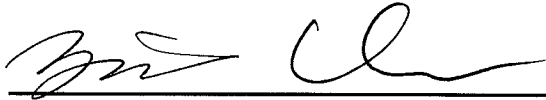**BS in Electrical or Computer Engineering
And
MS in Electrical and Computer Engineering
Department of Electrical and Computer Engineering
Purdue School of Engineering and Technology
Fall 2007**

Combined BS/MS Electrical and Computer Engineering
Signature Sheet

Degree Title: Combined BS/MS Electrical and Computer Engineering
Department of Electrical and Computer Engineering, Purdue School of
Engineering and Technology, IUPUI

10/23/06

Signature of Department Head   **Date**
Electrical and Computer Engineering

3/6/07

Signature of Academic Dean   **Date**
Purdue School of Engineering and Technology

Dean of the Graduate School   **Date**

Provost   **Date**

Proposal Summary

The Department of Electrical and Computer Engineering (ECE) at IUPUI proposes an integrated, five-year, combined BSMS degree program in which the students will receive both the BS and MS in Electrical and Computer Engineering. By designing a seamless transition from the BSEE/BSCmpE to the MSECE curriculum, it is expected that the program will graduate students who meet all the BSEE/BSCmpE and MSECE requirements. The availability of the combined-degree program is also expected to enhance the student recruitment and retention capabilities of the department. Similar programs currently exist in several other institutions in the nation.

IUPUI has a strong commitment to teaching and research. Consistent with this mission, the proposed program will provide students with intensive training and the opportunity to do supervised research. The additional benefit is to receive two degrees in a shorter time than it would take to pursue the degrees separately. The program is a fully integrated five-year curriculum, including undergraduate and graduate level courses, which will aid the students in developing a frame of mind and a set of tools that enable them to apply fundamental engineering principles to solve real-world advanced engineering problems. Students who complete the program will have higher credentials and be able to contribute more quickly and effectively to their employer's mission. Such an innovative program is important for attracting domestic students to graduate studies, especially from central Indiana and the city of Indianapolis.

By the nature of its structure, the program will require undergraduate students to make an early commitment to graduate studies; thereby raising the odds that highly motivated students will enter the program. It is important to note that the design of the program is such that if a student in the five-year curriculum should have a change of heart, the student will still be able to complete the requirements for a traditional BSEE/BSCmpE in four years.

The proposed program will benefit the ECE graduate program by adding an extra channel of recruitment. The caliber of students recruited is likely to be superior, since they would have demonstrated an early commitment to the pursuit of a graduate degree and maintained a good academic record. Therefore, the availability of the combined-degree program will enhance the graduate program, raise marketability of prospective students, and increase recruitment and retention of students. A sample program is attached at the end of this document.

Degrees to Be Conferred

Students can leave this program with one of two combinations of degrees:

- BS in Electrical Engineering and MS in Electrical and Computer Engineering
- BS in Computer Engineering and MS in Electrical and Computer Engineering

Rational and Need for the Dual-Degree Program

The U.S. has been the leader in engineering, science and technology since the World War II. However, this dominant position is now being challenged by other nations. For the recent years, China and India have graduated several times more engineers than the U.S., thus reducing the

number of talented foreign students studying in the U.S.. As a result, it is imperative to attract more domestic students to engineering programs, especially at graduate level since the percentage of the domestic (U.S. citizens) engineering graduate students is very low. For example, in the School of Electrical and Computer Engineering of Purdue University, West Lafayette, 85% of the graduate students are international out of 500 students. At IUPUI, more than 50% of the graduate students in ECE are international. One of the reasons is most domestic undergraduate students in engineering do not continue to pursue advanced graduate engineering degrees after graduation due to their job opportunities. The proposed 5-year combined BS/MS in ECE provides incentive to those high quality undergraduates to complete both degrees in relatively shorter time period. As Indiana State and the Indianapolis metropolitan area are moving towards more technology-based and high-tech economy, there are tremendous needs for engineers with advanced graduate degrees and education and training. It is also noted that the national committee for professional engineer license has decided to increase the minimum requirement for eligibility. This will require the practicing engineers with the BS degree take at least 30 more credit hours in advanced courses. The proposed program will benefit those students with minimum time investment to fulfill such a requirement.

Objectives of the Dual-Degree Program

The proposed combined-degree program will provide high quality students with intensive training and the opportunity to do supervised research in advanced electrical and computer engineering area. The students will receive two degrees in a relatively shorter time period than it would take to pursue the degrees separately. The proposed program will help the department to recruit and retain superior undergraduate students who will receive both BS and MS degrees in five years.

Proposed Program Structure

A. Admission requirement- Students will be admitted to the ECE department under the guidelines that currently exist for admitting traditional BS students. The sequence of courses that they will take for the first three years will be identical to the courses taken by the traditional ECE majors. The students will be made aware of the option to pursue the combined-degree program during their first year, and counseled appropriately if they wish to pursue it. It must be emphasized that the program is not meant for every ECE student, but is for those who demonstrate the commitment and the academic ability to be successful in the program. Therefore, it is anticipated that only the highly motivated students would be counseled to enter the combined-degree program.

B. Degree Requirements- The proposed curriculum includes all the core undergraduate courses that are currently required for BSEE/BSCmpE majors and all the current graduate course requirements of the traditional ECE Master's program.

Students will be required to maintain a minimum GPA of 3.2 for the first 85 credit hours of coursework (normally the end of fifth semester) in the plan of study in order to be conditionally admitted to the program. This requirement is more stringent than the current admission requirements for the MS program in ECE.

Students interested in applying for the combined-degree program will have up to the first week of the final semester in which they complete all the BS requirements to apply for admission.

The total credit hours required for this combined-degree program will be 147 hours for those students awarded BSEE/MSECE and 148 hours for those students awarded BSCmpE/MSECE. For reference, the Bachelor of Science in Electrical Engineering (BSEE) requires 126 hours, the Bachelor of Science in Computer Engineering (BSCmpE) requires 127 hours, and the MS in ECE requires 30 hours, for a total of 156 and 157 hours, respectively. The integrated program is constructed to exploit an overlap of 9 credit hours, thereby reducing the number of required hours to 147 and 148 hours respectively.

The final admission to the graduate program will not be made unless the student meets the minimum 3.2 GPA requirement and receives at least a B grade in each of the three graduate courses in his/her BS plan of study.

C. Scope and Size of the Program- The program should be attractive to ECE students because there have been continuous inquiries on using the graduate courses taken in students' senior years towards their MSECE degrees. During the initial years, it is expected that the program will attract at least three students per year for a period of four years. This will increase to five students per year during the following years. The first group of students will graduate after the fifth year following the start of the program.

D. Administrative Structure- There will be two plans of study for students in this program: 1) a BS plan of study that will be filed no later than one semester before completing the BS degree requirements (normally in seventh semester), and will include the 9 credit hours of graduate courses to be taken in place of the ECE electives, and 2) an MS plan of study that will be completed after the completion of the BS plan of study (normally in ninth semester), and will include the three graduate courses (9 credit hours) taken. The three graduate level classes will consist of two graduate level ECE electives and another graduate level Mathematics/Science elective such as MATH 511.

The two plans of study to be maintained are attached to this document, where the three overlapping graduate courses (9 credit hours) are to be indicated in both BS and MS plans. Granting of the BS diploma will be delayed until the MS (i.e., 147/148 credit hours) is completed, unless the student withdraws from the program. Semester-by-semester distribution of the courses is also attached.

A minimum GPA of 3.00 will be required in the MS plan of study for graduation as in the traditional Master's program. Master's GPA will be calculated by including the grades of the three graduate courses transferred from the BS plan of study. Table 1 attached here further outlines the timeline and milestones of the program.

The program is designed such that a student in the program will be able to switch to the traditional BSEE/BSCmpE at any time to receive a BSEE/BSCmpE degree.

The graduate program will offer thesis and non-thesis options. Depending on the nature of the research, in some cases the thesis option may require an additional semester to finish. Thesis committees will consist of at least three members from ECE department.

The Graduate Committee will review each student's performance each semester after they are conditionally admitted to the combined-degree program.

Following the conditional admission, the student's performance will be assessed by the ECE Graduate Committee at the end of each semester to ensure that the student's performance is at the level expected for traditional MS students in the ECE graduate program and the grades in each Master's courses in the BS plan of study are B or higher.

Students will receive both degrees together, upon completion of the requisite credit hours. As alluded to previously, if a student decides to leave the program, he/she will still be eligible to receive a BSEE/BSCmpE degree. Also, if the student's performance is judged by the ECE Graduate Committee to be unsatisfactory for the combined-degree program in that the minimum grade requirements (minimum 3.00 GPA and minimum B grade in any of the first three graduate courses taken) are not met, the student will still be able to receive a BS in ECE upon completion of all the requirements for that degree.

This degree program will be offered only on the IUPUI campus.

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (BSEE) DEGREE
PLAN OF STUDY Page 1/2

(Effective June 1, 2002)

Name_____Student No._____Co-Op_____

School Admission Date_____   Program Entry Date_____Credit Transfer_____

Course Number	Alter Course	Sem Hrs	Grd	Comments	Course Number	Alter Course	Sem Hrs	Grd	Comments
I. FRESHMAN ENGINEERING (30 hours)					**IV. ENGINEERING SCIENCES 21 hours)**				
MATH 163		5			ECE 201*		3		
MATH 164		5			ECE 202*		3		
CHEM C105		3			ECE 207*		1		
PHYS 152		4			ECE 264*		2		
ENG W131		3			ECE 301*		3		
COMM R110		3			ECE 302*		3		
ENGR 195		1			ECE 311*		3		
ENGR 196		3			ECE 340		3		
ENGR 197		3							
					V. ECE, SCI & TECH ELECTIVES (15 hours)				
II. MATH & SCIENCES (16 hours)							3		ECE Elec.
MATH 261		4					3		ECE Elec.
MATH 262		4					3		ECE Elec.
PHYS 251		5					3		ECE Elec.
		3					3		ECE Elec.
							3		Sci/Tech
III. ENGINEERING DESIGN (22 hours)									
ECE 208*		1			**VI. GENERAL EDUCATION (18 hours)**				
ECE 255*		3			TCM 360		2		
ECE 270*		4			ECE 401*		1		
ECE 362*		4					3		Humanities
ECE 382*		3					3		Hum/SocSci
ECE 440*		4					3		Hum/Soc Sci
ECE 492*		3					3		Hum/Soc Sci
							3		Soc Science

CAND 991 _____ 0

Student must register for CAND 991 the semester prior to the graduation semester. Student must also take a copy of the approved Plan of Study to the Recorders in ET 215 to fill out the application for graduation.

VII. OTHER (4 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
ECE 400		1		Seminar
Unrestricted		3		

TOTAL SEMESTER HOURS _____ (126 minimum)

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (BSEE) DEGREE
PLAN OF STUDY Page 2/2

Approvals

Student _____   Chairman_____

Advisory Committee   Date _____

1. _____   Degree Grade Point Average _____

2. _____   Engineering Grade Point Ave. _____

3. _____   (for courses marked with * only)

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING (BSCmpE) DEGREE
PLAN OF STUDY , Page 1/2

(Effective June 1, 2002)

Name_____Student No._____Co-Op_____

School Admission Date   Program Entry Date_____Credit Transfer_____

Course Number	Alter Course	Sem Hrs	Grd	Comments

I. FRESHMAN ENGINEERING (30 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
MATH 163		5		
MATH 164		5		
CHEM C105		3		
PHYS 152		4		
ENG W131		3		
COMM R110		3		
ENGR 195		1		
ENGR 196		3		
ENGR 197		3		

II. MATH & SCIENCES (16 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
MATH 261		4		
MATH 262		4		
PHYS 251		5		
		3		Math/Sci Elective

III. ENGINEERING DESIGN (18 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
ECE 208*		1		
ECE 255*		3		
ECE 270*		4		
ECE 362*		4		
ECE 365*		3		
ECE 492*		3		

IV. ENGINEERING SCIENCES (13 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
ECE 201*		3		
ECE 202*		3		
ECE 207*		1		
ECE 301*		3		
ECE 302*		3		

V. COMP.ENGR./COMP>SCIENCE (13 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
CSCI 242*		2		
CSCI 265*		3		
ECE 264*		2		
ECE 359*		3		
ECE 369*		3		

VI. COMPUTER ENGR. ELECTIVES (15 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
		3		Cmp Elect.
		3		Cmp Elect.
		3		Cmp Elect.
		3		Cmp Elect.
		3		Tech Elect.

VII. GENERAL EDUCATION (18 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
TCM 360		2		
ECE 401*		1		
		3		Humanities
		3		Humanities
		3		Hum/Soc Sci
		3		Soc Science
		3		Soc Science

VIII. OTHER (4 hours)

Course Number	Alter Course	Sem Hrs	Grd	Comments
ECE 400		1		Seminar
Unrestricted		3		

CAND 991		0		

Student must register for CAND 991 the semester prior to the graduation semester. Student must also take a copy of the approved Plan of Study to the Recorder in ET 215 to fill out an application for graduation.

**BACHELOR OF SCIENCE IN COMPUTER ENGINEERING (BSCmpE) DEGREE
PLAN OF STUDY , Page 2/2**

(Effective June 1, 2002)

Name_____Student No._____Co-Op_____

School Admission Date   Program Entry Date_____Credit Transfer_____

TOTAL SEMESTER HOURS _____ (127 minimum)

Approvals

Student _____   Dean _____

Advisory Committee

1._____   Date _____

2._____   Degree Grade Point Average _____

3._____   Engineering Grade Point Average _____

Chairman _____   (for courses marked with * only)

Graduate School Form 6
(Revised 5/00)

PURDUE UNIVERSITY
GRADUATE SCHOOL
Request for Master's Degree Advisory Committee and Plan of Study Approval
(Please read instructions on reverse side.)

Pg _____ of _____ Pgs.   Date Degree Expected _____

1. NAME OF STUDENT _____   Student ID No. _____

2. DEPARTMENT _____   Dept. Code _____   ☐ Thesis Option   ☐ Nonthesis Option

Degree Title _____   Degree Code _____   Research _____

3. AREA OF SPECIALIZATION (if any) _____   AOS Code _____

Area	4. COURSES					5. METHOD OF ESTABLISHING CREDIT			6. DATE COMPLETED
	OFFICIAL TITLE ABBREVIATION *Please group courses into "Primary" (P) & "Related" (R) areas.*	Subject Abbr.	Course No.*	Cr. Hours	Regular Regis.	Non-degree Regis.	Other or Transfer From +		
	ECE 5XX						**From BS Plan**		
	ECE 5XX						**From BS Plan**		
	MATH 5XX						**From BS Plan**		

7. LANGUAGE REQUIREECENTS	Method to be used to meet language requirements	+ Transfer course must be described as on original transcript.
a.	a.	* Mark course number with asterisk (*) if B or better is required.
b.	b.	

8. NAMES OF ADVISORY COMMITTEE MEMBERS (Please type full name.)	9. GRADUATE FACULTY IDENTIFIER	APPROVED BY ADVISORY COMMITTEE MEMBERS (Signature)		10. DEPARTMENT		11. ADVISER IN AREA OF:
				Abbr.	Code	
Chair			Chair			

☐ Check here if special notes or other requirements are specified in the comments section on the reverse.	13. APPROVED BY:	
	Head of the Graduate Program Date	
12. SIGNATURE OF STUDENT Date	School Dean (if required) Date	Graduate School Dean

Semester-by-Semester Distribution of Courses in the
Five-Year Combined BSEE/MSECE Program in ECE
for Electrical Engineering Majors

(Jointly Developed by the ECE Undergraduate and Graduate Committees)

Year 1

First Semester	SCH	Second Semester	SCH
ENGR 196 Intro. Engineering	3	ENGR 197 Programming	3
ENGR 195 Intro. Engineering Profession	1	PHYS 152 Mechanics	4
CHEM C105 Chemical Science I	3	ENG W131 Elementary Composition I	3
MATH 163 Integrated Calculus and Analytic Geometry	5	Math 164 Integrated Calculus and Analytic Geometry II	5
COMM R110 Fundamentals of Speech Communication	3	Humanities or Social Science Elective (1)	3
TOTAL SCH	15		18

Year 2

First Semester	SCH	Second Semester	SCH
ECE 201 Linear Circuit Analysis I	3	ECE 202 Circuit Analysis II	3
ECE 207 Electronic Measurement Techniques	1	ECE 208 Electronic Design and Devices Lab.	1
ECE 264 Advanced C Programming	2	ECE 255 Intro to Electronics Analysis & Design	3
PHYS 251 Electricity and Optics	5	ECE 270 Digital Logic Design	4
MATH 261 Multivariate Calculus	4	MATH 262 Linear Algebra Differential Eqns.	4
		Humanities or Social Science Elective (1)	3
TOTAL SCH	15		18

Year 3

First Semester	SCH	Second Semester	SCH
ECE 301 Signals and Systems	3	ECE 302 Probabilistic Methods in Electrical Engineering	3
ECE 311 Electric & Magnetic Fields	3	ECE 340 Simulation, Modeling and Identification	3
ECE 362 Microprocessor Systems and Interfacing	4	ECE 382 Feedback System Analysis	3
ECE Elective (4)	3	ECE Elective (4)	3
Science or Math Elective (2)	3	TCM 360 Communications in Engineering Practice	2
		Humanities or Social Science Elective	3
TOTAL SCH	16		17

Year 4

First Semester	SCH	Second Semester	SCH
ECE 400 Senior Seminar	1	ECE 401 Ethics	1
ECE 440 Introduction to Communication Systems Analysis	4	ECE 492 Senior Design	3
EE Elective ECE 5XX	3	EE Elective ECE 5XX	3
EE Elective ECE 5XX	3	Unrestricted Elective (5)	3
Humanities or Social Science Elective (1)	3	Humanities or Social Science Elective (1)	3
TOTAL SCH	14		13

Summer

First Semester	SCH
ECE698 (Thesis Option) or MATH5XX	3
TOTAL SCH	3

Year 5

First Semester	SCH	Second Semester	SCH
ECE 6XX ECE Core Course	3	ECE 6XX ECE Core Course	3
ECE5XX	3	ECE5XX	3
ECE698 (Thesis Option) or ECE5XX	3	ECE698 (Thesis Option) or MATH5XX or ECE5XX	3
TOTAL SCH	9		9

TOTAL SCH = 147

NOTES (1) = From Approved Humanities or Social Science Elective List
(2) = From Approved Science Elective List
(3) = From Approved Technical Elective List
(4) = From Approved Electrical Engineering Elective List
(5) = From Lists 1-4

Semester-by-Semester Distribution of Courses in the
Five-Year Combined BSCmpE/MSECE Program in ECE
for Computer Engineering Majors

(Jointly Developed by the ECE Undergraduate and Graduate Committees)

Year 1

First Semester	SCH	Second Semester	SCH
ENGR 196 Intro. Engineering	3	ENGR 197 Programming	3
ENGR 195 Intro. Engineering Profession	1	PHYS 152 Mechanics	4
CHEM C105 Chemical Science I	3	ENG W131 Elementary Composition I	3
MATH 163 Integrated Calculus and Analytic Geometry	5	Math 164 Integrated Calculus and Analytic Geometry II	5
COMM R110 Fundamentals of Speech Communication	3	Humanities or Social Science Elective (1)	3
TOTAL SCH	**15**		**18**

Year 2

First Semester	SCH	Second Semester	SCH
ECE 201 Linear Circuit Analysis I	3	ECE 202 Circuit Analysis II	3
ECE 207 Electronic Measurement Techniques	1	ECE 255 Intro. to Electronics Analysis & Design	3
ECE 264 Advanced C Programming	2	ECE 270Digital Logic Design	4
PHYS 251 Electricity and Optics	5	ECE 208 Electronic Design and Devices Lab.	1
MATH 261 Multivariate Calculus	4	MATH 262 Linear Algebra Differential Eqns.	4
CSCI 2XX Computing II	2	CSCI 265 Advanced Programming	3
TOTAL SCH	**17**		**18**

Year 3

First Semester	SCH	Second Semester	SCH
ECE 301 Signals and Systems	3	ECE 302 Probabilistic Methods in Electrical Engineering	3
ECE 362 Microprocessor Systems and Interfacing	4	ECE 365 Intro. to the Design of Digital Computers	3
ECE 369 Discrete Math for Computer Engineers	3	CmpE Elective (4)	6
ECE 359 Data Structures	3	TCM 360 Communications in Engineering Practice	2
Science(2) or Technical (3) Elective	3	Humanities or Social Science Elective (1)	3
TOTAL SCH	**16**		**17**

Year 4

First Semester	SCH	Second Semester	SCH
ECE 400 Senior Seminar	1	ECE 401 Ethics	1
CmpE Elective ECE5XX	3	ECE 492 Senior Design	3
CmpE Elective ECE5XX	3	CmpE Elective ECE5XX	3
Humanities or Social Science Elective (1)	6	Unrestricted Elective (5)	3
		Humanities or Social Science Elective (1)	3
TOTAL SCH	13		13

Summer

First Semester	SCH
ECE698 (Thesis Option) or MATH5XX	3
TOTAL SCH	3

Year 5

First Semester	SCH	Second Semester	SCH
ECE 6XX ECE Core Course	3	ECE 6XX ECE Core Course	3
ECE5XX	3	ECE5XX	3
ECE698 (Thesis Option) or ECE5XX	3	ECE698 (Thesis Option) or MATH5XX or ECE5XX	3
TOTAL SCH	9		9

TOTAL SCH = 148

NOTES **(1) = From Approved Humanities or Social Science Elective List**
(2) = From Approved Science Elective List
(3) = From Approved Technical Elective List
(4) = From Approved Computer Engineering Elective List
(5) = From Lists 1-4

Notes:

1. Students who want to do a thesis or an independent project are advised to take *ECE 698 MS Thesis Research* or *ECE 696 Advanced Electrical Engineering Projects* during the summer following the eighth semester to reduce their work load in the last semester.

2. Depending on the thesis topic, the thesis option may take longer than five years.

3. Students wishing to pursue the thesis option will have to register for at least 9 thesis credit hours, and will therefore be required to register for two core ECE courses, and two elective ECE classes in addition to the three classes they have already taken and have counted towards their BS degree requirements.

4. Students pursuing the non-thesis option are required to take another mathematics/science course from the list of approved courses as the related-area course.

5. It is to be noted that, currently, very few undergraduates take 500 level courses as ECE electives in the program. They usually take 400 level courses. However, students in the proposed dual program will be required to take 500 level courses as ECE electives, since they are expected to achieve more because of their commitment to the graduate program.

6. Taking a general education course during the summers of the second and third years may reduce the course load in the senior year, and hence increase the chances of success in the semesters where graduate courses are taken.

Sustainability and Impact on the State and Region

The proposed program does not require additional resources and financial support from the school and campus. The key to the success of the program is to make students (prospective students) aware of the availability of the program when they enter the freshman engineering program. The feature of the program is to double count 9 credit hours 500-level (dual-level) courses in both the BS plan of study and the MSECE plan of study. This seamless transition from undergraduate program to graduate program greatly reduce the time needed to complete the two degrees in such a short time compared to a traditional, separate BS and MS degree programs. Therefore, it is very economical and sustainable in long run.

As the State and the City are moving towards technology-based high-tech economy, there will be critical needs for well-educated and trained high quality engineers with advanced graduate degrees. Historically, more than 90% of our graduates work in the metropolitan Indianapolis area and Indiana after graduation. It is expected those graduates with advanced degrees will have major impact on the State and Region.

Staffing and Infrastructure- Because the program utilizes existing courses, faculty, and facilities, no additional resources are required.