

ACADEMIC PLAN

APPLIED ELECTRICAL ENGINEERING PROGRAM

**KING SAUD UNIVERSITY- COLLEGE OF
ENGINEERING- MUZAHMIA BRANCH**

DEGREE REQUIREMENTS

MAY, 2014

KING SAUD UNIVERSITY - MUZAHMIA BRANCH
COLLEGE OF ENGINEERING
APPLIED ELECTRICAL ENGINEERING PROGRAM

1- INTRODUCTION

The Applied Electrical Engineering Program has been established in 2013. The program focuses on the application of advances in science and technology in designing and developing electrical engineering systems. The program equips graduates with wide experience in various disciplines of electrical engineering. Graduating engineers have experience in engineering applications. The graduates will be able to work in the fields of communication, power systems, automatic control, electronics and computer engineering. The college of engineering guarantees the competency of its graduates in working in various sectors in the kingdom including ministries, government authorities, private companies, and industrial enterprises.

The Applied Electrical Engineering (AEE) program has been designed in accordance with the international standards and criteria of engineering education to serve the goals of the development plans of the Kingdom in preparing the graduates to fit in different job sectors within the field of specialization. In addition to that, a minor in business is proposed as an optional choice for willing students.

2- BACHELOR OF ENGINEERING IN APPLIED ELECTRICAL ENGINEERING PROGRAM

The undergraduate Applied Electrical Engineering program leads to the Bachelor of Engineering Degree with a Major in Applied Electrical Engineering (AEE). The program is carefully designed to provide a wide knowledge in important areas of modern electrical engineering. The B.S. program is a five-years/ten-semesters program that focuses on applied electrical engineering courses and projects as well as general science and engineering soft skills to prepare students for the future with solid foundations in theory and practice which is intended to make the engagement of our graduated students in the industry smooth and effective.

The degree in applied electrical engineering is a ten-semester full-time program. The first year curriculum focuses on physics, math, chemistry and other complementary courses, and the following years are intended to focus on applied electrical engineering courses and project. To facilitate the real industry practices of our students, they have to take summer and Cooperative Training for duration of about six months. This training represents a unique partnership program with industry that allows students to work in teams and solve real-world engineering problems and improve their engineering skills as well. We aim to give the students an opportunity to apply their skills in the real world, explore career opportunities within industry and to improve their understanding of how the topics they study are related to the industry. This scheme of education helps students to launch own careers. They can explore their career opportunities before graduation that best suit their skills and interests.

The undergraduate program offered by the Program of Applied Electrical Engineering is designed to provide the students with a strong combination of theory and practice and equip them with high practical engineering sense. The applied engineering nature of the program is reflected in the following:

- Industry Experience:

The program is keen to enhance the mutual relation with the industry and to increase the awareness and industrial experience of student. The program intends to fulfill this by the following:

1- Co-operative Training Course: 9 credits

This course allows students to gain valuable experience in employment that relates directly to their major and career goals. At the same time, it provides employers with opportunities to evaluate students as potential full-time employees, while having them complete meaningful projects. This course is designed to be of a significant benefit to students and employers alike. Students get a chance to apply the knowledge they have learned to hands-on

projects in industry. In the six months of their co-op training, students should actively participate in actual company projects and activities. Students return to college with a renewed interest in their studies along with a better idea of their course and career preferences. In addition, the co-op training provides a potential career opportunity with the participating companies. The companies benefit as well from the co-op training program. It gives them the opportunity to observe students over a sufficient amount of time in order to evaluate their pertinent performance. With this familiarity of student work ethic, employers can make sound judgments in recruiting decisions. Therefore, we hope that this co-operative training course is turned to be both productive and beneficial for all parties.

The course starts typically during the summer session upon completion of 125 credit hours. The student will spend the whole summer and one full semester at a company. However, he is required to communicate regularly with his academic advisor to follow up on his training and project progress. In addition, the academic advisor will visit the student on site and he will be in close contact with his industry advisor. At the end of his co-op training, the student is required to submit a full professional technical report about his training experience and the engineering skills and experience he has acquired. A public oral presentation by the student is required to be given in front of an examination committee that includes both advisors and other invited examiners and it is preferred to be given at the company site. The student's co-op training final grade depends on his performance during training sessions, quality of work and report, presentation and the acquired engineering skills as well.

2- Capstone Senior Design Project: 3 credits

Based on his summer experience within the company and with the consultation of the industrial training advisor, the student should develop a proposal about an engineering problem related to his major and the company requirements. The student will hand-in his proposal at the beginning of the following semester and after the program approval he will be assigned an academic advisor to follow up on his training progress with the cooperation of the industrial advisor and to supervise his capstone design project he proposed. The student will spend the whole semester at the company. However, he is required to communicate regularly with his academic advisor to follow up on his capstone design project progress. At the end of the semester the student is required to give a complete report and a presentation regarding his design project in front of an examination committee from the program and a grade will be given according to his performance and his engineering background as well.

Remarks:

- i. It should be cleared out that the co-op training and capstone design project will be graded independently.
 - ii. A group project and co-op training is highly encouraged and recommended to enhance team skills.
 - iii. In case the student fails to propose a sound capstone design project topic or at some circumstances which are based on program judgment, the program may assign project topic to an individual student or a group of students and direct student(s) to specific company or industry to complete his/their co-op training and capstone design project.
 - iv. For the benefit of students, the program will make all the effort necessary to solicit companies and industry for sound engineering practical design projects that can be completed in a one semester period.
- Increasing labs and practical work to about 25-30% of the plan without scarifying theory and foundation of the field. Some laboratories are merged together so the student will grasp an integrated picture of the field. Also in the elective courses the plan concentrate on project based learning (Project Leads the Way) in which the instructor is required to give student some projects during semester.
 - In the proposed plan, two selected-topic courses are offered to meet certain requirements of the current industry. The courses are expected to be flexible to accommodate new changes and advancements in the major or in the industry.
 - According to some studies showing that engineering students lack important soft skills, a compulsory management skills course is proposed in addition to traditional engineering management and economy courses.
 - In addition, a seminar course is proposed to train student on presenting his self to enhance his communication skills, also some outsider speakers will be invited to give talks to students in order to increase their relation and awareness of real work environment before graduation.
 - Finally, an optional Minor in business is proposed in which students are given the opportunity to take a sequence of carefully chosen courses in management to increase their competence.

Finally, this balanced combination among the various attributes of engineering knowledge is manifested in the designed coherent program. Accordingly, graduates of this program will acquire an excellent knowledge in Applied Electrical Engineering Science to be used in solving new problems in better, more efficient, and more economic methods.

2.1 Program Objectives

The Program Educational Objectives (PEOs) are:

- To enable our graduates to practice a leading and successful engineering careers by equipping them with the necessary knowledge and skills.
- To promote professional engineering principles, including ethics and responsiveness to safety, health, and environmental issues.
- To foster an efficient and enjoyable program environment, which encourages continuous self-learning and progression in career and in post-graduate studies.
- To prepare graduates to various sectors of engineering market by gaining experience on applied engineering, business administration and industrial management.

2.2 Program Requirements

The requirements for the Bachelor Degree of Engineering in Applied Electrical Engineering Program consist of 160 credit hours plus two months of Industrial Summer Training. The breakdown of the program credit hours is explained below:

- 31 credit hours (two semesters) of general skills and pre-calculus. This year is called preparatory year. (Table 1)
- 8 credit hours of university requirements (Table 2)
- 52 credit hours of college requirements, which are compulsory for all programs (Table 3)
- 69 credit hours of program requirements of which:
 - 51 credit hours are core courses (Table 4A)
 - 9 credit hours of Summer and Cooperative Training (Table 4B)
 - 3 credit hours of Capstone Senior Design Project (Table 4C)
 - 6 credit hours of elective courses (Table 4D)

2.2.1 Preparatory Year

The program starts by preparatory year that intended to enhance the skills of students and prepare students for future study in the program. This is done through intensive English courses, courses that improve their communication and computer skills and pre-calculus as well. The table below illustrates the modules studied during this year.

Table 1: PREPARATORY YEAR COURSES

Course Code	Course Title	Cr. Hr. T(X,Y,L)*
MATH 140	Introduction to Mathematics	2(2,1,0)
MATH 150	Differential Calculus	3(3,1,0)
ENG 140	English Language I	8(20,0,0)
ENG 150	English Language II	8(20,0,0)
IT 140	Computer Skills	3(0,0,6)
CHS 150	Health & Fitness	1(1,1,0)
CUR 140	Learning, Thinking and Research Skills	3(3,1,0)
ENT 101	Entrepreneurship	1(1,1,0)
COM 140	Communication Skills	2(2,1,0)
Total		31

*T(X-Y-L) T=Total Credit Hours X = Lectures Y = Tutorials L = Laboratory

2.2.2 University Requirements

Each student is required to take one compulsory Islamic course and select 3 other courses (A total of 8 credit hours.) from the Islamic Culture Courses pool provided by College of Education, department of Islamic Culture. The table below shows the required and suggested courses by the program:

Table 2: COMPULSORY AND SUGGESTED UNIVERSITY REQUIREMENTS

Course Code	Course Title	Cr. Hr. T(X,Y,L)	Remarks
IC 103	Economic system in Islam	2(2,0,0)	Suggested
IC 105	Human Rights	2(2,0,0)	Suggested
IC 107	Work Ethics in Islam	2(2,0,0)	Compulsory
IC 108	Current Issues	2(2,0,0)	Suggested
Total		8	

2.2.3 College Requirements

There are 52 credit hours of college requirements, these courses are compulsory courses for all programs and provide the students with the basis and foundation of engineering. These courses are listed in Table 3:

Table 3: COLLEGE REQUIREMENTS

Course Code	Course Title	Cr. Hr. T(X,Y,L)	Requisites	
			Pre-	Co-
MATH 1110	Calculus For Engineers	3(3,2,0)	MATH 140 MATH 150	---
MATH 1120	Linear Algebra and Vector Analysis	3(3,2,0)	MATH 1110	---
MATH 1130	Differential Equations	3(3,2,0)	MATH 1120	---
AGE 1150	Engineering Probability and Statistics	3(3,1,0)	---	---
PHYS 1210	Physics for Engineers I	4(3,0,2)	---	---
PHYS 1220	Physics for Engineers II	4(3,0,2)	PHYS 1210	---
CHEM 1230	Chemistry for Engineers	4(3,0,2)	---	---
AGE 1310	Basics of Engineering Drawing	3(1,0,4)	---	---
AGE 1320	Introduction to Manufacturing	2(1,1,2)	---	---
AGE 1510	Technical Writing	2(2,1,0)	---	---
MATH 2140	Numerical Methods	3(3,2,0)	MATH 1120 MATH 1130	---
AGE 2330	Engineering Mechanics	3(3,1,0)	MATH 1110 MATH 1120	---
AGE 2340	Basic Engineering Measurements	2(1,1,2)	AGE 1150	---
AGE 2410	Computer programming	3(2,1,2)	---	---
AGE 2520	Management Skills	2(2,1,0)	---	---
AGE 3350	Introduction to Design	1(1,1,0)	AGE 1310	---
AGE 4530	Engineering Economy	2(2,1,0)	---	---
AGE 4540	Seminar	1(0,0,2)	---	---
AGE 4550	Engineering Management	2(2,1,0)	---	---
AGE 4560	Industry and Environment	2(2,1,0)	---	---
Total			52	

2.2.4 Program Requirements

There are 69 credit hours of program requirements. These courses are compulsory courses for all Electrical Engineering students and divided into four parts as follow:

2.2.4.1 Program Core Courses

The core courses are intended to give a wide perspective of various domains in Electrical Engineering. A total of 51 credit hours of core courses are listed in the Table 4A.

2.2.4.2 Cooperative Training Requirements

The Cooperative Training (Table 4B) is divided into two parts:

- AEE 4910 - Co-Op Training (Part I) : 0 credit hours
- AEE 4920 - Co-Op Training (Part II) : 9 credit hours

The student is eligible to register for the Cooperative Training if he completes successfully at least 125 credit hours. Refer to section 2: (Industry Experience - Bachelor of Engineering in Applied Electrical Engineering Program)

Table 4A: APPLIED ELECTRICAL ENGINEERING PROGRAM CORE COURSES REQUIREMENTS

Course Code	Course Title	Cr. Hr. T(X,Y,L)	Requisites	
			Pre-	Co-
AEE 2110	Electric Circuits I	3(3,1,0)	MATH 1120	---
AEE 2120	Electric Circuits II	3(3,1,0)	AEE 2110	---
AEE 2130	Electronics I	3(3,1,0)	AEE 2110	---
AEE 2310	Engineering Electromagnetics	3(3,1,0)	MATH 1110 PHYS 1210	---
AEE 2410	Signal and System Analysis	3(3,1,0)	AEE 2110	---
AEE 2710	Circuits Laboratory	2(1,0,2)	---	AEE 2120
AEE 3140	Electronics II	3(3,1,0)	AEE 2130	---
AEE 3210	Fundamentals of Power Systems	3(3,1,0)	AEE 2120	---
AEE 3220	Electric Machines	2(2,1,0)	AEE 2120	---
AEE 3420	Digital Signal Processing	2(2,1,0)	AEE 2410	---
AEE 3430	Communication System Principles	3(3,1,0)	AEE 2410	---
AEE 3510	Logic Systems Design	3(3,1,0)	---	---
AEE 3520	Automatic Control	4(3,1,2)	AEE 2410	---
AEE 3610	Data Communication and Networking	3(2,0,2)	---	---
AEE 3720	Electronics Laboratory	2(1,0,2)	---	AEE 3140
AEE 3730	Power Systems Laboratory	1(0,0,2)	---	AEE 3210
AEE 3740	Machines and Power Electronics Laboratory	2(1,0,2)	---	AEE 3220
AEE 3750	Microwave and Communications Laboratory	2(1,0,2)	---	AEE 3430
AEE 3760	Logic Design Laboratory	1(0,0,2)	---	AEE 3510
AEE 4610	Introduction to Microcontroller	3(2,1,2)	AEE 3510	---
Total			51	

Table 4B: CO-OP TRAINING REQUIREMENTS

Course Code	Course Title	Cr. Hr.	Requisites	
			Pre-	Co-
AEE 4910	Cooperative Training (Part I : during summer session)	0	Completion 125 credit hours	—
AEE 4920	Cooperative Training (Part II : during the semester next to summer session of part I)	9	AEE 4910	—
Total			9	

2.2.4.3 Capstone Senior Design Project Requirements

The Student in this project is required to complete about 75 hours per semester in a related industry project (3 credit hours). The student is eligible to register for the capstone senior design project after submission of the proposal by the end of the summer training (Table 4C). The project can be taken in conjunction with the Co-Op training since it is highly recommended to be industry related.

Table 4C: CAPSTONE SENIOR DESIGN PROJECT REQUIREMENTS

Course Code	Course Title	Cr. Hr.	Requisites	
			Pre-	Co-
AEE 4930	Capstone Senior Design Project	3(1,0,4)	AEE 4910	—
Total		3		

2.2.4.4 Elective Courses

Elective courses are intended to provide depth in a certain specialty of the Electrical Engineering Program. These courses are expected to be project-oriented to cover engineering applications. Practical projects will be given to students to enhance their understanding of the theory presented. Each student is required to acquire 6 credits from the list of elective courses listed below (Table 4D):

Table 4D: ELECTIVE COURSES OF SPECIALIZED AREAS*

Course Code	Course Title	Cr. Hr. T(X,Y,L)	Requisites	
			Pre-	Co-
AEE 4110	VLSI Circuit Design	3(2,1,2)	AEE 3140	---
AEE 4120	Real Time Systems	3(2,1,2)	AEE 4610	---
AEE 4130	Embedded System Design	3(2,1,2)	AEE 4610	---
AEE 4210	Power System Planning	3(2,1,2)	AEE 3210	---
AEE 4220	High Voltage Engineering	3(2,1,2)	AEE 3210	---
AEE 4230	Power System Protection	3(2,1,2)	AEE 3210	---
AEE 4310	Wave Propagation and Antennas	3(2,1,2)	AEE 2310	---
AEE 4320	RF Electronics	3(2,1,2)	AEE 3140	---
AEE 4410	Wireless Communications	3(2,1,2)	AEE 4310	---
AEE 4420	Optoelectronics and Optical Communications	3(2,1,2)	AEE 3140 AEE 3410	---
AEE 4510	Artificial Intelligence	3(2,1,2)	AEE 3520	---
AEE 4520	Introduction to Robotics	3(2,1,2)	AEE 3520	---
AEE 4940	Selected Topics in Electrical Engineering I	3(2,1,2)	<i>Instructor and Program Approval</i>	
AEE 4950	Selected Topics in Electrical Engineering II	3(2,1,2)		
Total of 2 Elective Courses		6		

*All courses have a Pre-requisite of AEE 4920 in addition to other individual Pre-requisites.

2.3 Typical Study Plan

To take into consideration the logical flow of courses and the credit hours load-balance of different semesters, a typical plan for the Bachelor of Engineering in Applied Electrical Engineering Program is proposed in Table 5.

Table 5: TYPICAL STUDY PLAN – APPLIED ELECTRICAL ENGINEERING PROGRAM

Level 1			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
MATH 140	Introduction to Mathematics	2(2,1,0)	---
ENG 140	English Language I	8(20,0,0)	---
CHS 150	Health & Fitness	1(1,1,0)	---
CUR 140	Learning, Thinking and Research Skills	3(3,1,0)	---
ENT 101	Entrepreneurship	1(1,1,0)	---
Total		15	

Level 2			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
MATH 150	Differential Calculus	3(3,1,0)	---
ENG 150	English Language II	8(20,0,0)	---
IT 140	Computer Skills	3(0,0,6)	---
COM 140	Communication Skills	2(2,1,0)	---
Total		16	

Level 3			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
MATH 1110	Calculus For Engineers	3(3,2,0)	MATH 140 MATH 150
MATH 1120	Linear Algebra and Vector Analysis	3(3,2,0)	MATH 1110
PHYS 1210	Physics for Engineers I	4(3,0,2)	---
CHEM 1230	Chemistry for Engineers	4(3,0,2)	---
AGE 1510	Technical Writing	2(2,1,0)	---
IC I	Islamic Culture I	2(2,0,0)	---
Total		18	

Level 4			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
MATH 1130	Differential Equations	3(3,2,0)	MATH 1120
PHYS 1220	Physics for Engineers II	4(3,0,2)	PHYS 1210
AGE 1310	Basics of Engineering Drawing	3(1,0,4)	---
AGE 1320	Introduction to Manufacturing	2(1,1,2)	---
AGE 1150	Engineering Probability and Statistics	3(3,1,0)	---
IC II	Islamic Culture II	2(2,0,0)	---
Total		17	

Level 5			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 2110	Electric Circuits I	3(3,1,0)	MATH 1120
AEE 2310	Engineering Electromagnetics	3(3,1,0)	MATH 1110 PHYS 1210
MATH 2140	Numerical Methods	3(3,2,0)	MATH 1120 MATH 1130
AGE 2340	Basics of Engineering Measurements	2(1,0,2)	AGE 1150
AGE 2410	Computer Programming	3(2,1,2)	---
IC III	Islamic Culture III	2(2,0,0)	---
Total		16	

Level 6			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 2120	Electric Circuits II	3(3,1,0)	AEE 2110
AEE 2130	Electronics I	3(3,1,0)	AEE 2110
AEE 2410	Signal and System Analysis	3(3,1,0)	AEE 2110
AEE 2710	Circuits Laboratory	2(1,0,2)	---
AGE 2330	Engineering Mechanics	3(3,1,0)	MATH 1110 MATH 1120
AGE 2520	Management Skills	2(2,1,0)	---
IC IV	Islamic Culture IV	2(2,0,0)	---
Total		18	

Level 7			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 3140	Electronics II	3(3,1,0)	AEE 2130
AEE 3210	Fundamentals of Power Systems	3(3,1,0)	AEE 2120
AEE 3420	Digital Signal Processing	2(2,1,0)	AEE 2410
AEE 3510	Logic Systems Design	3(3,1,0)	---
AEE 3720	Electronics Laboratory	2(1,0,2)	AEE 3140 ^c
AEE 3730	Power Systems Laboratory	1(0,0,2)	AEE 3210 ^c
AEE 3760	Logic Design Laboratory	1(0,0,2)	AEE 3510 ^c
Total		15	

Level 8			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 3220	Electric Machines	2(2,1,0)	AEE 2120
AEE 3430	Communication System Principles	3(3,1,0)	AEE 2410
AEE 3520	Automatic Control	4(3,1,2)	AEE 2410
AEE 3610	Data Communication and Networking	3(2,0,2)	---
AEE 3740	Machines and Power Electronics Laboratory	2(1,0,2)	AEE 3220 ^c
AEE 3750	Microwave and Communications Laboratory	2(1,0,2)	---
AGE 4350	Introduction to Design	1(1,1,0)	AGE 1310
Total		17	

AEE 3140^c: means co-requisite

Summer Session: AEE 4910 Cooperative Training – Part I (0 credit hours) Pre-requisite: Senior Standing, Completion of 125 credit hours

Level 9			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 4920	Cooperative Training - Part II	9 credits	AEE 4910
AEE 4930	Capstone Senior Design Project	3(1,0,4)	AEE 4910
Total		12	

Level 10			
Course Code	Course Title	Cr. Hr. T(X,Y,L)	Pre-requisite
AEE 4940	Elective Course I	3(2,1,2)	Table 4D
AEE 4950	Elective Course II	3(2,1,2)	Table 4D
AEE 4610	Introduction to Microcontroller	3(2,1,2)	AEE 3510
AGE 4530	Engineering Economy	2(2,1,0)	---
AGE 4540	Seminar	1(0,1,2)	---
AGE 4550	Engineering Management	2(2,1,0)	---
AGE 4560	Industry and Environment	2(2,0,0)	---
Total		16	

3- APPENDIX A

COURSE CODE

Some course codes contain dedicated symbols such as MATH, PHYS and CHEM to represent Mathematics, Physics, and Chemistry accordingly. Other course codes consist of symbol (AGE, or AEE) and a number and they are represented as follows:

For General Engineering: (AGE A B C D)

- A Year
- B Category:
 - 1 Math and Statistics
 - 2 Science
 - 3 Engineering
 - 4 Computer
 - 5 General
- C: Course Number
- D: Version

For Electrical Engineering: (AEE A B C D)

- A Year
- B Category:
 - 1 Electrical, Electronics, VLSI, and Real-Time Systems
 - 2 Power and Machine
 - 3 Microwave, RF, and EM
 - 4 Signal and systems, Communication, and Signal Processing
 - 5 Logic, AI, Robotics, and Control
 - 6 Computer Data and Microprocessors
 - 7 Labs
 - 8 Reserved
 - 9 General, Selected Topics, Summer Training, Co-Op Training and Senior Capstone Design Projects
- C: Course Number
- D: Version