 312) (3 hrs)	X		X		
Microprocessor Based Systems ECE 594 (4 hrs)	X		X		
Data Structures and Algorithms CS 300 (4 hrs)	X				
Unix CS 444 (3 hrs)	X		X		
Operating Systems CS 540 (3 hrs)	X		X		
Senior Design Project I ECE 585 (2 hrs)		X	X	X	X
Senior Design Project II ECE 595 (2 hrs)		X	X	X	X
Technical Electives (18 hrs)	X				

*General education credit is given for PHIL 385

Table 5 - Required courses in 128-Hour Computer Science program (adopted fall 2008) and Program Outcomes they support

Course	Program Outcomes				
	1	2	3	4	5
English 101 (3 hrs)				X	
English 102 (3 hrs)				X	
Communication 111 (3 hrs)				X	
General Education Electives (15 hrs)					X
Ethics and Computers PHIL 354 (3 hrs) (GE credit)					X
Formal Logic Phil 325 (3hrs)					X
Calculus I MATH 242 (5 hrs)	X				
Calculus II MATH 243 (5 hrs)	X				
Linear Algebra MATH 511 (3 hrs)	X				
Discrete Mathematics I Math 321 (3 hrs)	X				
Discrete Mathematics II Math 322 (3 hrs)	X				
Probability and Statistics IE 254 (3 hrs)	X				
Physics I PHYSICS 313 (4 hrs)	X				
Physics II PHYSICS 314 (4 hrs)	X				
Chemistry I CHEM 211 (5 hrs)	X				
Computing in C CS 211 (4hrs)	X	X	X		
Intro to Digital Design ECE 194 (4 hrs)	X		X		
Engineering Economics IE 255 (3 hrs)		X			X
Data Structures and Algorithms CS 300 (3 hrs)	X				
Assembly Lang. and Syst Programming (CS 312) (3 hrs)	X		X		
Data Structures and Algorithms CS 300 (4 hrs)	X				
Intro to Computer Architecture ECE 394 (3 hrs)	X		X		
Programming Paradigms CS 410 (3 hrs)	X	X	X		
Object-Oriented Programming CS 411 (3hrs)	X	X	X		
Algorithm Design Methodologies CS 460 (3 hrs)	X	X			
Intro to Computer Networking CS 464 (3 hrs)	X				
Programming Language Concepts CS 510 (3hrs)	X	X			
Operating Systems CS 540 (3 hrs)	X		X		
Data Structures and Algorithms II CS 560 (3 hrs)	X				
Introduction to Data Bases CS 665 (3 hrs)	X	X	X	X	
Software Engineering CS 680 (3 hrs)	X		X		X
Senior Design Project I ECE 585 (2 hrs)		X	X	X	X
Senior Design Project II ECE 595 (2 hrs)		X	X	X	X
Technical Electives (12 hrs)	X				

4. *A Statement that addresses student needs, employer demands, and how well the program prepares the students for their goals.*

According to *Job Outlook 2008*, an annual survey of college recruiters published by the National Association of Colleges and Employers (NACE), employers plan to hire 16 percent more new college graduates in 2007-08 than they did in 2006-07. The top 10 degrees in demand by employers for 2008 BS graduates, according to *Job Outlook 2008*, are:

Accounting
Mechanical Engineering
Electrical Engineering
Computer Science
Business Administration/Management
Economics/Finance (incl. banking)
Information Sciences & Systems
Marketing/Marketing Management
Computer Engineering
Management Information Systems/ Business Data Processing

All three of the EECS department's programs, bolded above, provide degrees in the top 10 BS degrees sought after by employers.

Graduates with advanced degrees in electrical engineering and computer science also have some of the best starting salaries. According to the NACE's *Salary Survey Fall 2008*, the average starting salaries for graduates with the following BS degrees are:

Chemical Engineering -	$63,773
Computer Science -	$61,110
Computer Engineering -	$60,280
Electrical/Electronics Engineering -	$57,603
Mechanical Engineering -	$57,024
Civil Engineering -	$51,780
Economics -	$51,062
Finance -	$48,158
English -	$35,453
Sociology -	$35,434
Psychology -	$34,059

As seen, graduates with BS degrees offered by the EECS department, bolded above, are among the top offers provided new graduates. According to Marilyn Mackes, NACE Executive Director, "One force driving the overall increase in the average salary offer to *all* college graduates is the strong demand for and low supply of technical graduates." These salaries and demand for our students is seen by the EECS faculty. Virtually all of our graduates have jobs by the time they graduate, and the few that do not, find them soon after.

The demand for engineers is also very strong locally. According to a September 20, 2008 article in the Wichita Eagle entitled *Program seeks millions to get kids into science to keep industry; Wichita needs to build up a skilled work force:*

> Kansas Senate President Stephen Morris said he and other legislators are concerned about what might happen if Wichita's aircraft companies, or engineer-reliant Kansas City-area companies like Black & Veatch, Garmin and Burns & McDonnell, leave Kansas or outsource.
>
> Those companies are at least 1,500 engineers short, said Morris, R-Hugoton. "Part of the reason our state is not growing as fast as other states is because of this shortage," Morris said.

And:

> "The shortage is so severe that when I show up at career fairs and talk to company representatives I become almost uncomfortable," said Stuart Bell, KU's dean of engineering. "They are so desperate for engineers. We're not meeting their needs."

Wichita is also home of LSI's largest research and development center for its nearly $1 billion data storage division. According to a November 5, 2008 article in the Wichita Eagle entitled *LSI to kids: Bank on math, science*:

> The building at 3718 N. Rock Road is packed with hundreds of electrical and computer engineers designing new hardware and software. The company faces a dilemma: It loves being in Wichita because of its low turnover and low cost, but it struggles to get enough young talent.

Presently, LSI logic employs 60-65 WSU co-op students and is in collaboration with the EECS department in establishing a WSU/industry consortium in data storage.

To assess how well the program prepares students in their carrier goals, respondents to the Alumni Survey, mentioned in section 1, were asked about the relevance and adequacy of their engineering education at Wichita State University. The combined EE and CE responses from the spring 2007 Alumni Survey received to date are summarized below.

Those surveyed that attended graduate school were asked how well they were prepared. Fourteen of the sixteen indicated that they were very well prepared (highest level of response, a 5 on a 1 to 5 scale), one of the sixteen indicated as response of somewhat prepared (a 4 on a 1 to 5 scale) and one of the sixteen indicated a response of neutral (a 3 on a 1 to 5 scale) yielding an average response of 4.81 of 5.0.

5—Very Well	14
4—Somewhat	1
3—Neutral	1
2—A Little	0
1—Very Little	0
Average Response	4.81/5.0

In response to the question "Were you able to find the position you wanted?" the responses were as follows:

5—Yes	19
4—Somewhat	6
3—Neutral	2
2—Not Really	2
1—No	1
Average Response	4.33/5.0

The alumni were asked how appropriate the current program objectives to what they wanted from their educational experience. The responses were as follows:

5—Very Appropriate	23
4—Somewhat Appropriate	6
3—Neutral	0
2—Somewhat Inappropriate	1
1—Very Inappropriate	0
Average Response	4.7/5.0

In response to the question "How well did the EE or CE program at WSU prepare your for your first engineering position? The responses were as follows:

5—Very Well	14
4—Somewhat	14
3—Neutral	1
2—A Little	1
1—Very Little	0
Average Response	4.37/5.0

As seen, the EE and CE programs are generally perceived by the alumni to be well preparing them for their carrier goals.

5. *A statement that describes the service the program provides to the discipline, other programs at the university, the metropolitan area or Kansas, or other matters as appropriate.*

The Electrical Engineering and Computer Science Department strongly serves the needs of the Wichita metropolitan area. Approximately 34% of the engineers employed in Wichita, Kansas, the center of industrial activity in the state, received their engineering training at Wichita State University. Many of these engineers continue their education as part-time graduate students. As mentioned above, most graduate level courses are frequently offered in the evening to cater to the special needs of the working students.

As further service to Wichita and Kansas, some faculty members are actively engaged with industries in collaborative research, training and consulting. For example, Dr. Skinner has collaborated with local aircraft manufactures in developing new technologies through state/industry/university cooperatives, and has consulted with local companies. Dr Pendse directs a Cisco Systems Technical Assistance laboratory, located at WSU, where students can get hands-on experience working with Cisco professionals in troubleshooting customer networks. Dr. Jewel has provided short courses and workshops on power quality to several organizations including the Kansas Electric Utilities Research Program, the Kansas Association of Hospital Engineers, the Kansas Energy Association and the Midwest Power and Communications Association.

The faculty of the Electrical Engineering and Computer Science Department are very active in service to the profession. All EECS faculty are members of the professional society which covers their respective area and have been involved with reviewing articles for technical journals and serving as session chairs to various professional conferences. Below is a sample of some other services to the profession that have been performed by EECS faculty members during their tenure at WSU:

- Chairman - IEEE Wichita Section
- Vice Chair – IEEE Wichita Section
- Treasurer - IEEE Wichita Section
- Secretary - IEEE Wichita Section
- Proposal Review Board - National Science Foundation
- Technical Program Chair – IEEE Wichita Conf. on Commun., Netw. and Signal Process.
- Associate Editor of IEEE Signal Processing Magazine
- Registration Chair, American Control Conference
- Chair, Wichita Chapter of the IEEE Power Engineering Society (PES)
- Secretary, IEEE Power and Energy Society (PES) Energy Development Subcommittee
- Secretary, IEEE PES Working Group on Photovoltaic

6. *An assessment of the program's cost effectiveness as measured by such matters as cost per credit hour, peer comparisons, and other indicators.*

The Department of Electrical Engineering and Computer Science is a cost effective program in regards to cost per credit hour and cost per graduate. Appendix A provides financial costs and credit hour production of the department. Table 6 is a summary, over the past five years, of the cost per credit hour. Because the Department of Computer Science and the Department of Electrical and Computer Engineering have recently merged, program data is separated between the two. Table 7 shows the students enrollment per major. Although the enrollments have been declining slightly, the programs have become more efficient and the cost per credit hour has also declined.

Table 6 – Cost per credit hour

	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Average
	Electrical and Computer Engineering					
Salaries/Benefits	$1,399,236	$1,501,201	$1,475,715	$1,347,859	$1,160,301	$1,376,862
Other Operating Expenditures	$110,846	$75,673	$27,982	$134,146	$173,889	$104,507
Total	$1,510,082	$1,576,874	$1,503,697	$1,482,004	$1,334,190	$1,481,369
SCH	8,335	7,524	7,783	7,953	7,637	7,846
Cost/SCH	$181	$210	$193	$186	$175	$189
	Computer Science					
Salaries/Benefits	$913,220	$910,270	$856,155	$874,552	$851,803	$881,200
Other Operating Expenditures	$60,550	$64,856	$56,307	$58,894	$50,514	$58,224
Total	$973,770	$975,126	$912,462	$933,447	$902,317	$939,424
SCH	6,789	5,421	4,562	4,202	4,804	$5,156
Cost/SCH	$143	$180	$200	$222	$188	$187

Credit hour production for peer institutions in Kansas is difficult to come by. However, the American Society for Engineering Education keeps statistics on the number of degrees awarded by programs throughout the US. Table 8 shows a FY2006 comparison of effectiveness, with regard to degrees awarded per faculty member, between the Electrical Engineering and Computer Science Department at WSU and the corresponding departments at peer institutions Kansas State University and University of Kansas. As seen in Table 8, when compared with KSU and KU, WSU is extremely cost effective.

Table 7 – Student Enrolment per Major

	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	Average
	Undergraduate					
BS EE	235	214	211	207	186	211
BS CE	180	176	139	123	138	151
BS CS	361	273	263	234	227	272
Total UG	776	663	613	564	551	633
	Graduate					
MS EE	267	207	217	272	237	240
PhD EE	26	24	24	19	28	24
MS CS	140	117	86	74	74	98
Total Grad	433	348	327	365	339	362
	Total Students					
Total	1209	1011	940	929	890	996

Table 8 - FY2006 comparison of degrees awarded per faculty

	WSU	KSU	KU
BS Degrees Awarded: EE	40	48	35
CE	21	31	33
CS	30	26	39
IS	NA	11	NA
Total BS Degrees Awarded	91	126	107
MS Degrees Awarded: EE	73	19	11
CE	NA	NA	15
CS	27	24	15
Total MS Degrees Awarded	100	43	41
PhD Degrees Awarded: EE	2	4	2
CS	NA	0	2
Total PhD Degrees Awarded	2	4	4
Total Degrees Awarded	193	163	152
Faculty	16	45*	36
Degrees/Faculty	12.0	3.6	4.2

* 23 in ECE and 21 in CIS

The EECS Department also has significant income with regards to research grants. Research awards granted to faculty of the department, during calendar year 2008 alone, is over $4,200,000. This includes grants from NASA EPSCoR ($447K), Army DEPSCoR ($406K), NIS ($160K), Cisco Systems ($2,800K), and Department of Energy ($213K). Given the research nature of our department and the research dollars that we bring into the university, we are extremely cost effective and beneficial to the university system.

Appendix A

SECTION	DISCIPLINE	DESCRIPTION	2004	2005	2006	2007	2008
Electrical and Computer							
Section I: Part A: Academic Instruction Expenditures		1. Salaries/Benefits	$1,399,236	$1,501,201	$1,475,715	$1,347,859	$1,160,301
		2. Other Operating Exp.	$110,846	$75,673	$27,982	$134,146	$173,889
		3. Total	$1,510,082	$1,576,874	$1,503,697	$1,482,004	$1,334,190
Section I: Part B: Student Credit Hour Production		1. Lower Division	2,344	2,523	2,406	2,106	2,268
		2. Upper Division	2,659	2,098	2,514	2,117	2,188
		3. Masters	3,179	2,679	2,700	3,614	2,993
		4. Doctoral	153	224	163	116	188
		5.Total	8,335	7,524	7,783	7,953	7,637
Section I: Part D: Percentage of Departmental SCH taken by:		1. Their Undergraduate Majors	53.7	54.9	50.1	41.8	44.3
		2. Their Graduate Majors	36	30.6	36	47.1	43.3
		3. Non-Majors	10.3	14.5	13.9	11.1	12.4
Section I: Part E: Departmental Faculty		1. Tenured/Tenure Track Faculty Head Count	12	13	12	9	9
		2. Tenured/Tenure Track Faculty with Terminal Degrees	12	12	11	9	9
		3. Total Tenured Faculty	8	7	6	7	9

		Total Instructional Faculty FTE in Department	11	12	12	11	11
Section I: Part F: Actual Instructional FTE		1. Tenured/Tenure Track Faculty	11.25	13	12	10	10.5
		2a. Instructor of Record (IOR)	1.83	1.03	0	0.45	2.5
		2b. Not Instructor of Record	2.34	2.04	2.23	1.95	1.1
		3. Other Instructional FTE	1.25	1.67	2.25	2.33	1.3
		4.Total FTE	16.67	17.74	16.48	14.73	15.4
		5. SCH generated by Tenured/Tenure Track Faculty	2,706	2,387	2,158	3,031	2,765
		6. SCH generated by GTA's (IOR)	834	755	0	425	820
		7. SCH generated by Other Instructional Faculty	668	914	2,005	702	466
		8. Total SCH	4,208	4,056	4,163	4,158	4,051
		9. Average SCH per Tenured/Tenure Track Faculty	240.53	183.62	179.83	303.10	263.33
		10. Average SCH per GTA (IOR only)	455.74	733.01	0.00	944.44	328.00
		11. Average SCH per Other Instructional Faculty	534.40	547.31	891.11	301.29	358.46
		12. Average Overall SCH per FTE	252.43	228.64	252.61	282.28	263.05

Section II: Part A: Majors in the Discipline	**COMPUTER ENGINEERING**	1. Freshmen/Sophomores (optional)	81	73	71	62	74
		2. Jrs., Srs., 5th Year Majors	99	103	68	61	64
		3. Masters	0	0	0	0	0
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	0	0	0	0	0
	ELECTRICAL ENGINEERING	1. Freshmen/Sophomores (optional)	75	67	74	77	65
		2. Jrs., Srs., 5th Year Majors	160	147	137	130	121
		3. Masters	267	207	217	272	237
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	26	24	24	19	28
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs	**COMPUTER ENGINEERING**	1. Average ACT Composite	23.3	23.5	24.6	24.5	26.3
		2. Low ACT	13	12	15	13	17
		3. High ACT	34	35	35	33	33
		4. Number Reporting an ACT Score	57	47	28	29	26
		5. Percent Reporting ACT Score	57.58%	45.63%	41.18%	47.54%	40.63%
	ELECTRICAL ENGINEERING	1. Average ACT Composite	21.9	21.8	21.7	23	22.9
		2. Low ACT	13	12	12	13	12

		3. High ACT	34	35	35	33	33
		4. Number Reporting an ACT Score	82	68	62	55	44
		5. Percent Reporting ACT Score	51.25%	46.26%	45.26%	42.31%	36.36%
Section II: Part C: Degrees Conferred	**COMPUTER ENGINEERING**	1. Associate	0	0	0	0	0
		2. Baccalaureate	21	34	21	14	21
		3. Masters	0	0	0	14	0
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	0	0	0	0	0
	ELECTRICAL ENGINEERING	1. Associate	0	0	0	0	0
		2. Baccalaureate	45	45	39	47	37
		3. Masters	124	91	73	72	151
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	2	4	2	0	3

SECTION	DISCIPLINE	DESCRIPTION	2004	2005	2006	2007	2008
Computer Science							
Section I: Part A: Academic Instruction Expenditures		1. Salaries/Benefits	$913,220	$910,270	$856,155	$874,552	$851,803
		2. Other Operating Exp.	$60,550	$64,856	$56,307	$58,894	$50,514
		3. Total	$973,770	$975,126	$912,462	$933,447	$902,317
Section I: Part B: Student Credit Hour Production		1. Lower Division	2,363	2,022	1,709	1,565	1,774
		2. Upper Division	3,161	2,405	2,240	1,860	2,409
		3. Masters	1,265	994	613	777	621
		4. Doctoral	0	0	0	0	0
		5.Total	6,789	5,421	4,562	4,202	4,804
Section I: Part D: Percentage of Departmental SCH taken by:		1. Their Undergraduate Majors	43.7	36.2	42.7	41.8	42.4
		2. Their Graduate Majors	24.7	24.6	21.9	18.8	20.3
		3. Non-Majors	31.6	39.2	35.4	39.4	37.3
Section I: Part E: Departmental Faculty		1. Tenured/Tenure Track Faculty Head Count	7	6	5	4	3
		2. Tenured/Tenure Track Faculty with Terminal Degrees	7	6	5	4	2
		3. Total Tenured Faculty	3	3	3	3	2

		Total Instructional Faculty FTE in Department	8	7	7	8	7
Section I: Part F: Actual Instructional FTE		1. Tenured/Tenure Track Faculty	7	6	5	4.06	3.3
		2a. Instructor of Record (IOR)	0.36	0.45	0.52	0.11	1
		2b. Not Instructor of Record	0.27	0.08	0	0	0
		3. Other Instructional FTE	3.44	7.35	5.14	6.07	6.6
		4.Total FTE	11.07	13.88	10.66	10.24	10.9
		5. SCH generated by Tenured/Tenure Track Faculty	1,656	938	457	493	225
		6. SCH generated by GTA's (IOR)	0	0	66	0	159
		7. SCH generated by Other Instructional Faculty	1,366	1,493	1,434	1,436	1,686
		8. Total SCH	3,022	2,431	1,957	1,929	2,070
		9. Average SCH per Tenured/Tenure Track Faculty	236.57	156.33	91.40	121.43	68.18
		10. Average SCH per GTA (IOR only)	0.00	0.00	126.92	0.00	159.00
		11. Average SCH per Other Instructional Faculty	397.09	203.13	278.99	236.57	255.45
		12. Average Overall SCH per FTE	272.99	175.14	183.58	188.38	189.91
Section II: Part A: Majors in the Discipline	**COMPUTER SCIENCE**	1. Freshmen/Sophomores (optional)	126	104	104	87	92

		2. Jrs., Srs., 5th Year Majors	235	169	159	147	135
		3. Masters	140	117	86	74	74
		4. 1st Prof / Specialist / Certif.	0	0	0	0	0
		5. Doctoral	0	0	0	0	0
Section II: Part B: ACT Scores of Undergraduate Jrs.,Srs	**COMPUTER SCIENCE**	1. Average ACT Composite	22.7	23	23.1	23.7	23.1
		2. Low ACT	7	13	13	10	7
		3. High ACT	33	33	33	33	33
		4. Number Reporting an ACT Score	113	81	71	76	71
		5. Percent Reporting ACT Score	48.09%	47.93%	44.65%	51.70%	52.59%
Section II: Part C: Degrees Conferred	**COMPUTER SCIENCE**	1. Associate	0	0	0	0	0
		2. Baccalaureate	42	41	30	29	30
		3. Masters	36	40	27	29	23
		4. First Prof / Specialist / Certificate	0	0	0	0	0
		5. Doctorate	0	0	0	0	0