Robotics-Centered Curriculum (2006-2007)

Annual Report

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MEMORANDUM

DATE: January 06, 2008
TO: David Hall, Ph.D.
Associate Professor of Mechanical Engineering
Program Chair and James F. Naylor Endowed Professor
Louisiana Tech University

FROM: Patsy Brackin & Shannon Sexton, Rose-Hulman Institute of Technology

SUBJECT: Robotics-Centered Curriculum Annual Assessment Report

The Office of Assessment has completed analysis of the assessment implemented during the spring 2007 quarter. The following items were analyzed:

- ENGR 120 - end of quarter surveys - old curriculum (1 section)
- ENGR 121 - end of quarter surveys - old curriculum (2 sections)
- ENGR 122 - end of quarter surveys - old curriculum (2 sections)
- ENGR 122 - end of quarter surveys - Living WITH the Lab (2 sections)
- Focus group results
- Two ENGR 122 design notebooks from previous years and write-ups on possible projects in the new curriculum
- Syllabi from the old curriculum

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LIVING WITH THE LAB

The major aim of LIVING WITH THE LAB curriculum is to create innovative students with a can-do spirit through a project based curriculum where students repeatedly apply technology and fundamentals to solve problems. The new curriculum boosts experiential learning by putting the ownership and maintenance of the “lab” into the hands of the students. Each student will purchase a robotics kit (~$150) with a programmable controller, sensors, servos, and software to provide the basis for a mobile laboratory and design platform. A basic tenet of the curriculum is that student-owned labs motivate student learning and broaden the spectrum of projects and design topics that can be addressed, thus facilitating innovation.

Assessment Activities

LIVING WITH THE LAB is a college-wide freshman course sequence focusing on several of the attributes listed in “The Engineer of 2020.” The curriculum objectives are grouped into seven threads that span the freshman year. These seven themes include Systems, Electromechanical, Fabrication and Acquisition, Software, Fundamentals, Communication and Broadening Activities. Specific outcomes were developed within each of the three courses to support the curriculum objectives.

A variety of assessment activities were undertaken to examine the effectiveness of the curriculum and the extent to which the objectives were obtained. Student surveys, focus groups, student work products, and course syllabi were examined to assess the effectiveness of the curriculum innovation. As a primary focus of the curriculum change is to develop an innovative spirit, students were surveyed to determine their confidence in their abilities and the frequency with which they used those abilities.

Table 1 lists the target group, method of assessment, timeline and focus of assessment for each instrument administered during Spring Quarter, 2007. Part of this assessment effort is to determine the effectiveness of the assessment methods employed and to make suggestions to enhance the assessment effort throughout the grant period.

Table 1
Spring 2007 Assessment Activities

Target Group	Method	Focus of Assessment
ENGR 120	Survey	• Skills practiced • Course outcomes
ENGR 121	Survey	• Skills practiced • Course outcomes
ENGR 122	Survey	• Skills practiced • Course outcomes
ENGR 122 (old and new curriculum)	Focus Group	• Student perceptions • Student aspirations
ENGR 120, 121, 122	Syllabus Analysis	• Opportunities for practice
ENGR 122	Student Work	• Evidence of student ideas

Participants

The survey was administered during the spring quarter in 2007 in 3 courses; ENGR 120, ENGR 121, and ENGR 122. A total of 182 students participated in the survey.

Statistical Analysis

The student responses from the surveys were analyzed and are presented in several ways. First, frequency of student responses were calculated overall. Second, an ANOVA was conducted to compare each course participating in the assessment. Finally, an Independent T-test was run to compare course objectives for cases where only 2 of the courses had a common objective.

Data Collection Process

The course instructors distributed paper versions of the course survey to students during the quarter for all sections. (A copy of each survey can be found in the appendixes.) The surveys were then sent to Patsy Brackin and Shannon Sexton for data entry and analysis. The rating scales used for each survey consisted of a 6 point confidence scale and a 7 point frequency scale.

Rating	Confidence Anchor	Frequency Anchor
1	Completely Unconfident	Never
2	Mostly Unconfident	Very Infrequently
3	Slightly Unconfident	Rarely
4	Slightly Confident	Occasionally
5	Mostly Confident	Frequently
6	Completely Confident	Very Frequently
7		Always

Common Item Comparisons

When comparing student survey responses across courses, 12 statistically significant differences appeared on ratings of confidence in common course outcomes. These means can be seen in Table 2 on the following page.

- Students in Honors ENGR 122 rated their confidence higher in their ability to "utilize the prescribed solution format when solving problems" than students in ENGR 122.
- Students in Honors ENGR 122 rated their confidence higher in their ability to "present the results of assignments and projects using oral communication" than students in ENGR 120 and ENGR 121.
- Students in ENGR 120 rated their confidence lower in their ability to "generate 3D models of engineering components and assemblies using Solid Edge" than students in ENGR 121 and both sections of ENGR 122.
- Students in Honors ENGR 122 rated their confidence higher in their ability to "present technical data in tables and on graphs in a professional manner" than students in ENGR 120, ENGR 121, and ENGR122.
- Students in ENGR 122 and Honors ENGR 122 rated their confidence higher in their ability to "locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers" than students in ENGR 120 and ENGR 121.
- Students in Honors ENGR 122 rated their confidence higher in their ability to "use linear regression analysis as appropriate in class projects" than students in ENGR 120, ENGR 121, and ENGR 122.
- Students in ENGR 120 rated their confidence lower in their ability to "utilized MathCAD to assist in solving engineering problems" than students in ENGR 121 and both sections of ENGR 122 while students in ENGR 121 rated their confidence in this item lower than students in both sections of ENGR 122.
- Students in Honors ENGR 122 rated their confidence in their ability to "utilize Excel to assist in solving engineering problems" higher than students in ENGR120, ENGR 121, and ENGR 122.
- Students in ENGR 122 rated their confidence higher in their ability to "use creative techniques to overcome at least one project difficulty" higher than students in ENGR 121.
- Students in Honors ENGR 122 rated their confidence in their ability to "explain the trends and assess the implications in a broad engineering context" given a current societal concern higher than students in ENGR 120, ENGR 121, and ENGR 122.

Table 2
Common Course Outcome Confidence Means by Course

Item	ENGR 120 A	ENGR 121 B	ENGR 122 C	ENGR 122H D	*Sig.
Utilize the prescribed solution format when solving problems.	5.00	5.14	5.33	5.63	D>C
Work collaboratively with one or more other students.	5.41	5.20	5.51	5.63	
Present the results of assignments and projects using written communication.	4.85	4.88	4.91	5.00	
Present the results of assignments and projects using oral communication.	4.39	4.50	4.88	5.13	D>A&B
Generate 3D models of engineering components and assemblies using Solid Edge.	2.55	4.54	4.52	4.38	A<B,C,&D
Present technical data in tables and on graphs in a professional manner.	4.76	4.66	4.89	5.58	D>A,B,&C
Locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers.	3.85	3.17	4.92	5.50	C>A&B D>A&B
Use linear regression analysis as appropriate in class projects.	3.58	3.98	4.05	5.13	D>A,B,&C
Utilize MathCAD to assist in solving engineering problems.	1.67	4.11	4.92	5.08	A<B,C,&D B<C&D
Utilize Excel to assist in solving engineering problems.	4.85	4.64	5.06	5.63	D>A,B,&C
Use creative techniques to overcome at least one project difficulty.	4.61	4.45	4.97	5.00	C>B
When I set a goal, I keep going after it no matter what the obstacles.	4.97	5.05	5.28	5.04	
I enjoy developing technical tools that improve the quality of life for people.	4.88	4.77	4.77	5.00	
I intend to develop new products/processes during my career as an engineer.	4.82	4.57	5.11	5.00	
I prefer improving products/processes that already exist instead of developing something new.	4.28	4.63	4.65	4.83	
Given a current societal concern explain the trends and assess the implications in a broad engineering context.	3.25	3.51	3.97	4.96	D>A,B,&C
Program a BASIC Stamp II microcontroller using the PBASIC language to control the speed and direction of servos.	1.33	1.54			

Notes: * indicates statistically significant difference between means.

There were 12 statistically significant differences on ratings of performance in common course outcomes. These means can be seen in Table 3 below.

- Students in Honors ENGR 122 rated the frequency of their performance in “utilize the prescribed solution format when solving problems” higher than students in ENGR 122.
- Students in Honors ENGR 122 rated the frequency of their performance in “present the results of assignments and projects using oral communication” higher than students in ENGR 120, ENGR 121, and ENGR 122.
- Students in ENGR 120 rated the frequency of their performance in “generate 3D models of engineering components and assemblies using Solid Edge” lower than students in ENGR 121 and both sections of ENGR 122.
- Students in Honors ENGR 122 rated the frequency of their performance in “present technical data in tables and on graphs in a professional manner” higher than students in ENGR 121 and ENGR 122.
- Students in Honors ENGR 122 rated the frequency of their performance in “locate specifications and prices for the supplies, parts and systems used in course projects from manufactures and on-line retailers” higher than students in ENGR 120, ENGR 121, and ENGR 122 while students in ENGR 121 rated the frequency of their performance on this item lower than students in ENGR 120 and both sections of ENGR 122.
- Students in Honors ENGR 122 rated the frequency of their performance in “Use linear regression analysis as appropriate in class projects” higher than students in ENGR 122.
- Students in ENGR 120 rated the frequency of their performance in “utilize MathCAD to assist in solving engineering problems” lower than students in ENGR 121 and both sections of ENGR 122.
- Students in ENGR 120 and Honors ENGR 122 rated the frequency of their performance in “utilize Excel to assist in solving engineering problems” higher than students in ENGR 121 and ENGR 122.
- Students in Honors ENGR 122 rated the frequency of their performance in “use creative techniques to overcome at least one project difficulty” higher than students in ENGR 121.
- Students in Honors ENGR 122 rated their confidence in their ability to “explain the trends and assess the implications in a broad engineering context” given a current societal concern higher than students in ENGR 120, ENGR 121, and ENGR 122.

Table 3
Common Course Outcome Performance Means by Course

Item	ENGR 120	ENGR 121	ENGR 122	ENGR 122H	*Sig.
	A	B	C	D	
Utilize the prescribed solution format when solving problems.	5.66	5.71	5.23	6.25	D>C
Work collaboratively with one or more other students.	5.36	5.46	5.98	6.08	
Present the results of assignments and projects using written communication.	4.79	5.04	4.50	5.25	
Present the results of assignments and projects using oral communication.	3.91	3.91	4.11	5.00	D>A,B,&C
Generate 3D models of engineering components and assemblies using Solid Edge.	2.41	4.27	4.14	3.54	A<B,C,&D
Present technical data in tables and on graphs in a professional manner.	4.53	4.29	4.00	5.38	D>B&C
Locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers.	3.15	2.11	3.70	5.00	B<A,C,&D D>A,B,C
Use linear regression analysis as appropriate in class projects.	3.58	3.65	3.25	4.43	D>C
Utilize MathCAD to assist in solving engineering problems.	1.32	4.71	4.97	4.96	A<B,C,&D
Utilize Excel to assist in solving engineering problems.	5.26	4.11	4.44	5.46	A>B&C D>B&C
Use creative techniques to overcome at least one project difficulty.	4.47	3.95	4.56	5.00	D>B
When I set a goal, I keep going after it no matter what the obstacles.	5.59	4.89	5.53	5.33	
I enjoy developing technical tools that improve the quality of life for people.	4.76	4.21	4.11	4.92	
I intend to develop new products/processes during my career as an engineer.	4.35	4.17	4.60	4.91	
I prefer improving products/processes that already exist instead of developing something new.	4.12	4.10	4.46	4.35	
Given a current societal concern explain the trends and assess the implications in a broad engineering context.	2.88	3.04	3.28	4.87	D>A,B,&C
Program a BASIC Stamp II microcontroller using the PBASIC language to control the speed and direction of servos.	1.18	1.28			

Notes: * indicates statistically significant difference between means.

There were 11 significant differences between courses in students' reports of frequency of mechanical task performance. These means can be found in Table 4 below.

- Students in Honors ENGR 122 reported performing assembly, cutting internal or external threads, drilling, implementing circuits on a breadboard, layout, sawing, soldering, using a dial indicator, using a lathe, and writing PBASIC programs more than students in ENGR 120, ENGR 121, and ENGR 122.
- Students in ENGR 122 reported performing rapid prototyping more than students in ENGR 120 and ENGR 121.

Table 4
"Hands-On" Application Means by Course

Item	ENGR 120	ENGR 121	ENGR 122	ENGR 122H	* Sig.
Assembly	2.15	.55	3.10	11.19	D>A,B,&C
Bending	1.04	.18	4.77	3.32	
Cutting internal or external threads	.23	.02	.55	1.62	D>A,B,&C
Drilling	1.81	.55	4.29	13.14	D>A,B,&C
Implementing circuits on a breadboard	.04	.49	.62	21.73	D>A,B,&C
Layout	1.35	.63	2.24	10.05	D>A,B,&C
Milling	.34	.00	.09	.36	
Rapid Prototyping	.21	.00	.71	.30	C>A&B
Sawing	1.52	.15	2.05	7.77	D>A,B,&C
Soldering	.14	.05	2.17	13.83	D>A,B,&C
Using a dial indicator	.07	.02	.17	2.71	D>A,B,&C
Using a lathe	.24	.02	.06	1.17	D>A,B,&C
Using a multimeter	.26	.33	2.28	3.55	
Using a scale	4.12	1.06	3.59	2.27	
Writing PBASIC programs	.00	.05	.02	20.23	D>A,B,&C

Notes: * indicates statistically significant difference between means.

ENGR 120 Survey Results

In addition to the 17 common course outcomes discussed above, students in ENGR 120 also rated their confidence and frequency of performance in 19 other course outcomes specific to ENGR 120. The means for these outcomes are listed below in Table 5. The highest rating of confidence was in "create Excel spreadsheets using formulas and built-in functions and generate plots of the spreadsheet." Not surprisingly, this was also the highest rated outcome in terms of frequency of performance.

Table 5
ENGR 120 Specific Course Outcome Means

Item	Confidence	Performance
Utilize MathCAD to build functions, to solve sets of linear equations and to create plots.	1.61	1.44
Create Excel spreadsheets using formulas and built-in functions and generate plots of the spreadsheet data.	5.00	5.24
Explain the origin of electric charge and define electric current, voltage, resistance, and power.	2.76	2.29
Compute current, resistance, voltage and power for circuits composed of resistors and DC power sources using Ohm's law and Kirchhoff's laws.	2.58	2.38
Compute the mean, median, standard deviation, and variance of a data set.	4.91	4.65
Determine the best fit equation for a set of (x,y) data points, considering linear, power, polynomial and exponential functions.	4.88	4.82
Identify and describe the purpose of each component on the BASIC Stamp II microcontroller.	1.30	1.18
Identify and describe the purpose of each component on the Board of Education.	1.56	1.15
Identify and describe the purpose of each component on Boe-Bot.	1.21	1.18
Convert between decimal numbers and binary numbers.	2.79	2.47
Explain how programs and variables are stored in EEPROM and RAM on the BASIC Stamp II microcontroller.	1.55	1.53
Implement whisker circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.	1.33	1.18
Implement photoresistor circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.	1.42	1.24
Implement LED and piezospeaker circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.	1.38	1.24
Program a BASIC Stamp II microcontroller using the PBASIC language to control the illumination of LEDs.	1.23	1.18
Program a BASIC Stamp II microcontroller using the PBASIC language to control the frequency and duration of sound output from piezospeakers.	1.26	1.15
Fabricate a centrifugal pump driven by a DC motor with an impeller drawn in Solid Edge and printed on a rapid prototyping machine.	1.42	1.15
Utilize a mulitmeter to troubleshoot circuits and to measure the current, voltage and power usage of an electric pump.	1.58	1.39
Compute the efficiency and evaluate the performance of a centrifugal pump using DC circuit analysis, conservation of energy, and linear regression analysis.	1.32	1.21

ENGR 121 Survey Results

In addition to the 17 common course outcomes discussed above, students in ENGR 121 also rated their confidence and frequency of performance in 12 other course outcomes specific to ENGR 121. The means for these outcomes are listed below in Table 6. The highest rating of confidence was in "compute the molarity, concentration, and mass of the constituents in a salt water mixture." Not surprisingly, this was also the highest rated outcome in terms of frequency of performance.

Table 6
ENGR 121 Specific Course Outcome Means

Item	Confidence	Performance
Compute the molarity, concentration, and mass of the constituents in a salt water mixture.	4.33	3.85
Compute quantities such as iron concentration, mass of reactants and products, and electrical current for a salt water mixture undergoing oxidation/reduction reactions due to the presence of a conductivity probe.	3.06	2.83
Apply conservation of mass to batch and rate problems to compute the inputs, outputs and changes of system constituents.	3.94	3.76
Apply conservation of energy to a small volume of water that is heated using an electrical resistance heater, computing quantities such as heater wattage, temperature change, and heating time.	2.92	2.46
Design an electrical resistance heater to heat a small volume of water in a specified period of time, where the design involves choosing the gage and length of a segment wire.	2.24	1.90
Evaluate the compatibility of electrical components and devices (transistors, solenoid valves, heaters, pumps, sensors) with the BASIC Stamp II microcontroller, the Board of Education and with external power supplies.	2.04	1.86
Implement cascaded switching circuits consisting of transistors and relays to allow the BASIC Stamp II microcontroller to turn external components on and off.	1.92	1.67
Implement RC circuits and PBASIC programs to interface the BASIC Stamp II microcontroller with sensors.	1.60	1.40
Explain the microfabrication steps and processes used to fabricate a resistance temperature detector – RTD.	1.48	1.34
Design a nickel-based RTD by computing the width and length of the resistor and by drawing the chosen resistor layout using Solid Edge.	1.62	1.30
Design and fabricate a system where the temperature and salinity of a small fluid volume are measured and controlled.	1.54	1.28
Troubleshoot, test, and validate a system where the temperature and salinity of a small fluid volume are measured and controlled.	1.70	1.34

ENGR 122 Survey Results

In addition to the 16 common course outcomes discussed above, students in ENGR 122 also rated their confidence and frequency of performance in 16 other course outcomes specific to ENGR 122. The means for these outcomes are listed on the following page in Table 9. Students in the Honors section rated their confidence and frequency of performance in these outcomes higher than the traditional section for all but 4 outcomes.

Students in ENGR 122 were also asked to list the 5 steps in the IDEO design methodology and to list the "Seven Secrets for Better Brainstorming." Students in Honors ENGR 122 significantly outperformed students in the traditional ENGR 122 on both items (IDEO M = 2.63 and .02 respectively while Seven Secrets M = .79 and .00 respectively). The breakdown for the number of IDEO steps and Seven Secrets can be seen in Table 8 below.

Table 8
ENGR 122 Number of Steps Correct

Number Correct	IDEO		Seven Secrets	
	Honors	Traditional	Honors	Traditional
0	42%	99%	83%	100%
1	0%	1%	0%	0%
2	4%	0%	4%	0%
3	4%	0%	4%	0%
4	8%	0%	0%	0%
5	42%	0%	0%	0%
6			0%	0%
7			8%	0%

Table 9
ENGR 122 Specific Course Outcome Means

Item	Confidence		Performance	
	ENGR 122	ENGR 122H	ENGR 122	ENGR 122H
Apply statics to determine resultants of force systems.	4.92*	5.43*	4.91	5.35
Apply statics to determine unknown forces and moments for concurrent and non-concurrent force systems.	4.79	5.22	4.73	5.00
Apply the principles of electrical circuits, statics and conservation of energy to evaluate the efficiency of a motor/gearbox system, computing quantities such as electrical power usage, mechanical power output, torque and angular velocity.	3.85*	5.13*	3.71*	5.30*
Compute present worth, future worth, and annuity schedules to perform engineering economic analyses.	5.36*	4.00*	5.14	4.65
Implement an infrared LED/receiver circuit (IR pair) to detect objects.	1.95*	5.39*	1.71*	5.35*
Implement a Hall-effect sensor circuit as a proximity sensor.	1.68*	4.83*	1.52*	4.30*
List the specifications and PBASIC commands to interface selected sensors to the BASIC Stamp II microcontroller.	1.30*	5.17*	1.27*	5.04*
Explain the physics behind how sensors function.	1.86*	4.74*	1.56*	5.04*
Explain the roles of the ten "Faces of Innovation" as discussed in "The Ten Faces of Innovation" by Tom Kelley.	1.62*	4.13*	1.48*	4.17*
Create a Mind Map to organize ideas around a central topic.	2.67*	3.96*	2.09*	2.96*
Apply the Pugh method to evaluate concept ideas.	1.48*	4.87*	1.35*	3.65*
Conceive a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.	1.62*	5.09*	1.33*	5.17*
Design a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.	1.61*	5.17*	1.32*	5.09*
Fabricate a functional prototype of an innovative product that utilizes one or more sensors, actuators, or other output devices, and the BASIC Stamp II microcontroller.	1.62*	5.04*	1.27*	5.09*
Test a functional prototype of an innovative product that utilizes one or more sensors, actuators, or other output devices, and the BASIC Stamp II microcontroller.	1.68*	5.09*	1.32*	5.04*
Develop a work plan to manage your time and resources to successfully produce a prototype of an innovative product.	4.02	4.74	3.61	4.39

Notes: * indicates statistically significant difference between means.

Finally students were asked to indicate which of 24 components they had used during the academic year and then to rate their confidence in their ability to incorporate the components into a project. The percentage of students using each device and the mean confidence ratings for these components are listed below in Table 10. Students in Honors ENGR 122 rated their confidence higher on all but 2 components.

Table 10
Confidence and Usage of Components

Component	Usage		Confidence	
	ENGR 122	ENGR 122H	ENGR 122	ENGR 122H
Whisker	5%	75%	1.15*	5.65*
Photoresistors	3%	92%	1.15*	5.52*
IR Pairs	8%	96%	1.15*	5.52*
Temperature Sensor	15%	80%	1.89*	4.65*
Conductivity Sensor	15%	75%	1.32*	4.48*
Hall Effect Sensor	3%	83%	1.02*	4.82*
RF Keychain Transmitter and Receiver	5%	88%	1.06*	4.83*
Ultrasonic Range Finder	3%	42%	1.04*	3.94*
Accelerometer	8%	42%	1.33*	3.94*
RF ID Tags and Reader	14%	21%	1.09*	3.50*
GPS Receiver	12%	4%	1.51*	2.69*
Compass	23%	4%	2.79	2.63
Force Sensor	11%	25%	1.74*	3.61*
Temperature and Humidity Sensor	17%	21%	3.28	3.12
RF Communication Modules	6%	8%	1.04*	2.56*
Embedded Blue Transceiver Appmod	8%	0%	1.13*	2.19*
Color Sensor	6%	0%	1.17*	2.19*
CMUcam Vision System	3%	0%	1.02*	2.31*
Continuous Rotation Servos	3%	75%	1.09*	5.35*
LEDs	14%	96%	1.49*	5.86*
Buzzers	11%	79%	1.40*	5.32*
Switchable Actuators	30%	79%	2.43*	5.22*
Limited Rotation Servos	5%	17%	1.15*	3.71*
LCD Display Output	11%	21%	1.72*	3.47*

Notes: * indicates statistically significant difference between means.

Professional Society Meetings and Student-Led Functions

All students in ENGR 120, 121, and 122 were asked to list the professional society meetings and student-led functions they attended this quarter. Those responses are listed in Table 11 below. The meetings and functions are listed alphabetically and the number of students listing each function is broken down by course.

Table 11
Professional Society Meetings and Student-Led Functions

Count	Meeting/Function
120 – 1 121 – 0 122 – 4	American Chemical Society (ACS)
120 – 0 121 – 0 122 – 1	American Institute of Chemical Engineers (AIChE)
120 – 1 121 - 1 122 – 6	American Society of Civil Engineers (ASCE)
120 – 0 121 – 0 122 – 1	ASHRAE
120 – 0 121 – 0 122 - 20	American Society of Mechanical Engineers (ASME)
120 – 0 121 – 1 122 – 4	ASME concrete canoe race
120 – 1 121 – 0 122 – 0	BCM
120 – 0 121 – 1 122 – 1	Boeing Meeting
120 – 0 121 – 1 122 – 0	Bio-Med
120 – 0 121 – 0 122 – 1	Biomed Building Dedication
120 – 0 121 – 0 122 – 4	Biomedical Engineering Society (BMES)
120 – 0 121 – 1 122 – 0	Bridge Builder
120 – 0 121 – 0 122 – 1	Christmas Party (COES)
120 – 0 121 – 0 122 – 1	CME

120 – 0 121 – 2 122 – 2	Crawfish Boil
120 – 0 121 – 0 122 – 8	Dean Lecture Series
120 – 0 121 – 0 122 – 1	Defense Contract Seminar
120 – 0 121 – 0 122 – 2	Dr. Woshich/Wobisch Lecture
120 – 0 121 – 0 122 – 1	EAS
120 – 8 121 – 1 122 – 18	Engineering 2020 Meeting
120 – 0 121 – 0 122 – 2	Engineering Convocation
120 – 0 121 – 1 122 – 0	Engineering and Science in China
120 – 0 121 – 0 122 – 2	Engineering Quiz Bowl
120 – 0 121 – 0 122 – 1	E & S ma
120 – 0 121 – 0 122 – 9	ESA
120 – 1 121 – 0 122 – 5	Engineers without Borders (EWB)
120 – 0 121 – 1 122 – 6	Gumbo Fest (COES)
120 – 2 121 – 0 122 – 3	IEE
120 – 0 121 – 0 122 – 5	IEEE
120 – 0 121 – 0 122 – 4	IIE
120 – 0 121 – 0 122 – 1	Institute of Industrial Engineers (IIE) Lego Competition
120 – 0 121 – 0 122 – 1	IMF

120 – 1 121 – 0 122 – 1	Lambda Sigma
120 – 0 121 – 0 122 – 1	Mini-Baja Meeting
120 – 0 121 – 1 122 – 0	NASA – How are we going to live on the moon
120 – 2 121 – 1 122 – 5	National Society of Black Engineers (NSBE)
120 – 1 121 – 0 122 – 0	National Society of Chemical Engineering
120 – 0 121 – 0 122 – 1	Professional Awareness
120 – 1 121 – 0 122 – 0	Professional Engineers Speaking
120 – 0 121 – 0 122 – 7	SAE
120 – 0 121 – 0 122 – 2	Senior Design Conference
120 – 1 121 – 0 122 – 3	Society of Women Engineers (SWE)
120 – 0 121 – 0 122 – 2	SPAC
120 – 0 121 – 2 122 – 3	Spring Release
120 – 0 121 – 0 122 – 1	Steel Bridge Setup
120 – 0 121 – 0 122 – 1	Study of Matter Lecture
120 – 0 121 – 0 122 – 1	TI Trip

Focus Group Results

During the spring of 2007, Alicia Boudreaux, a Student Success Specialist, conducted focus groups with the engineering freshmen. Alicia was particularly well suited for this task as her undergraduate degree was in mechanical engineering and she has an MS in educational administration. A summary of her impressions are given in this section while all data is included in Attachment D.

Focus groups were conducted with engineering freshmen to get their feedback about their freshman year, and specifically about the engineering curriculum. There were three different groups. The first two were from a regular engineering class (old curriculum). Both were randomly selected. The third group was from an honors engineering class (Living WITH the Lab pilot curriculum). Four out of the six participants were randomly selected, and the other two were "willing participants." All of the groups interviewed were mixed engineering majors and included five to six students.

General impressions of all the groups are that they had a positive experience and attitude, but they had a lot of frustrations to share and appreciated the opportunity to do so. The regular class focused a lot of their likes around working in groups and learning about engineering as a career, while the honors class focused a lot on hands-on projects and learning to troubleshoot.

Involving frustrations, both classes talked a lot about not having thorough instruction in the computer software they were expected to learn (MathCAD and SolidEdge). They described learning the programs through tutorials but never really being taught them and/or not having much opportunity to *apply* them in real projects. They also all talked about wanting even better connections to their other classes, one of the main goals of the integrated curriculum. The honors class felt frustrated with the challenge of problems in the class (some that the teacher could not answer) and with the fact that they did not have a reference book to use when they did not quite understand concepts taught in class.

As far as new product ideas, all three groups sounded very creative and had innovative ideas. They all described the steps to take when proceeding with a new idea. However, from watching the honors class presentations at the end of the quarter, Alicia believes they understand more deeply the steps to take. At least for the beginning of the process, they know more than the "right words" to use (prototyping, etc.); they know the details of how to do it. At the same time, the regular class students mentioned more of the long-term steps like patenting, marketing, etc. Though they probably do not know the actual steps to take to achieve those goals, they seemed more familiar with the overall process.

Student Work Analysis

Examination of student work was performed to count the number of ideas that students generated. Two log books from the old curriculum and 9 student project proposals from the new curriculum were inspected. A summary of the classification of the ideas generated are shown in Attachment E. It is difficult to compare the results from the two courses because the assignments were so different. In the old curriculum, the log books were documentation of an airplane design. Both groups generated several feasible alternatives initially. The first group generated more than one alternative every time that a problem was encountered. The second group tended to generate only one solution each time a problem was encountered during their design. In the new curriculum, students were asked to give initial ideas for a project. Each group gave a minimum of three alternatives.

The main difference between the two submissions is that the students in the new curriculum were focusing on generating concepts for new products. Students in the old curriculum were focused on solving the same challenge. Students in the new curriculum consistently proposed the use of technology based solutions whereas the solutions proposed by students in the old curriculum did not rely on newer technology but rather on traditional items such as rubber bands.

Robotics-Centered Curriculum (Spring 2007)

Syllabi Analysis

Syllabi and course schedules were examined in an effort to determine the opportunities that students had for creativity and hands on practice. The syllabi and schedules examined are included in Attachment F. Without more description of the actual assignments, it is not possible to get a baseline of the number of opportunities offered in the old curriculum.

The goals for the assessment efforts during the spring of 2007 were to develop a method for assessing the effectiveness of the new curriculum, to obtain a baseline for the old curriculum, and to determine if there were differences between the old curriculum and new curriculum that could be quantified. Each goal will be discussed separately:

Development of Assessment Method

T
he use of student surveys provided a wealth of information about student confidence and the frequency with which they performed desired activities. The use of student surveys should be continued. There are some suggestions for improvement of the survey instrument. First, putting the surveys on-line is recommended so that students must enter information in the desired format. Some students wanted to enter real numbers such as 3.5 which complicates interpreting their answers. Second, when asking how often students perform certain operations, it would be more helpful to give students a range. Some students indicated that they had performed an operation many times, but they weren't sure of the exact number. Third, provide a list of common organizations for students to select from when indicating the professional and student led activities in which they participated. An "other" blank could be used for students to add activities not on the list.

Although focus groups do not provide numeric data, there is a wealth of information about student concerns and perceptions. Continuation of focus groups is recommended.

There is not a good method for comparing student creativity from the old curriculum to the new curriculum. Examination of student work products and course syllabi and schedules, did not give concrete evidence. Instead of concentrating on comparing the activities in the two curricula, establishing a method for documenting student creativity and innovation is recommended. For example, the course instructors are devising methods for practicing creativity. In addition, a list of all completed student projects can be maintained to give an idea of the effect of the curriculum.

Development of Baseline

The surveys utilized provide a baseline of responses for students in the old curriculum for ENGR 120, 121, and 122. The respondents for the new curriculum of ENGR 122 were all from honors sections. At this time it is not know if the differences observed between the new curriculum and the old curriculum are due to the curriculum or due to the fact that you typically have more motivated and talented students in the honors sections. This will not be known until the results from the fall of 2007 are analyzed for students in ENGR 120.

Quantification of Differences

The data obtained from the spring of 2007 allowed a comparison between the old ENGR 122 and the new Honors ENGR 122. There are several striking differences. When examining the common course outcomes, the new Honors ENGR 122 reported a statistically greater frequency of performance in seven areas: using the prescribed solution format, presenting the results of assignments and projects using oral communication, presenting technical data in a professional manner, locating specifications and prices, using linear regression, using Excel, and given a current societal concern being able to explain the trends and assess the implications in a broad engineering context. This frequency of use led to a statistically greater confidence in six areas: using the prescribed solution format, presenting the results of assignments and projects using oral communication, presenting technical data in a professional manner, using linear regression, using Excel, and given a current societal concern being able to explain the trends and assess the implications in a broad engineering context.

One of the major assumptions of the "Living with the Lab" is that students' ownership and maintenance will result in students obtaining more hands-on practice. This assumption is demonstrated dramatically in Table 4, "Hands-On" Application Means by Course. Of the fifteen items listed in the table, Honors ENGR 122 reported statistically higher hands-on use in 10 of the 15 items.

When examining ENGR 122 Specific Course Outcomes in Table 7, the Honors ENGR 122 sections rated statistically higher in both confidence and performance in 12 of the 16 outcomes. They rated statistically lower in confidence in only one of the outcomes.

Because the new curriculum was presented to honors students, it is not possible to determine the effectiveness for all students at this time. The survey differences are encouraging and results should continue to be tracked.

In addition to the evidence from the surveys, the focus group results and examination of student work indicate that students are spending more time with innovative technologies. The initial results are exciting.

Items of Interest Outside the Scope of the Project

Although the grant and assessment efforts are focused on the new curriculum, it is interesting to examine Tables 2 and 3 across the three quarters of the freshmen year. In two areas, generating 3D models and using MathCAD to assist in problem solving, students improve throughout the year. Furthermore, students do not worsen in any area. Finally, examination of Table 4 reveals that students do gain more "hands-on" experience throughout the year.

ENGR 120 Survey

ENGR 120, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	Level of Confidence	Frequency of Performance
1. Utilize the prescribed solution format (Given, Required, Solution, Discussion) when solving problems.		
2. Work collaboratively with one of more other students.		
3. Present the results of assignments and projects using written communication.		
4. Present the results of assignments and projects using oral communication.		
5. Generate 3D models of engineering components and assemblies using Solid Edge.		
6. Present technical data in tables and on graphs in a professional manner.		
7. Locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers.		
8. Use linear regression analysis as appropriate in class projects.		
9. Utilize Mathcad to assist in solving engineering problems.		
10. Utilize Mathcad to build functions, to solve sets of linear equations and to create plots.		
11.Utilize Excel to assist in solving engineering problems.		
12. Create Excel spreadsheets using formulas and built-in functions and generate plots of the spreadsheet data.		
13. Use creative techniques to overcome at least one project difficulty.		
14. When I set a goal, I keep going after it no matter		

what the obstacles.		
15. I enjoy developing technical tools that improve the quality of life for people.		

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
16. I intend to develop new products/processes during my career as an engineer.		
17. I prefer improving products/processes that already exist instead of developing something new.		
18. Given a current societal concern (such as population growth, food and water supply, ethical dilemmas, globalization, etc.) explain the trends and assess the implications in a broad engineering context.		
19. Explain the origin of electric charge, and define electric current, voltage, resistance and power.		
20. Compute current, resistance, voltage and power for circuits composed of resistors and DC power sources using Ohm’s law and Kirchoff’s laws.		
21. Compute the mean, median, standard deviation and variance of a data set.		
22. Determine the best fit equation for a set of (x, y) data points, considering linear, power, polynomial and exponential functions.		
23. Identify and describe the purpose of each component on the BASIC Stamp II microcontroller.		
24. Identify and describe the purpose of each component on the Board of Education.		
25. Identify and describe the purpose of each component on Boe-Bot.		
26. Convert between decimal numbers and binary numbers.		
27. Explain how programs and variables are stored in EEPROM and RAM on the BASIC Stamp II microcontroller.		
28. Implement whisker circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.		

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
29. Implement photoresistor circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.		
30. Implement LED and piezospeaker circuits on the Board of Education breadboard based on circuit diagrams provided by the instructor or in the Robotics book.		
31. Program a BASIC Stamp II microcontroller using the PBASIC language to control the speed and direction of servos.		
32. Program a BASIC Stamp II microcontroller using the PBASIC language to control the illumination of LEDs		
33. Program a BASIC Stamp II microcontroller using the PBASIC language to control the frequency and duration of sound output from piezospeakers		
34. Fabricate a centrifugal pump driven by a DC motor with an impeller drawn in Solid Edge and printed on a rapid prototyping machine.		
35. Utilize a multimeter to troubleshoot circuits and to measure the current, voltage and power usage of an electric pump.		
36. Compute the efficiency and evaluate the performance of a centrifugal pump using DC circuit analysis, conservation of energy, and linear regression analysis.		

ENGR 120, Spring 2007
During the current quarter approximately how many times did you perform the individual activities?

Soldering______________________ Layout___________________________

Assembly______________________ Bending__________________________

Sawing ________________________ Drilling___________________________

Milling________________________ Using a scale _______________________

Using a lathe___________________ Rapid prototyping____________________

Cutting internal and external threads___________________________________

Using a dial indicator __________ Using a multimeter___________________

Implementing circuits on a breadboard_________________________________

Writing PBASIC programs____

Please list the professional society meetings and/or student-led functions you have attended this quarter.

ENGR 121 Survey

ENGR 121, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
1. Utilize the prescribed solution format (Given, Required, Solution, Discussion) when solving problems.		
2. Work collaboratively with one of more other students.		
3. Present the results of assignments and projects using written communication.		
4. Present the results of assignments and projects using oral communication.		
5. Generate 3D models of engineering components and assemblies using Solid Edge.		
6. Present technical data in tables and on graphs in a professional manner.		
7. Locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers.		
8. Use linear regression analysis as appropriate in class projects.		
9. Utilize Mathcad to assist in solving engineering problems.		
11.Utilize Excel to assist in solving engineering problems.		
12. Use creative techniques to overcome at least one project difficulty.		
13. When I set a goal, I keep going after it no matter what the obstacles.		
14. I enjoy developing technical tools that improve the quality of life for people.		

ENGR 121, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

15. I intend to develop new products/processes during my career as an engineer.		
16. I prefer improving products/processes that already exist instead of developing something new.		
17. Given a current societal concern (such as population growth, food and water supply, ethical dilemmas, globalization, etc.) explain the trends and assess the implications in a broad engineering context.		
18. Compute the molarity, concentration, and mass of the constituents in a salt water mixture.		
19. Compute quantities such as ion concentration, mass of reactants and products, and electrical current for a salt water mixture undergoing oxidation/reduction reactions due to the presence of a conductivity probe.		
20. Apply conservation of mass to batch and rate problems to compute the inputs, outputs and changes of system constituents.		
21. Apply conservation of energy to a small volume of water that is heated using an electrical resistance heater, computing quantities such as heater wattage, temperature change, and heating time.		
22. Design an electrical resistance heater to heat a small volume of water in a specified period of time, where the design involves choosing the gage and length of a segment wire.		
23. Evaluate the compatibility of electrical components and devices (transistors, solenoid valves, heaters, pumps, sensors) with the BASIC Stamp II microcontroller, the Board of Education and with external power supplies.		
24. Implement cascaded switching circuits consisting of transistors and relays to allow the BASIC Stamp II microcontroller to turn external components (such as a heater or pump) on and off.		

ENGR 121, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

25. Implement RC circuits and PBASIC programs to interface the BASIC Stamp II microcontroller with sensors (such as temperature and conductivity).		
26. Explain the microfabrication steps and processes used to fabricate a resistance temperature detector – RTD.		
27. Design a nickel-based RTD by computing the width and length of the resistor and by drawing the chosen resistor layout using Solid Edge.		
28. Program a BASIC Stamp II microcontroller using the PBASIC language to control the speed and direction of servos.		
29. Design and fabricate a system where the temperature and salinity of a small fluid volume are measured and controlled.		
30. Troubleshoot, test and validate a system where the temperature and salinity of a small fluid volume are measured and controlled.		

ENGR 121, Spring 2007

During the current quarter approximately how many times did you perform the individual activities?

Soldering______________________ Layout___________________________

Assembly______________________ Bending__________________________

Sawing ________________________ Drilling___________________________

Milling________________________ Using a scale _______________________

Using a lathe___________________ Rapid prototyping____________________

Cutting internal and external threads___________________________________

Using a dial indicator ___________ Using a multimeter___________________

Implementing circuits on a breadboard_________________________________

Writing PBASIC programs____

Please list the professional society meetings and/or student-led functions you have attended this quarter.

ENGR 122 Survey

ENGR 122, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
1. Utilize the prescribed solution format (Given, Required, Solution, Discussion) when solving problems.		
2. Work collaboratively with one of more other students.		
3. Present the results of assignments and projects using written communication.		
4. Present the results of assignments and projects using oral communication.		
5. Generate 3D models of engineering components and assemblies using Solid Edge.		
6. Generate a 3D model of an innovative product using Solid Edge.		
7. Present technical data in tables and on graphs in a professional manner.		
8. Locate specifications and prices for the supplies, parts and systems used in course projects from manufacturers and on-line retailers.		
9. Purchase supplies and parts for an innovative product.		
10. Use linear regression analysis as appropriate in class projects.		
11. Utilize Mathcad to assist in solving engineering problems.		
12. Utilize Excel to assist in solving engineering problems.		
13. Use creative techniques to overcome at least one project difficulty.		
14. When I set a goal, I keep going after it no matter what the obstacles.		

15. I enjoy developing technical tools that improve the quality of life for people.		

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
16. I intend to develop new products/processes during my career as an engineer.		
17. I prefer improving products/processes that already exist instead of developing something new.		
18. 18. Given a current societal concern (such as population growth, food and water supply, ethical dilemmas, globalization, etc.) explain the trends and assess the implications in a broad engineering context.		
19. Apply statics to determine resultants of force systems.		
20. Apply statics to determine unknown forces and moments for concurrent and non-concurrent force systems.		
21. Apply the principles of electrical circuits, statics and conservation of energy to evaluate the efficiency of a motor / gearbox system, computing quantities such as electrical power usage, mechanical power output, torque and angular velocity.		
22. Compute present worth, future worth, and annuity schedules to perform engineering economic analyses.		
23. Implement an infrared LED / receiver circuit (IR pair) to detect objects.		
24. Implement a Hall-effect sensor circuit as a proximity sensor.		
25. List the specifications and PBASIC commands to interface selected sensors to the BASIC Stamp II microcontroller.		
26. Explain the physics behind how sensors function.		
27. Explain the roles of the ten "Faces of Innovation" as discussed in "The Ten Faces of Innovation" by Tom Kelley.		

ENGR 122, Spring 2007

Please use the following scale to indicate the frequency of performance and level of confidence you have in your ability for each of the following outcomes:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	
Never	Very Infrequently	Rarely	Occasionally	Frequently	Very Frequently	Always
1	2	3	4	5	6	7

When given the opportunity I have the ability to:

Course Outcomes	**Level of Confidence**	**Frequency of Performance**
28. Create a Mind Map to organize ideas around a central topic.		
29. Apply the Pugh method to evaluate concept ideas.		
30. Conceive a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.		
31. Design a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.		
32. Fabricate a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.		
33. Test a functional prototype of an innovative product that utilizes one or more sensors, actuators or other output devices, and the BASIC Stamp II microcontroller.		
34. Develop a work plan to manage your time and resources to successfully produce a prototype of an innovative product.		

ENGR 122, Spring 2007

During the current quarter approximately how many times did you perform the individual activities?

Soldering______________________ Layout___________________________

Assembly______________________ Bending__________________________

Sawing ________________________ Drilling___________________________

Milling________________________ Using a scale _______________________

Using a lathe___________________ Rapid prototyping____________________

Cutting internal and external threads___________________________________

Using a dial indicator ___________ Using a multimeter___________________

Implementing circuits on a breadboard_________________________________

Writing PBASIC programs____

Please list the professional society meetings and/or student-led functions you have attended this quarter.

List the five steps in the IDEO design methodology.

ENGR 122, Spring 2007

List the "Seven Secrets for Better Brainstorming" as described in "The Art of Innovation" by Tom Kelley.

In the table below indicate the sensors, output devices, and actuators that you have used this academic year, by placing a check in the "Indicates Used" column.

Component	**Indicates Used**
Whisker	
Photoresistors	
IR pairs	
Temperature Sensor	
Conductivity Sensor	
Hall Effect Sensor	
RF Keychain Transmitter and Receiver	
Ultrasonic Range Finder	
Accelerometer	
RF ID Tags and Reader	
GPS Receiver	
Compass	
Force Sensor	
Temperature and Humidity Sensor	
RF Communication Modules (Boe-Bot to Boe-Bot communication)	
Embedded Blue Transceiver Appmod (add Bluetooth capabilities to the Boe-Bot)	
Color Sensor (senses Red Green and Blue color at a point)	
CMUcam Vision System	
Continuous Rotation Servos	
LEDs	
Buzzers	
Switchable Actuators: Pumps, motors, lights, etc.	
Limited Rotation Servos	
LCD Display Output	

ENGR 122, Spring 2007

Please use the following scale to indicate the level of confidence you have in your ability to use the components listed in the table below:

Completely Unconfident	Mostly Unconfident	Slightly Unconfident	Slightly Confident	Mostly Confident	Completely Confident	
1	2	3	4	5	6	

Component	**Level of Confidence**
Whisker	
Photoresistors	
IR pairs	
Temperature Sensor	
Conductivity Sensor	
Hall Effect Sensor	
RF Keychain Transmitter and Receiver	
Ultrasonic Range Finder	
Accelerometer	
RF ID Tags and Reader	
GPS Receiver	
Compass	
Force Sensor	
Temperature and Humidity Sensor	
RF Communication Modules (Boe-Bot to Boe-Bot communication)	
Embedded Blue Transceiver Appmod (add Bluetooth capabilities to the Boe-Bot)	
Color Sensor (senses Red Green and Blue color at a point)	
CMUcam Vision System	
Continuous Rotation Servos	
LEDs	
Buzzers	
Switchable Actuators: Pumps, motors, lights, etc.	
Limited Rotation Servos	
LCD Display Output	

Attachment D

Focus Groups

Students from both the old curriculum and the new curriculum were asked to answer the following questions:

1) What went well, what did you like?
2) How could the curriculum be improved?
3) What skills and concepts did you learn outside your major? (This question will address what they are learning outside of their major and hopefully give us feedback on the likelihood that they will use technology outside of their major.)
4) What ideas do you have for new and/or improved products? (This will hopefully address creativity.)
5) What kind of job are you interested in after graduation? Is there a particular area of engineering that interests you? (This will hopefully address their interest in new product development and innovation.)

Alicia Boudreaux coordinated the focus groups with the help of two seniors. There were three different groups. The first two were from a regular engineering class (old curriculum); the two seniors took one of those groups, and Alicia took the other. Both were randomly selected. The third group was from an honors engineering class (Living WITH the Lab pilot curriculum). Four out of the six participants were randomly selected, and the other two were "willing participants." The two seniors led this group, and Alica was there some of the time. All of the groups with whom we talked were mixed engineering majors and included five to six students. The raw results from these groups are listed below.

Old Curriculum Focus Group Feedback
Spring 2007

1. What went well, what did you like?
   - Working in groups
   - Giving presentations that are interesting
   - Greenwood - the opportunity to learn through problem sessions and examples
   - Crittenden – works a lot of example problems in class
   - Meng – does a good job of explaining material and giving examples they can follow
   - Cronk – good at explaining material balance
   - Have a good background in engineering – broad knowledge
   - Design projects – helped with problem solving
   - Intro into engineering fields
   - Career thing online – getting info about different careers (UNIV 100)
   - Good teamwork on projects
   - ELEN teacher could help with ELEN project
   - Cronk – had to work in different groups and it helped us get to know different people
   - Blocks made it easy to choose classes

What didn't you like?

- Registration in blocks – math classes closed too early, even though engr was still open

- Bad teachers in the blocks
- Not enough time between classes – like to have more time between them
- Order of 122 – better to do statics second so it would correlate better with physics class
- Wish they had more circuits and solidedge
- Crittenden's test style – all multiple choice
- Dickie – could not explain material if it wasn't in her notes
- Cross – doesn't explain symbols and equations, just throws them on the board. Whispers a lot and hard to hear. Teaches using problems, but doesn't explain them. Expects us to understand without explaining principles.
- Barron (math) – projects, had problems with computer program and felt like he wasn't understanding to help them with it
- Cronk – not good at explaining circuits
- Didn't have to apply anything in design project (material balance, etc.) – not making connections with applications

2. How could the curriculum be improved?
    - Refer to the previous section…
    - 120 series should be more specific if you already know your major
    - Overview of all the majors did not need to be as thorough if they already know major
    - Should raise the minimum price of project to more than $50
    - Team fell apart – 3 dropped out of engineering
    - Ran out of time and didn't present project at the end of the quarter
    - Should randomly pick teams so that we can meet more people and so all the "smart people" aren't in one group
    - Learning stuff that carries over (haven't seen the 120 info again)
    - Blocks can be frustrating because you can't choose classes
    - Solidedge
        - All they do is go through tutorials, never learn how to apply
        - Required to use it for project, but didn't really know how
        - Would not have used it in project if not required because didn't know how
        - Thought it was fun though
        - I can draw things better by hand
        - Need someone to actually TEACH it
    - MathCAD
        - Hated it, rather use calculator
        - Don't know how to operate it, not adequate instruction in class
        - The people who did get it used it in math classes mostly

3. What skills and concepts did you learn outside your major?
    - (Hard at first for them to answer because they didn't know what was inside and outside their major. Felt like it was all in their major?)
    - Material balance (because none of them were Chemical Engineering)
    - Circuits
    - Statics
    - English is a waste
    - Excel
    - Estimation

- SolidEdge

4. What ideas do you have for new and/or improved products?
   - If I had an answer, I wouldn't say it because of copyright
   - Can go somewhere and look at a current product and they understand a little more of how it works, but no new ideas to improve
   - Something that reduces heat of afterburners on jets
   - Soldering gun like a glue gun (hold everything in one hand)
   - Small granules of magnetic material in asphalt so tires have more traction
   - Spiderman virus – because it's cool
   - Nanobots that would attach onto oxygen so people can breathe under water

5. What kind of job are you interested in after graduation? Is there a particular area of engineering that interests you?
   - Aerospace, power, robotics, pyrotechnics
   - Civil – not in new Orleans; bridge design
   - Biomed – genetics, working with diseases, research, different ways for delivering medicine
   - Nano/electrical – research, work for government (secret projects)
   - Civil – not sure what do with civil

6. How would you proceed if you had an idea for a new product or invention?
   - Design, prototype, draw it up, lawyer, get patent, make CAD drawings
   - Gather ideas, pick out best, consider costs
   - Patent, gather a team (specialists in that field), build prototype, check market for that product

Honors Class Focus Group Feedback
Spring 2007

1. What went well, what did you like?
   - Hands on – applying things in the boe-bot project – spent at least 75% with hands on things
   - Troubleshooting – write program, have problems, learn a lot from fixing them
   - Project incorporated engineering principles in application
   - Project was very open-ended. They had to come up with an idea from the beginning.

2. How could the curriculum be improved?
   - Felt they were learning with the professor – sometimes he didn't know the answers, sometimes wished he could tell them why things didn't work
   - Machine shop – conflicts with time. Even though they got a tour, didn't know how some machines worked. Safety, used them without knowing proper way.
   - More things in graham – power tools, jigsaw – because they have to work in the evening
   - Would like to do engineering econ earlier in the quarter but didn't have much time to go over it, also covering it in another class and it wasn't coordinated

- Sometimes had to go ask friends to borrow reference books because they didn't have books – just notes online. Need a book for that kind of thing.
- Want a manual for circuits.
- Didn't have much time to do project, even though they really liked it. Not enough time to order boe-bot parts.
- More exams because they learn so much info.
- Quizzes to refresh what they learn in class.
- Solidedge - more practice, just did tutorials.
- MathCAD – used more in math class than engr/science classes.
- Maybe use the remainder of the quarter after UNIV 100 is over just to learn solidedge and mathCAD.
- Wish their projects were worth more, grade-wise
- Need more notice about getting a boe-bot
- Make laptop a requirement [talk to dell/gateway to get a deal?? Contract with LA Tech COES -rocky]
- Apply chemistry more to engineering
- Scared about going into statics and the 220 series. Not sure we're prepared enough because we focused more on the boe-bot than on book material.

3. What skills and concepts did you learn outside your major?
    - Circuits (biomed majors, ME's), sensors, etc.

4. What ideas do you have for new and/or improved products?
    - Talked about their individual projects – smart mailbox, self-navigating helicopter, automated floor cleaner, self-automated bathroom

5. What kind of job are you interested in after graduation?
    - Research and graduate school
    - Military or Lockheed martin – automation
    - Design and tooling
    - Anesthesiologist – biomed major, premed concentration

6. How would you proceed if you had an idea for a new product or invention?
    - IDEO video steps – observe, redesign, prototype, etc.

Attachment E

Analysis of Logbooks

Logbook #1 Old Curriculum(Start Date 3/29/04-End Date 5/11/04)

Lott, Horne, McCormick, Kinler
Basic Design: 4 Alternatives
Prop Design: 1 Alternative
Rubber Band Propulsion: 1 Alternative
Failure Analysis: 5 Alternatives, 4 Solutions
2nd Failure Analysis: 2 Alternatives
Wing Design: 3 Alternatives

Logbook #2 Old Curriculum(Start Date 3/25/04-End Date 5/16/04)

McCoy, Herrera, Bell, Olsen
Propulsion Methods: 5 Alternatives
Wing Design: 1 Alternative
After Failure: 1 New Alternative Wing
Testing: New Rudder Design

New Curriculum

Swanbom Section

Brown and Creel: Project Idea 3

Application of idea to 4 areas: hockey, football, baseball, dog fences

No Name: Project Idea 3

Application to 5 areas: measure steps, distance, heart rate, average speed, calories burned

No Name: Project Idea 3

Use of infrared sensors: Detect distance, obstacles
Use of color sensors: Aid the blind
Use of pressure sensors: Evaluating pitchers during practice

Project Ideas: Josh Hawthorne

Automatic Door Entry, Pressure-Sensing Alarm Clock, Automatic Room Quieter

No Name Project Ideas

4 Methods for Painting Eggs

Knight, Newman Automatic Cut-off System

3 Methods: GPS, RF Transmitter/Receiver Pairs, RF Identification

Pham Noise Control

3 Methods

No Name Project Ideas

Detect and repair dents, improved parking meter, car navigation aid

Harger and Sahuque

Mailbox lock and mail detector, 3 alternatives

Syllabi

Course syllabi and schedules from the old curriculum were provided for inspection. The Syllabi and schedules inspected are included on the following pages. The format of some syllabi have been changed to fit this report, but the content has not been changed.

Engineering 120 Engineering Problem Solving I Fall, 2002

Instructor: Dr. Kelly Crittenden
Phone: 257-2714 (Home: 513-1111 -- please do not call after 9:30 P.M)
e-mail: kellyc@coes.latech.edu
Office: BH 251
Office Hours: 8-10 MWF, 10-12 TR
Class Time: 2:00 – 3:50 MW
Building: PAVB 207
Textbooks: Eide, A.R., R.D. Jenison, L.H. Mashaw, and L.L. Northrop. 2002. Engineering Fundamentals and Problem-Solving, 4th ed., McGraw-Hill Publishers.
Fogler, H.S. and S.E. LeBlanc. 1994.
Strategies for Creative Problem-Solving, Prentice-Hall, Inc.
Kuncicky, D.C. 2001. Introduction to EXCEL. Prentice-Hall, Inc.
Larsen, R.W. 2001. Introduction to Mathcad. Prentice-Hall, Inc.

Attendance Policy for ALL Integrated Engineering Curriculum Courses (ENGR, MATH, CHEM, PHYS):

As indicated in the Louisiana Tech University Bulletin, "Class attendance is regarded as an obligation as well as a privilege, and all students are expected to attend regularly and punctually all classes in which they are enrolled. Failure to do so may jeopardize a student's scholastic standing and may lead to suspension from the college or university."

Also, "When a freshman or sophomore student receives excessive unexcused absences (ten percent of the total classes) in any class, the instructor may recommend to the students' academic dean that the student be dropped from the rolls of that class and given an appropriate grade. The student is responsible for making arrangements satisfactory to the instructor regarding absences. A student shall submit excuses for class absences to the appropriate instructor within three class days following the student's return to his/her respective class. If a student has been absent to allow participation in a University sponsored or approved activity, an official excuse (documenting a request for an excused absence) may be provided by the sponsoring Department/Division."

The College of Engineering and Science has chosen to strictly apply this University requirement. Any student who has more than three unexcused absences in an integrated engineering curriculum course (ENGR, MATH, CHEM, PHYS) will be removed from the rolls of that class and given a grade of 'F'.

Make-up exams are not generally available except upon prior arrangement with the instructor. Pop quizzes may not be made up.

Grading:	A=90+, B=80-89.9, C=70-79.9, etc.	
	Homework (Teams)	25%
	Tests (2) (Individual)	70%
	Professional Meeting Attendance	5%

Course Objective:

The goal of Engineering 120 is to acquaint the student with the basic concepts that form the foundation of engineering. Students will be introduced to the different professions and skills in engineering practice. The course will also serve to integrate skills developed in math, chemistry, and university seminar and to further clarify the importance of these skills for solving engineering problems. Students will develop their own skills in problem-solving, working in teams, using the computer for problem-solving (spreadsheets), and communication. The course will employ a variety of learning strategies including cooperative learning (teamwork), critical thinking, creative problem-solving, and oral/written communication.

Instructor Goals:

To know and impact each student in a way that helps prepare them for professional and personal success

To make the class interesting and stimulating

To be expressive of the material and responsive to students

General Suggestions

1. Please speak out freely with questions or constructive comments in an orderly manner.
2. Study your notes carefully between each class period. Come to class prepared.
3. Academic misconduct will be severely penalized.
4. Help your group and let your group help you.
5. For individual assignments, you may, and are encouraged to, discuss homework assignments with fellow students in an effort to outline a logical engineering approach but the actual write-up and supporting logic and calculations must be your own.
6. Please first discuss any grievances with me.

Homework Policy

1. All homework is to be done as a team. Each member of the team must contribute to the solution of each problem. Do not divide problems among your team members. The responsibility for actually writing (or typing) the homework assignment and turning it in will be rotated among team members.
2. Homework is to be turned in at the beginning of class on the day the assignment is due.
3. Late homework will not be accepted.
4. Homework papers must follow appropriate engineering format (to be discussed in class).
5. Points may be deducted for lack of neatness or shoddy appearance. Maximum credit will be awarded for homework that is neatly done and easily readable, and for solutions that are logically obtained and clearly marked.

ENGR 120 (004) Engineering Problem Solving I Fall, 2003

Class	Date	Topics	Homework Assignments	Reading Assignments
1	Monday, 9/8/03	Course & Instructor Introduction, Engineering Profession		Read Eide, Chap 1
2	Wednesday, 9/10/03	Engineering Profession, Lab 1		Read Eide, Chap 4
3	Monday, 9/15/03	Data Analysis from Lab 1, Learning in Teams	Eide* 1.5, 1.6, 1.10	Read Eide, Chap 6
4	Wednesday, 9/17/03	Dimensions, Units, & Conversions, Problem Solving Strategies	Lab Report 1 Due	Read Eide, Chap 3
5	Monday, 9/22/03	Engineering Solutions, Engineering Format, Sketching	Eide 6.14, 6.15, 6.27	Review Excel tutorial Read Excel Ch 1 & 2
6	Wednesday, 9/24/03	Excel, More Engineering Problems	Eide 3.8, 3.11, 3.21, 3.27	Read Eide, Chap 5
7	Monday, 9/29/03	Engineering Approximations and Estimations	Excel† 2.8, 2.14, 2.17	
8	Wednesday, 10/1/03	More Estimation, Excel, Review Session	Estimation Problem	
9	Monday, 10/6/03	***Test 1***		Read Excel, Ch 3
10	Wednesday, 10/8/03	Test 1 Review, Excel		
11	Monday, 10/13/03	Representation of Technical Data, Problem Definition	Eide 4.9, 4.11	
12	Wednesday, 10/15/03	Representation of Technical Data, Sketching, Excel	Excel 3.4, 3.7, 3.12, 3.20	Read Eide, Chap 8 Read Excel, Chap 6
13	Monday, 10/20/03	Linear Regression Sketching		
14	Wednesday, 10/22/03	Descriptive Statistics, Histograms, Sketching	Eide 8.16, 8.18, 8.25	
15	Monday, 10/27/03	Normal Distribution	Excel 6.13	Read Excel, Chap 8
16	Wednesday, 10/29/03	Trend lines with EXCEL	Eide 8.7, 8.9 Excel 6.14, 6.15	
17	Monday, 11/3/03	Lab 2	Excel 8.3, 8.19, 8.20, 8.25	
18	Wednesday, 11/5/03	Analysis of Lab 2 Data with Excel		
19	Monday, 11/10/03	Review Session	Lab 2 Report Due	
20	Wednesday, 11/12/03	***Test 2***		
21	Monday, 11/17/03	Review and Preview		

Homework assignments will be **due at 2:00 on the date shown** unless otherwise indicated.

Tutorials are located at http://www.latech.edu/tech/engr/tutorials

* Eide refers to *Eide, A.R., R.D. Jenison, L.H. Mashaw, and L.L. Northrop. 2002. Engineering Fundamentals and Problem-Solving, 4th ed., McGraw-Hill Publishers.*

† Excel refers to *Gottfried, Byron. 2003. Spreadsheet Tools for Engineers Using Excel. McGraw-Hill Publishers.*

ENGINEERING 122 Daily Schedule			
W – Mar 12	1	Introduction	
M – Mar 17	2	Statics (resultants)/MathCad	Chapter 9: 1, 3, 5, 8
W – Mar 19	3	Design Project Initiation	
M – Mar 24	4	Statics (equilibrium)	Chapter 9: 15, 21,23,38
W – Mar 26	5	Statics (3D)/Design Milestone 1	Chapter 9: 34, 35
M – Mar 31	6	Statics (stress/strain)	Chapter 9: 36, 38, 40, 43
W – Apr 2	7	Design Milestone 2	
M – Apr 7	8	Test 1 (STATICS)	
W – Apr 9	9	Design Milestone 3	
M – Apr 14	10	Economics/Excel	Chapter 13: 1,3, 5
W – Apr 16	11	Design Milestone 4/Econ	Chapter 13: 8, 16, 20
W – Apr 23	12	Design Milestone 5/Econ	Chapter 13: 29, 38, 45
M – Apr 28	13	Solid Edge	
W – Apr 30	14	Design Milestone 6/Solid Edge	SolidEdge Assignment
M – May 5	15	Test 2 (ECONOMICS)	
W – May 7	16	Design Milestone 7	
M – May 12	17	Design Milestone 8	
W – May 14	18	Presentations of Designs	
M – May 19	19	Presentations of Designs	
W – May 21	20		

ENGINEERING 122 Daily Schedule			
W – Mar 7	1	Introduction	
M – Mar 12	2	Statics (resultants)/MathCAD	Chapter 9: 1, 3, 5, 8
W – Mar 14	3	Design Project Initiation	
M – Mar 19	4	Statics (equilibrium)	Chapter 9: 15, 21,23,38
W – Mar 21	5	Statics (equilibrium) / Design Milestone 1	Chapter 9: 32, 33
M – Mar 26	6	Statics (stress/strain)	Chapter 9: 36, 38, 40, 43
W – Mar 28	7	Design Milestone 2	
M – Apr 2	8	Test 1 (STATICS)	
W – Apr 4	9	Design Milestone 3	
M – Apr 9	Easter Holiday		
W – Apr 11	10	Solid Edge Part / Drafting	Tutorial
M – Apr 16	11	Solid Edge Assemblies	Tutorial
W – Apr 18	12	Economics / Excel Design Milestone 5	Chapter 13: 1,3, 5
M – Apr 23	13	Economics	Chapter 13: 8, 16, 20
W – Apr 25	14	Economics / Design Milestone 6	Chapter 13: 29, 38, 45
M – Apr 30	15	Design Milestone 7	
W – May 2	16	Test 2 (ECONOMICS)	
M – May 7	17	Design Milestone 8	
W – May 9	18	Presentations of Designs	
M – May 14	19	Presentations of Designs	
W – May 16	20	Freshman Design Competition	

ENGR 121(H11) Engineering Problem Solving II Winter, 2006

Class	Date	Topics	Assignments
1	R, 12.01.2005	Syllabus Capacitors; Modeling Exercise I	Modeling Exercise I
2	T, 12.06.05	Mathcad	2.2, 2.4, 2.12, 2.13 (Eide) - Individual
3	R, 12.08.05	Fabrication (drilling, cutting); Mathcad; RC Circuit Time constant; Shop visit	
4	T, 12.13.05	RC circuit Experiment; Linear Regression; Modeling Exercise II	Modeling Exercise II
5	R, 12.15.05	Fabrication (brake); Resistance Heating; Shop visit	
6	T, 12.20.05	Magnetic Fields; Relays; Hall Effect Sensors; Introduce Design Project	Circuits Problems
		MERRY CHRISTMAS	
7	R, 01.05.06	Measure Temperature; Fabrication (lathe, tapping); Shop visit	Relay Problem due
	S, 01.07.2006	Saturday in the Shop	8:00 – 4:00 pm
8	T, 01.10.06	Test Review; Relay Demo	
9	R, 01.12.06	Midterm Exam	Fabrication, Electrical Components, Circuits, Linear Regression, Mathcad
		Martin Luther King, Jr. Holiday	
10	T, 01.17.06	Conservation of Mass; Solid Edge; Modeling Exercise III	CoM, Solid Edge Assignment Modeling Exercise III
11	R, 01.19.06	Conservation of Mass and Energy; Solid Edge	CoM, CoE, Solid Edge Assignment
12	T, 01.24.06	Conservation of Energy	CoM, CoE, Solid Edge Quiz
13	R, 01.26.06	Measurement and Feedback	
14	T, 01.31.06	Hall Effect sensors	Measurement and Feedback Problem due Turn on LED per HeatGun
15	R, 02.02.06	Design Project work and discussion	Hall Effect sensor application due
16	T, 02.07.06	Design Project work and discussion; Modeling Exercise IV	Modeling Exercise IV
17	R, 02.09.06	Design Project work and discussion	
18	T, 02.14.06	Test Review; Project Demonstrations	In-class Project Demonstrations
19	R, 02.16.06	Comprehensive Final Exam	Conservation of Mass and Energy, Circuits, Linear Regression, Fabrication, Solid Edge, Mathcad
20	T, 02.21.06	Design Project Presentations	Formal Group Presentations
21	R, 02.23.06	Review ENGR121 Preview ENGR122	*RELAX!*
		Mardi Gras	

ENGR 121(001) Engineering Problem Solving II Winter, 2003-04

Class	Date	Topics	Homework Assignments	Reading Assignments
1	Thursday, 12/4/03	Course & Instructor Introduction		Mathcad Chap 1 & 2
2	Tuesday, 12/9/03	Solid Edge		
3	Thursday, 12/11/03	Solid Edge	Mathcad 2.2, 2.3, 2.4, 2.12, 2.13, 2.18	
4	Tuesday, 12/16/03	Solid Edge	Solid Edge Assignment Due	Mathcad Chap 3
5	Thursday, 12/18/03	Teams Revisited, ***Mathcad Quiz 1***		
		MERRY CHRISTMAS		
6	Tuesday, 1/6/04	**Material Balance**		Eide Chap 10
7	Thursday, 1/8/04	Material Balance	Mathcad 3.2, 3.3, 3.5, 3.11	
8	Tuesday, 1/13/04	Material Balance	Eide 10.1, 10.5, 10.12, 10.15	Eisenberg, Chap 1 & 2 Mathcad Chap 4
9	Thursday, 1/15/04	Report Writing, ***Mathcad Quiz 2***	Eide 10.17, 10.18, 10.19, 10.20	
10	Tuesday, 1/20/04	Problem Session	Mathcad 4.2, 4.5, 4.6, 4.14, 4.17	
11	Thursday, 1/22/04	***Test 1***		Mathcad Chap 5
12	Tuesday, 1/27/04	Laboratory		
13	Thursday, 1/29/04	***Mathcad Quiz 3*** (Mathcad & whatever else we need to do to catch up)		
14	Tuesday, 2/3/04	Circuits	Lab Report Due Mathcad 5.1, 5.8, 5.9, 5.10, 5.11	Eide Chap 11
15	Thursday, 2/5/04	Circuits	Eide 11.6, 11.12, 11.13, 11.15	Mathcad Chap 6
16	Tuesday, 2/10/04	Circuits ***Mathcad Quiz 4***	Eide 11.17, 11.20, 11.24, 11.25	
17	Thursday, 2/12/04	Problem Session	Mathcad 6.2, 6.6, 6.8, 6.9, 6.10, 6.13	
18	Tuesday, 2/17/04	***Test 2***	Presentation Powerpoint Files Due	
19	Thursday, 2/19/04	Presentations		
		Mardi Gras		
20	Thursday, 2/26/04	Presentations ***Mathcad Quiz 5***		

21	Tuesday, 3/2/04	*Review and Preview*		

Homework and reading assignments will be due at the beginning of class on the date shown unless otherwise indicated.

Engineering 121 -- Engineering Problem Solving II -- Winter, 2003-04

Instructor: Dr. Kelly Crittenden
Office: Bogard Hall 251
Phone: (office) 257-2714
e-mail: kellyc@coes.latech.edu
Web Page: blackboard.latech.edu
Class Time: 10:00-11:50 TR
Class Room: BH 304
Office Hours: 9-11 MWF, 1-3 TR

Textbooks: Eide, A.R., R.D. Jenison, L.H. Mashaw, and L.L. Northrup. 2003. Engineering Fundamentals and Problem Solving, 4th Edition, McGraw Hill Publishers.

Pritchard, Philip J. 1998. Mathcad: A Tool for Engineering Problem Solving. McGraw Hill Publishers.

Eisenberg, Anne. 1998. A Beginner's Guide to Technical Communication. McGraw Hill Publishers.

Web-based tutorials are located at http://www.latech.edu/tech/engr/tutorials

Attendance: See Louisiana Tech University Catalog page 11.
"Class attendance is regarded as an obligation ..."
Make-up exams are not generally available except upon prior arrangement with the instructor.

Grading: A=90+, B=80-89.9, C=70-79.9, D=60-69.9, F=0-59.9

Tests (2) (Individual)	60%
Mathcad Quizzes (Individual)	7%
Homework (Team)	15%
Lab Report (Team)	10%
Presentation (Team)	5%
Professional Meetings/Seminars	3%

Course Objectives:

The objective of Engineering 121 is to further acquaint you with the basic concepts that form the foundations of engineering. Specifically, at the end of this course you should be able to formulate and solve simple material balance problems and simple electrical circuits problems. You should also be able to utilize a solids modeling package to accurately draw an object that can then be constructed using rapid prototyping. This course will help you integrate skills developed in math and chemistry and further clarify the importance of these skills for solving engineering problems. You will continue to develop your skills in problem solving, working in teams, using the computer for problem solving (particularly MathCAD), and communication. The course will employ a variety of learning strategies including cooperative learning (teamwork), critical thinking, creative problem solving, and oral/written communication.

Engineering 122 Engineering Problem Solving III Spring, 2007

Instructor: Dr. Kelly Crittenden
Phone: 257-2714
e-mail: kellyc@latech.edu
Office: BH 213
Office Hours: 9-11 MW, 9-12 T, 10-12 and 1:30-3 R
Class Time: 12:30 – 2:20 MW
Room: BH

Textbooks: Eide, A.R., R.D. Jenison, L.H. Mashaw, and L.L. Northrop. 2002. Engineering Fundamentals and Problem-Solving, 4th ed., McGraw-Hill Publishers.

Kuncicky, D.C. 2001. Introduction to EXCEL. Prentice-Hall, Inc.

Larsen, R.W. 2001. Introduction to Mathcad. Prentice-Hall, Inc.

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Also, "When a freshman or sophomore student receives excessive unexcused absences (ten percent of the total classes) in any class, the instructor may recommend to the students' academic dean that the student be dropped from the rolls of that class and given an appropriate grade. The student is responsible for making arrangements satisfactory to the instructor regarding absences. A student shall submit excuses for class absences to the appropriate instructor within three class days following the student's return to his/her respective class. If a student has been absent to allow participation in a University sponsored or approved activity, an official excuse (documenting a request for an excused absence) may be provided by the sponsoring Department/Division."

The College of Engineering and Science has chosen to strictly apply this University requirement. Any student who has more than three unexcused absences in an integrated engineering curriculum course (ENGR, MATH, CHEM, PHYS) will be removed from the rolls of that class and given a grade of 'F'.

Make-up exams are not generally available except upon prior arrangement with the instructor. Pop quizzes may not be made up.

Course Objective:

The goal of Engineering 122 is to acquaint the student with the basic concepts that form the foundation of engineering. Students will be introduced to basic economics, statics, and design methods. The course will also serve to integrate skills developed in math, physics and chemistry and to further clarify the importance of these skills for solving engineering problems. Students will develop their own skills in problem-solving, working in teams, using the computer for problem-solving (spreadsheets, computer aided design, numerical methods), and communication. The course will employ a variety of learning strategies including cooperative learning (teamwork), critical thinking, creative problem-solving and oral/written communication.

Grading: A=90+, B=80-89.4, C=70-79.4, etc.

Homework/Quizzes (Team and Individual)	10%
Statics Test (Individual)	30%
Economics Test (Individual)	30%

Design Project Completion (Team)	5%
Design Project Milestones (Team)	5%
Design Project Final Report (Team)	6%
Design Project Peer Review (Individual)	3%
Design Project Design Notebook (Team)	3%
Design Presentation (Team)	3%
Design Presentation (Individual)	3%
Senior Design Conference (Individual)	1%
Other Professional Meeting (Individual)	1%

General Suggestions

1. Please speak out freely with questions or constructive comments in an orderly manner.
2. Study your notes carefully between each class period. Come to class prepared.
3. Academic misconduct will be severely penalized.
4. Help your group and let your group help you.
5. For individual assignments, you may, and are encouraged to, discuss homework assignments with fellow students in an effort to outline a logical engineering approach but the actual write-up and supporting logic and calculations must be your own.
6. Please first discuss any grievances with me.

Homework Policy

5. Homework is to be done as a team unless otherwise noted. Each member of the team must contribute to the solution of each problem. Do not divide problems among your team members. The responsibility for actually writing (or typing) the homework assignment and turning it in will be rotated among team members.
6. Homework is to be turned in at the beginning of class on the day the assignment is due.
7. Late homework will not be accepted.
8. Homework papers must follow appropriate engineering format (to be discussed in class).
9. Points may be deducted for lack of neatness or shoddy appearance. Maximum credit will be awarded for homework that is neatly done and easily readable, and for solutions that are logically obtained and clearly marked.

Louisiana Tech has an Honor Code that all students are expected to know. The purpose of the code is to maintain the academic integrity of the university. It is important to you because it defines what appropriate behavior is and what the penalties for violations are. Please take time to read it and follow it.

Check blackboard.latech.edu for more class information.