جامعة الملك سعود
King Saud University
1957

King Saud University
College of Engineering

Electrical Engineering Department

Program Bulletin

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A MESSAGE FROM CHAIRMAN

I have the honor of directing the Electrical Engineering department, together with our top notch faculty and staff. It is a pleasure to help and inspire the new generation enthusiastic students. It gives me immense pleasure to welcome you to the website of the Department of Electrical Engineering (EE), King Saud University. With more than four decades of continuous advancement in education, and with the expertise of more than 47 full-time faculty members and 45 technical and supporting staff members, the department offers prominent programs which are highly reputed. Being one of the largest departments in the college of engineering, the department attracts more than 500 of the best undergraduate students in the Kingdom, and more than fourscore graduate (MS & PhD) with high caliber students. A group of international students joins all programs of the department.

Graduates of the undergraduate program gets a degree with major in Electrical Engineering (EE). The program offers elective courses that allow students to get depth experience in one specialization area in electrical engineering, in addition to breadth knowledge in other areas. The four major areas include: Electronics, Communication Systems, Electrical Power Engineering, and Automation and Intelligent Systems. The program equip the students with all required basic courses, in addition to advanced topics that cover emerging technologies such as VLSI design, nanoelectronics, electronic warfare, wireless communications, optical communication, satellite communication, renewable energy, smart grids, artificial intelligence, computer networks, and real-time systems. The diverse areas of specialty provide the graduates with very good job opportunities both in the governmental as well as in the private sectors throughout the Kingdom. The student experience is culminated by working as a team on a senior design project for a full academic year.

Graduate students conduct active research in various aspects of electrical engineering, under supervision of the faculty members. An MS student can choose a research topic of his thesis in one of advanced fields of electrical engineering. MS students can also choose to have a non-thesis option program, in which they take two research courses as part of their curriculum. The department also offers a prominent PhD program that is designed to provide education and research ability to graduates who are competent in basic knowledge and research experience. PhD candidates have to pass a set of

written and oral qualifying exams in basic and advanced topics of electrical engineering. After passing these exams, a PhD candidate conduct a research that leads to innovative contribution to the field of electrical engineering, using the state-of-the-art facilities in the department.

The Electrical Engineering Department is continuously updating the curricula of all programs to keep pace with the national and international norms. In this regard, the Department is continuously upgrading education, research laboratories, and class-rooms in order to keep pace with the latest technology advancements.

The department has maintained close working relation with public and private sector industries including government agencies, telecommunication companies, power generation and production companies, electronics companies, and automation & control companies. Students are provided various scientific trips to these companies through the electrical engineering club. Undergraduate students also choose one company to have two-month practical training as part of the curriculum. The department also provides many services to the society. Faculty members participate in consulting work related to technical aspects of electrical engineering, in addition to educating the public through newspaper and magazine articles about new technologies and possible dangers associated with their mal-use. Faculty members also provide short courses to enhance the skills of engineers and technicians in government and industrial partners.

I hope that this message would attract prospective students to join our prestigious program. For current students, you should be proud that you will be an engineer with KSU degree in EE, and you should make all possible efforts to enhance the experience you gain from the program. You will be a live demonstration of the professional engineer model that you learn here, when you develop innovative solutions to engineering problems, abide to ethics, preserve the environment and become an influential engineer in your workplace. The EE program will then be proud to provide the society with successful alumni like you.

Dr. Ahmed Almaiman

Chairman of Electrical Engineering Department

TABLE OF CONTENTS

INTRODUCTION

The Electrical Engineering Department has been in the forefront of the educational development process at King Saud University up to this year as it celebrates its 50th anniversary. Since its establishment, the Electrical Engineering Department has effectively contributed to the rapid development of the educational system in the Kingdom by striving to offer graduates who are qualified to play a vital role in all development plans of the country and hold key positions in all governmental and private sectors. As is understood by its faculty and staff members, the main objective of the Electrical Engineering Department is to educate highly specialized and qualified electrical engineers in different fields of electrical engineering who are capable of enhancing the rapid industrial, economic and social development that takes place in Saudi Arabia.

Accordingly, the Electrical Engineering Program prepares engineers to work in electrical power engineering stations, substations and high voltage transmission networks. The program also teaches students the issues pertaining to the design, development, and analysis of different types of electrical generators and motors in addition to their operation, maintenance, and control through extensive knowledge of power electronics. In addition, the program qualifies engineers to be capable of designing, developing, operating, and maintaining networks including antenna systems, satellite, microwave, and digital communications, in addition to signal processing. On the other hand, the program also prepares engineers to design, manufacture, and maintain the electronic systems used various civilian or military fields. Moreover, the Department prepares system engineers to design and manage automation, artificial intelligence and control systems of various industrial processes.

The Electrical Engineering Department is continuously updating the curricula of undergraduate and graduate programs to keep pace with the national and international norms. In this regard, the Department is fully equipped with advanced facilities and high-quality laboratories that cover all aspects of electrical engineering. These facilities are subject to continuous upgrades and improvements in order to keep pace with the latest technology requirements. Graduates of Electrical Engineering Program are thus equipped with experience to excel in notable job opportunities in various specialties related to electrical engineering. The Electrical Engineering Program is also accredited on both national level by "*Education Evaluation Commission-National Center for Academic Accreditation"* and internationally by *"Accreditation Board for Engineering and Technology, Inc. (ABET)"*

VISION AND MISSION

رؤية قسم الهندسة الكهربائية:

أن يقدم برامج مرموقة عالمياً تتبنى بيئة تعليمية متميزة وإسهامات ملموسة في البحث العلمي وبصمات على المجتمع عبر تعزيز مهنة الهندسة الكهربائية.

رسالة القسم:

أن نوفر تعليماً متميزاً وشاملاً يجعلنا من البرامج المرموقة في الهندسة الكهربائية. سوف نحافظ على بيئة تعليمية تسلح الخريجين بأحدث الخبرات وتحفزهم على مواصلة النجاح المهني وتخدم مجتمعنا بحلول هندسية مبتكرة.

Vision

To provide world-class programs with distinguished educational environment, tangible contributions in innovative research and positive impact on the society by fostering the profession of electrical engineering.

Mission

To provide an outstanding and comprehensive education that makes us among the best electrical engineering programs. We shall maintain distinctive environment to equip our graduates with cutting-edge experience, motivate them to achieve successful career, and serve our society with innovative engineering solutions.

Values

The Department of Electrical Engineering operates according to the spirit of the following four values:

1. To manage with quality and efficiency and to emphasize cooperation, ethical values, and trust.
2. To treat individuals with dignity and respect and to value diversity.
3. To support distinction and to encourage creativity.
4. To focus on the well-being of the society and to protect humanity.

EDUCATIONAL PROGRAMS

The department offers a carefully designed undergraduate program with a Major in Electrical Engineering (EE).

The Department also offers Master of Science programs (Non-thesis and thesis options) in the following areas of specialization:

1- Electronics
2- Communications
3- Electrical Power
4- Control Systems and Computers

PhD programs in the following specializations are also offered by the Department:

1. Electronics.
2. Electromagnetic Waves and Communication.
3. Electrical Machines and Power Electronics.
4. Electrical Power and High Voltage Systems.

Degrees awarded by the department

- Bachelor of Science in Electrical Engineering.
- Master of Science in Electrical Engineering (Non-thesis and thesis options).
- PhD in Electrical Engineering

BACHELOR OF SCIENCE PROGRAM

Program Mission:

To provide an outstanding and comprehensive education that makes us among the best electrical engineering programs. We shall maintain distinctive environment to equip our students with cutting-edge experience and serve our society with innovative engineering solutions. We shall also invoke the desire and ability of life-long learning in our graduates for pursuing successful career in engineering and postgraduate studies.

Program Educational Objectives:

Within few years of their graduation, graduates of the electrical engineering would accomplish the following PEOs. Our graduates would:

PEO 1: Apply their experience and knowledge to lead a successful engineering career and demonstrate leadership in advancing their workplace.

PEO 2: Demonstrate commitment to professional & ethical responsibilities, and exercise informed judgments considering the impact of engineering solutions in global, economic, environmental, and societal contexts.

PEO 3: **Exhibit** proficiency in producing innovative solutions that serve the requirements of our society, employing the teamwork experience they gain in our laboratories and the practical skills they acquire in the field.

PEO 4: **Succeed in** pursuing self-learning, and advancing their career and post-graduate studies.

Program Learning Outcomes

[1]	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
[2]	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
[3]	An ability to communicate effectively with a range of audiences.
[4]	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
[5]	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
[6]	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
[7]	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The Academic Plan

Graduates of the Electrical Engineering program earn Bachelor of Science in Electrical Engineering Degree. The curriculum is covered in five-years (ten-semesters).

Course Requirements

As described in Table 1, students need to successfully pass 165 credit hours with minimum GPA of (2.75 of 5) to complete graduation requirements. This includes the following

- 32 credit hours of first common year (Table 2)
- 8 credit hours of University requirements (Table 3), which includes:
  - Compulsory course (2 credit hours) (Table 3A)
  - Elective courses: student chooses 3 courses (6 credit hours) (Table 3B).
- 48 credit hours of College requirements (Table 4) of which:
  - 40 credit hours are common courses for all programs (Table 4A)
  - 6 credit hours of additional courses for Electrical Engineering Program (Table 4B)
  - 2 credit hours of free elective courses to be taken by student from any college but not from his department (Table 4C).
- 77 credit hours of departmental requirements (Table 5) of which:
  - 42 credit hours are core courses (Table 5A).
  - 4 credit hours of capstone design projects (Table 5B).
  - 30 credit hours of elective courses (Table 5C).
  - One credit hour of practical training with no-grade (Table 5D).
- The 30 credit hour elective courses are divided into the following groups:
  - Elective Laboratory Courses (3 cr. hr.): (Table 5E)

- Electrical Engineering Elective Courses (27 cr. hr.): (Table 5F)

- Students are allowed to register for an optional course on principles of scientific research (Table 5G)

Design Groups and Integrated Education

The current plan of EE program adopts an *integrated approach* in which the student is engaged in a team that works on a specific area in electrical engineering. The areas represent modern application in the field of electrical engineering, and the team should work to provide solutions to these challenges associated with this application. The experience attained by the student during his study prepares him to excel in working within professional engineering teams after graduation.

The academic plan is prepared to be highly flexible with 38 elective credit hours to allow students to get full benefits of this this problem-solution-oriented education. Various components of the academic plan are thus integrated to enhance student's knowledge and skills to succeed in working within his design group, including:

- Elective labs to be chosen by student.
- Elective courses to be chosen by student.
- Summer training.
- Academic trips to industrial sites.
- Graduation project.
- Cooperation with industrial partners in the graduation project

General Guidelines for forming design groups are as follows:

- Students at EE department chooses a depth area from one of various specialization areas that are entitled *design groups*. The specialization areas cross the boundary of conventional specialties that exist in the department.
- A design group includes a number of students supervised by faculty members, who are specialized in the area of this group.
- In addition, each design group has typically one or more teaching assistant to help students in the group on programming issues.
- One faculty member in the group serves as an academic advisor of the students in the group.

- Students who are expected to finish the 7th level within the current semester are entitled to join design groups.
- Design group committee will announce to students information about offered groups. Students can arrange with group coordinator to get more information on each of the design groups.
- Students are encouraged to contact you and discuss about the requirements of the group. Students can also present their qualifications to you that may include:
    - Academic background and achievements
    - Computational Skills
    - Communication Skills
    - Previous Training Courses
    - Conducted class projects
- Modeling and Simulation Lab EE 302 is design to prepare students to design group. Students in EE 302 course are required to work on a course project. Students are encouraged to choose their course project on the area of the design group they choose.
- The academic advisor of each group helps the student to choose the elective courses that equip the student with adequate depth and breadth experience. This typically include:
    - 3 credit hours of elective labs to be taken by group students
    - 18 credit hours of elective courses to be taken by group students
    - 9 credit hours of elective courses to be chosen by each student.
- The department prepares a list of courses to be offered in the next academic year. Minimum of 10 students per course should be maintained.
- The elective courses focus on design aspects and they assist the student in his capstone design projects.
- The student teams for capstone design project are arranged during the 8th level of study within each design group.
- The design group specifies the list of courses and labs required to be completed by student before registering for the design project. Failure of student to meet these requirements may lead to delaying his graduation or changing his design group.

- Students register for work on their design projects during the 9th and 10th levels.

Table 1: SUMMARY OF B.S. DEGREE REQUIREMENTS IN ELECTRICAL ENGINEERING

Requirements	Cr. Hr.	Description
Common First Year	**32**	General Chemistry (4) Differential Calculus (3) Statistics (3) English (12) Writing Skills (2) University Skills (3) IT Skills (3) Entrepreneurship (1) Health and Fitness (1)
University	**8**	**Islamic Studies**: Compulsory (2) Complementary (6)
College	**48**	Common (40) Additional (6) Free Elective Course (2)
Department	**77**	Core (42) Electrical Electives (30) Projects (4) Practical Training (1,NP) Research Project (0, NP)
Total	**165**	

Table 2: Common First Year (32 credit hours)

Level 1			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
ENGS 100	English language	6(6,9,0)	
MATH 101	Differential Calculus	3(3,1,0)	
ENT 101	Entrepreneurship	1(1,0,0)	
CHEM 101	General Chemistry	4(3,0,2)	
ARAB 100	Writing Skills	2(2,0,0)	
Total		**16**	

Level 2			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
ENGS 110	English	6(6,9,0)	
CUR 101	University Skills	3(3,0,0)	
CT 101	IT skills	3(0,0,6)	
STAT 101	Introduction to Statistics	3(2,2,0)	
EPH 101	Health Education & Fitness	1(1,1,0)	
Total		**16**	

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 3: UNIVERSITY REQUIREMENTS (TOTAL 8 CREDIT HOURS)

Table 3A: Compulsory University Requirements (2 Credit Hours)

Course Code	Course Title	Cr. Hr.	Nature
IC 107	Ethics of the Profession	2	Compulsory
	Total	**2**	

Table 3B: Elective University Requirements

Student chooses 6 credit hours from this table

Course Code	Course Title	Cr. Hr.	Nature
IC 100	Studies in Prophet Biography	2	Elective
IC 101	Origins of Islamic Culture	2	Elective
IC 102	Family in Islam	2	Elective
IC 103	The Economic System in Islam	2	Elective
IC 104	The Political System in Islam	2	Elective
IC 105	Human Rights	2	Elective
IC 106	Medical Jurisprudence	2	Elective
IC 108	Contemporary Issues	2	Elective
IC 109	Role of Women in Development	2	Elective
	Total	**6**	

Table 4: College Requirements

Table 3A College Compulsory Courses (40 Credit Hours)

Course Code	Course Title	Cr. Hr. (X,Y,L)	Prerequisites
MATH 106	Integral Calculus	3 (3,2,0)	MATH 101
MATH 107	Vectors and Matrices	3 (3,2,0)	MATH 101
MATH 203	Differential & Integral Calculus	3 (3,2,0)	MATH 106; MATH 107
MATH 204	Differential Equations	3 (3,2,0)	MATH 203
PHYS 103	General Physics (1)	4 (3,0,2)	
PHYS 104	General Physics (2)	4 (3,0,2)	PHYS 103
ENGL 109	Language & Communication	2 (2,1,0)	
ENGL 110	Technical Writing	2 (2,1,0)	ENGL 109
GE 201	Statics	3 (3,1,0)	MATH 106; MATH 107
GE 104	Basics of Engineering Drawing	3 (2,0,2)	
GE 106	Introduction to Engineering Design	3 (2,1,2)	GE 104
GE 203	Engineering and Environment	2 (2,0,0)	CHEM 101; MATH 101
GE 402	Engineering Projects Management	3 (3,1,0)	
GE 403	Engineering Economy	2 (2,1,0)	
Total		**40**	

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 4B: College Additional Courses for Electrical Engineering Program (6 Credit Hours)

Course Code	Course Title	Cr. Hr. (X,Y,L)	Prerequisites
GE 211	Computer Programming in "C++"	3(2,0,2)	
MATH 254	Numerical Methods	3(3,2,0)	*MATH 107*
	Total	**6**	

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 4C: College Free Course (2 Credit Hours)

Course Code	Course Title	Cr. Hr.	Prerequisites
XXX	Free Elective Course	2	
	Total	**2**	

Table 5: Electrical Engineering Requirements

Table 5A: Core Courses

Course Code	Course Title	Cr. Hr. (X,Y,L)	Requisites	
			Pre-	Co-
EE 201	Fundamentals of Electric Circuits	3(3,1,0)	*MATH 106*	
EE 202	Electric Circuit Analysis	3(3,1,0)	*EE 201* *MATH 107*	
EE 203	Engineering Electromagnetics (1)	3(3,1,0)	*MATH 203* *PHYS 104*	
EE 204	Engineering Electromagnetics (2)	3(3,1,0)	*EE 203*	
EE 205	Electric Circuits Laboratory	1(0,0,2)		*EE 202*
EE 208	Logic Design	3(3,1,0)		
EE 210	Logic Design Laboratory	1(0,0,2)		*EE 208*
EE 301	Signals and Systems Analysis	3(3,1,0)	*EE 201*	
EE 302	Modeling and Simulation Laboratory	1(0,0,2)	*EE 301*	
EE 310	Microelectronic Devices and Circuits	3(3,1,0)	*EE 201*	
EE 312	Basic Electronics Laboratory	1(0,0,2)		*EE 310*
EE 320	Communications Principles	3(3,1,0)	*EE 301*	
EE 330	Electromechanical Energy Conversion (1)	3(3,1,0)	*EE 202* *EE 203*	
EE 340	Fundamentals of Power Systems	3(3,1,0)	*EE 202*	
EE 351	Automatic Control	3(3,1,0)	*EE 301*	
EE 353	Introduction to Microprocessors	3(3,1,0)	*EE 208*	
EE 356	Control and Instrumentation Laboratory	1(0,0,2)		*EE 351*
EE 357	Microprocessor and Microcontroller Laboratory	1(0,0,2)		*EE 353*
	Total	**42**		

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab. NP= No grade (Pass or Fail)

Table 5B: Senior Design Projects (4 Credit Hours)

Course Code	Course Title	Cr. Hr. (X,Y,L)	Prerequisites
EE 496	Graduation Project -1	2(2,0,0)	Complete successfully 129 credits hours and pass all courses in levels 1-7.
EE 497	Graduation Project -2	2(2,0,0)	EE 496
	Total	**4**	

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 5C: ELECTIVE COURSES REQUIREMENTS

Elective Module	Cr. Hr.	Notes
Elective Laboratories	3	Table 5E
Electrical Engineering Elective Courses	27	Table 5F
Optional Elective Course	0	Table 5G
Total	**30**	

(NP): No grade-Pass

Table 5D: PRACTICAL TRAINING

Course Code	Course Title	Cr. Hr. (X,Y,L)	Prerequisites
EE 999	Practical Training	1 (NP)	Successful Completion of 110 credit hours
Total		**1**	

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 5E: ELECTIVE LABORATORIES

Student chooses 3 credit hours from the following table

Course Code	Course Title	Cr. Hr. (X,Y,L)	Requisites	
			Pre-	Co-
EE 402	Electronic Circuits Laboratory	1(0,0,2)		*EE 400*
EE 406	VLSI Design Laboratory	1(0,0,2)		*EE405*
EE 421	Communications Laboratory	2(0,0,4)	*EE 320*	*EE 423*
EE 433	Electromechanical Energy Conversion Laboratory	1(0,0,2)		*EE 430*
EE 445	Electrical Power Laboratory	2(0,0,4)		*EE 441*
EE 457	Applied Control Laboratory	1(0,0,2)		*EE 456*
EE 459	Advanced Logic Design Laboratory	1(0,0,2)		*EE 458*
Total		*3*		

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 5F: ELECTRICAL ENGINEERING ELECTIVE COURSES

Student chooses 27 credit hours from the following table. Student can also choose the course EE 998 as an optional course

Course Code	Course Title	Cr. Hr. (X,Y,L)	Requisites	
			Pre-	Co-
EE 400	Digital and Analog Electronic Circuits	3(3,1,0)	*EE 310*	
EE 403	Semiconductor Devices	3(3,1,0)	*EE 310*	
EE 404	Solar Cells and Photovoltaic Systems	3(3,1,0)	*EE 310*	
EE 405	VLSI Circuit Design	3(3,1,0)	*EE 310*	
EE 407	Electronic Communication Circuits	3(3,1,0)	*EE 310* *EE 320*	
EE 408	VLSI Technology and Fabrication	3(3,1,0)	*EE 310*	
EE 409	Electronic Instrumentation	3(3,1,0)	*EE 310*	
EE 410	Optoelectronic Devices and Systems	3(3,1,0)	*EE 310*	
EE 412	Low Power VLSI Design	3(3,1,0)	*EE 405*	
EE 415	Principles of Nanoelectronics	3(3,1,0)	*EE 310*	
EE 419	Introduction to Electronic Warfare	3(3,1,0)	*EE 310*	
EE 420	Digital Signal Processing	3(3,1,0)	*EE 301*	
EE 422	Digital Communications	3(3,1,0)	*EE 320*	
EE 423	Wave Propagation and Antennas	3(3,1,0)	*EE 204*	
EE 425	Satellite Communications	3(3,1,0)	*EE 423*	
EE 426	Microwave Engineering	3(3,1,0)	*EE 204*	
EE 430	Electromechanical Energy Conversion (2)	3(3,1,0)	*EE 330*	
EE 432	Power Electronics	3(3,1,0)	*EE 310*	
EE 435	Electric Drives	3(3,1,0)	*EE 330* *EE 432*	
EE 436	Electrical Machine Dynamics and Stability	3(3,1,0)	*EE 330*	
EE 441	Power System Analysis	3(3,1,0)	*EE 340*	
EE 443	Power System Operation and Control	3(3,1,0)	*EE 441*	
EE 444	Power System Planning	3(3,1,0)	*EE 340*	
EE 446	High Voltage Engineering	3(3,1,0)	*EE 340*	
EE 448	Power Distribution Systems	3(3,1,0)	*EE 340*	
EE 449	Power System Protection	3(3,1,0)	*EE 441*	
EE 450	Computer Architecture Organization	3(3,1,0)	*EE 353*	
EE 453	Microprocessor and Embedded System Design	3(3,1,0)	*EE 353*	
EE 454	Advanced Control Systems	3(3,1,0)	*EE 351*	
EE 456	Automatic Control Applications	3(3,1,0)	*EE 351*	
EE 458	Advanced Logic Design	3(3,1,0)	*EE 210*	
EE 463	Wireless Communications	3(3,1,0)	*EE 422*	

EE 464	Optical Communications	3(3,1,0)	EE 204, *EE 310, EE 320*	
EE 465	Probability Theory with Engineering Applications	3(3,1,0)	*STAT 101*	
EE 466	Cryptography and Network Security	3(3,1,0)	*EE320*	
EE 468	Selected Topics in Communications and Signal Processing	3(3,1,0)	*EE 301 EE 320*	
EE 469	Selected Topics in Engineering Electromagnetics	3(3,1,0)	*EE 204*	
EE 470	Renewable Energy Engineering	3(3,1,0)	*EE 310 EE 340*	
EE 479	Selected Topics in Electrical Power Engineering	3(3,1,0)	*EE 340*	
EE 480	Introduction to Artificial Intelligence	3(3,1,0)	*EE 351*	
EE 481	Real Time System Design	3(3,1,0)	*EE 353*	
EE 482	Communication Networks	3(3,1,0)	*EE 320*	
EE 483	Digital Control Systems	3(3,1,0)	*EE 351*	
Total Elected		**27**		

(X,Y,L) X = Lectures; Y = Tutorials; L = Lab.

Table 5G: ELECTIVE DEPARTMENT OPTIONAL COURSES WITHOUT CREDIT HOURS

Course Code	Course Title	Cr. Hr.	Requisites	
			Pre-	Co-
EE 998	Research Project	0 (NP)	Successful completion of 129 cr. hr.	

NP=No grade (Pass or Fail)

Table 6 RECOMMENDED SEMESTER SCHEDULE – ELECTRICAL ENGINEERING PROGRAM*

Level 1			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
ENGS 100	English language	6(6,9,0)	
MATH 101	Differential Calculus	3(3,1,0)	
ENT 101	Entrepreneurship	1(1,0,0)	
CHEM 101	General Chemistry	4(3,0,2)	
ARAB 100	Writing Skills	2(2,0,0)	
Total		**16**	

Level 2			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
ENGS 110	English	6(6,9,0)	
CUR 101	University Skills	3(3,0,0)	
CT 101	IT skills	3(0,0,6)	
STAT 101	Introduction to Statistics	3(2,2,0)	
EPH 101	Health Education & Fitness	1(1,1,0)	
Total		**16**	

Level 3			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
IC 1xx	Optional IC course	2(2,0,0)	
PHYS 103	General Physics (1)	4(3,0,2)	
MATH 106	Integral Calculus	3(3,2,0)	MATH 101
MATH 107	Vectors & Matrices	3(3,2,0)	MATH 101
ENGL 109	Language & Communication	2(2,1,0)	
GE 104	Basics of Engineering Drawing	3(2,0,2)	
Total		**17**	

Level 4			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
PHYS 104	General Physics (2)	4(3,0,2)	PHYS 103
ENGL 110	Technical Writing	2(2,1,0)	ENGL 109
MATH 203	Differential and Integral Calculus	3(3,2,0)	MATH 106 MATH 107
GE 106	Introduction to Engineering Design	3(2,1,2)	GE 104
GE 201	Statics	3(3,1,0)	MATH 106 MATH 107
GE 203	Engineering and Environment	2(2,0,0)	CHEM 101 MATH 101
Total		**17**	

Level 5			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre- (Co-) requisite**
EE 201	Fundamentals of Electric Circuits	3(3,1,0)	*MATH 106*
EE 203	Engineering Electromagnetics (1)	3(3,1,0)	*MATH 203* *PHYS 104*
GE 211	Computer Programming in C++	3(2,0,2)	
MATH 204	Differential Equations	3(3,2,0)	*MATH 203*
EE 208	Logic Design	3(3,1,0)	
EE 210	Logic Design Laboratory	1(0,0,2)	EE 208 [C]
Total		**16**	

Level 6			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre- (Co-) requisite**
EE 202	Electric Circuit Analysis	3(3,1,0)	*EE 201* *MATH 107*
EE 204	Engineering Electromagnetics (2)	3(3,1,0)	*EE 203*
EE 205	Electric Circuits Laboratory	1(0,0,2)	*EE 202* [C]
EE 301	Signals and Systems Analysis	3(3,1,0)	*EE 201*
EE 310	Microelectronic Devices and Circuits	3(3,1,0)	EE 201
EE 312	Basic Electronics Laboratory	1(0,0,2)	EE 310 [C]
IC xx	2nd Elective Islamic Culture Course	2(2,0,0)	
Total		16	

Level 7			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre- (Co-) requisite**
Math 254	Numerical Techniques	3(3,2,0)	MATH 107
EE 302	Modeling and Simulation Lab	1(0,0,2)	*EE301*
EE 320	Communications Principles	3(3,1,0)	*EE 301*
EE 330	Electromechanical Energy Conversion (1)	3(3,1,0)	*EE 202* *EE 203*
EE 340	Fundamentals of Power Systems	3(3,1,0)	*EE 202*
EE 353	Introduction to Microprocessors	3(3,1,0)	*EE 208*
EE 357	Microprocessor and Microcontroller Lab	1(0,0,2)	*EE 353* [C]
Total		**17**	

Level 8			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre- (Co-) requisite**
EE 351	Automatic Control	3(3,1,0)	*EE 301*
EE 356	Control and Instrumentation Laboratory	1(0,0,2)	*EE 351* [C]
EE4xx	EE Specialized Elective Course	10 (10,0,0)	*Refer to Table 5*
IC 107	Ethics of the Profession	2(2,0,0)	
	Free Elective Course	2(2,0,0)	
Total		**18**	

Level 9			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
EE 4xx	Specialized Elective Courses	11(11,0,0)	*Refer to Table 5*
EE 496	Graduation Project (1)	2(2,0,0)	Complete successfully 129 credits hours and pass all courses in levels 1-7.
GE 403	Engineering Economy	2(2,1,0)	
IC 1xx	3rd Elective Islamic Culture Course	2(2,0,0)	
Total		**17**	

Level 10			
Course Code	**Course Title**	**Cr. Hr. (X,Y,L)**	**Pre-requisite**
EE 4xx	EE Specialized Elective Course	9(9,0,0)	*Refer to Table 5*
EE 497	Graduation Project (2)	2(2,0,0)	*EE 496*
GE 402	Engineering Projects Management	3(3,1,0)	
EE 998	Research Project	0 (NP)	Complete successfully 129 credit hours
EE 999	Practical Training	1 (NP)	Successful completion of 110 credit hours
Total		**15**	

COURSE DESCRIPTION:

Please refer to the department website at:

http://engineering.ksu.edu.sa/en/courses_discription_EE

MASTER OF SCIENCE PROGRAM

The Electrical Engineering Department offers graduate programs leading to the degree of Master of Science in Electrical Engineering. The program has been designed to reflect the modern trends and developments in the Electrical Engineering curricula. The program is available with the following options in several specializations:

- Thesis Option.
- Non-Thesis Option.

Program Mission

The Master of Science Program in Electrical Engineering endeavors to prepare students in *an area of specialization to meet the fast-growing expectations of the society. Program graduates will continually* build on the attained knowledge and skills to demonstrate a prominent career in a wide range of professions in industry, government, as well as academia.

Program Goals

Goal 1: Prepare graduates to cope with the fast growing demands of society in their areas of specialization.

Goal 2: Emphasize on professional competence.

Goal 3: Provide graduates who would excel in research teams and solve engineering challenges.

Goal 4: Inspire graduates to demonstrate a prominent career in a wide range of professions in industry, government, as well as academia.

Aims of the Master Program:

- Offering specialized courses for electrical engineers.
- Development of production and service sectors in the Kingdom.
- Combining the university with industrial and technical sectors into common research programs.
- Promoting scientific and applied researches particularly that are related to development requirements of the kingdom.

MS Program Learning Outcomes:

Graduates of MS Programs will be able to:

Knowledge:

K1: Exhibit comprehensive-knowledge in a specialized area of electrical engineering.

K2: Identify main simulation and experimental analysis tools in their area of specialization.

Skills:

S1: Demonstrate proficiency in analyzing engineering problems using appropriate analysis and experimental tools.

S2: Apply advanced skills to solve complex engineering problems.

S3: Construct innovative designs that **optimize** the performance and **satisfy** the given constraints.

Competence:

C1: Evaluate simulation and experimental results and **compose** professional technical reports with comprehensive data evaluation, sound conclusions, and constructive recommendations.

C2: Excel in multidisciplinary environments.

C3: Reveal commitment to ethical and professional responsibility.

Requirements for MSc (Thesis Option) Degree Program:

1. Completing 24 credit hours of course work from the approved graduate courses as follows:

- 9 credit hours of common courses.
- 15 credit hours of specialized electrical engineering courses following the Departmental regulations.

2. The student must successfully complete and defend a thesis on a selected research topic in the area of specialization.

Common Courses

Course Code	Course Title	Credit hours
GE 501	Computer Simulation of Engineering Systems	3 (3,0)
EE 502	Modelling of Stochastic Engineering Systems	3 (3,0)
Math 505	Numerical Linear Algebra	3 (3,0)

Electronics

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 503 Math 505	Computer Simulation of Engineering Systems Advanced Digital Circuit Design Numerical Linear Algebra	3 3 3
II	EE 502 EE 504	Modelling of Stochastic Engineering Systems Electronic Devices	3 3
III	EE --- EE --- EE ---	*Course selected by the department from List 1-A** *Course selected by the department from List 1-A** *Course selected by the department from List 1-A or List 1-B **	3 3 3

List 1-A

EE 506 Advanced Analysis of Electronic Circuits
EE 507 VLSI Design
EE 508 Optoelectronics
EE 509 Embedded Systems
EE 510 Data Communication Integrated Circuits
EE 512 Applications of Integrated Circuits
EE 515 Microwave Electronics
EE 516 Selected Topics in Electronics
EE 517 VLSI Fabrication Technology
EE 519 System on Chip

List 1-B

		EE 524 Communication Networks EE 526 Optical Communications EE 528 Digital Communications EE 550 Internet Technologies and E-Services EE 552 Advanced Microprocessors and their Applications EE 553 Computer Organization and Architecture EE 575 Mobile Communications	
	EE 596	Thesis Proposal Preparation	1
	EE 600	Thesis	1

* This course is selected by the department according to its capabilities and circumstances.

Communications

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 521 Math 505	Computer Simulation of Engineering Systems Electromagnetic Fields Numerical Linear Algebra	3 3 3
II	EE 502 EE 528	Modelling of Stochastic Engineering Systems Digital Communications	3 3
III	EE --- EE --- EE ---	*Course selected by the department from List 2-A** *Course selected by the department from List 2-A** *Course selected by the department from List 2-A or List 2-B **	3 3 3
		List 2-A EE 524 Communication Networks EE 526 Optical Communications EE 571 Digital Image Processing EE 572 Satellite Communications EE 573 Information Theory EE 574 Error Correcting Coding for Communication Systems EE 575 Mobile Communications EE 576 Selected Topics in Communications and Signal Processing EE 577 Selected Topics in Electromagnetic waves and Microwave Engineering ***List 2-B*** EE 508 Optoelectronics	

		EE 510 Data Communication Integrated Circuits EE 515 Microwave Electronics EE 550 Internet Technologies and E-Services EE 551 Computer Controlled Systems EE 559 Intelligent Control Systems EE 585 Power System Operation and Control	
	EE 596	Thesis Proposal Preparation	1
	EE 600	Thesis	1

* This course is selected by the department according to its capabilities and circumstances.

Electrical Machines and Power Electronics

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 532 Math 505	Computer Simulation of Engineering systems The Generalized Theory of Electrical Machines Numerical Linear algebra	3 3 3
II	EE 502 EE 534	Modelling of Stochastic Engineering Systems Power Semiconductor Converters	3 3
III	EE --- EE --- EE ---	*Course selected by the department from List 3-A** *Course selected by the department from List 3-A** *Course selected by the department from List 3-A or List 3-B **	3 3 3
	EE 596	Thesis Proposal Preparation	1

List 3-A

EE 530 Design of Electrical Machines
EE 531 Advanced Theory of Electrical Machines
EE 533 Electrical Machine Dynamics
EE 535 Selected Topics in Electrical Machines
EE 536 Electrical Machines for Special Purposes
EE 537 Selected Topics in Power Electronics

List 3-B

EE 548 Power System Protection
EE 552 Advanced Microprocessors and their Applications

	EE 600	Thesis	1

* This course is selected by the department according to its capabilities and circumstances.

Electrical Power

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 585 Math 505	Computer Simulation of Engineering systems Power System Operation and Control Numerical Linear algebra	3 3 3
II	EE 502 EE 546	Modelling of Stochastic Engineering Systems High Voltage Test Techniques	3 3
III	EE --- EE --- EE ---	*Course selected by the department from List 4-A** *Course selected by the department from List 4-A** *Course selected by the department from List 4-A or List 4-B **	3 3 3
	EE 596	Thesis Proposal Preparation	1
	EE 600	Thesis	1

List 4-A

EE 544 Reliability Evaluation and Power System Planning
EE 547 Selected Topics in Power Systems
EE 548 Power System Protection
EE 549 Power System Dynamics
EE 581 High Voltage Transmission Systems
EE 582 Power System Transients
EE 583 Distribution System Engineering

List 4-B

EE 509 Embedded Systems
EE 524 Communication Networks
EE 533 Electrical Machine Dynamics
EE 534 Power Semiconductor Converters
EE 552 Advanced Microprocessors and their Applications
EE 559 Intelligent Control Systems
EE 560 Advanced Control Techniques

* This course is selected by the department according to its capabilities and circumstances.

Control Systems and Computers

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 551 Math 505	Computer Simulation of Engineering systems Computer Controlled Systems Numerical Linear algebra	3 3 3
II	EE 502 EE 552	Modelling of Stochastic Engineering Systems Advanced Microprocessors and their Applications	3 3
III	EE --- EE --- EE ---	*Course selected by the department from List 5-A** *Course selected by the department from List 5-A** *Course selected by the department from List 5-A or List 5-B **	3 3 3
	EE 596	Thesis Proposal Preparation	1
	EE 600	Thesis	1

List 5-A

EE 550 Internet Technologies and E-Services
EE 553 Computer Organization and Architecture
EE 554 Performance Evaluations of Computing Systems
EE 557 Linear Systems
EE 559 Intelligent Control Systems
EE 560 Advanced Control Techniques
EE 561 Selected Topics in Computers
EE 562 Selected Topics in Control

List 5-B

EE 509 Embedded Systems
EE 524 Communication Networks
EE 536 Electrical Machines for Special Purposes
EE 571 Digital Image Processing
EE 573 Information Theory

* This course is selected by the department according to its capabilities and circumstances.

Degree Requirements for M. Sc. (Non-Thesis Option) Program

1. Completing 36 credit hours of course work from the approved graduate courses as follows:
   - 9 credit hours of common courses.
   - 27 credit hours of specialized electrical engineering courses following the Departmental regulations.
2. The student must successfully complete a research project, which comprises two parts (EE598 & EE599), each having 3 credit hours. Each part is graded pass/fail.

Common Courses

Course Code	Course Title	Credit hours
GE 501	Computer Simulation of Engineering Systems	3 (3,0)
EE 502	Modelling of Stochastic Engineering Systems	3 (3,0)
Math 505	Numerical Linear Algebra	3 (3,0)

1- Electronics (Non-Thesis)

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 503 Math 505	Computer Simulation of Engineering Systems Advanced Digital Circuit Design Numerical Linear Algebra	3 3 3
II	EE 502 EE 504 EE 506	Modelling of Stochastic Engineering Systems Electronic Devices Advanced Analysis of Electronic Circuits	3 3 3
III	EE 507 EE --- EE ---	VLSI Design *Course selected by the department from List 1-A** *Course selected by the department from List 1-A**	3 3 3
IV	EE 598 EE --- EE ---	Research Project (1) *Course selected by the department from List 1-A** *Course selected by the department from List 1-A or List 1-B **	3 3 3
V	EE 599 EE ---	Research Project (2)	3 3

		Course selected by the department from List 1-A or List 1-B * ***List 1-A*** EE 508 Optoelectronics EE 509 Embedded Systems EE 510 Data Communication ICs EE 512 Applications of Integrated Circuits EE 515 Microwave Electronics EE 516 Selected Topics in Electronics EE 517 VLSI Fabrication Technology EE 519 System on Chip ***List 1-B*** EE 524 Communication Networks EE 526 Optical Communications EE 528 Digital Communications EE 550 Internet Technologies and E-Services EE 552 Advanced Microprocessors and their Applications EE 553 Computer Organization and Architecture EE 575 Mobile Communications	

* This course is selected by the department according to its capabilities and circumstances.

2- Communications (Non-Thesis)

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 521 Math 505	Computer Simulation of Engineering Systems Electromagnetic Fields Numerical Linear Algebra	3 3 3
II	EE 502 EE 528 EE 571	Modelling of Stochastic Engineering Systems Digital Communications Digital Image Processing	3 3 3
III	EE 524 EE --- EE ---	Communication Networks *Course selected by the department from List 2-A** *Course selected by the department from List 2-A**	3 3 3

IV	EE 598 EE --- EE ---	Research Project (1) *Course selected by the department from List 2-A** *Course selected by the department from List 2-A or List 2-B **	3 3 3
V	EE 599 EE ---	Research Project (2) *Course selected by the department from List 2-A or List 2-B ** ***List 2-A*** EE 526 Optical Communications EE 572 Satellite Communications EE 573 Information Theory EE 574 Error Correcting Coding for Communication Systems EE 575 Mobile Communications EE 576 Selected Topics in Communications and Signal Processing EE 577 Selected Topics in Electromagnetic waves and Microwave Engineering ***List 2-B*** EE 508 Optoelectronics EE 510 Data Communication ICs EE 515 Microwave Electronics EE 550 Internet Technologies and E-Services EE 551 Computer Controlled Systems EE 559 Intelligent Control Systems EE 585 Power System Operation and Control	3 3

* This course is selected by the department according to its capabilities and circumstances.

3- Electrical Power (Non-Thesis)

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 585 Math 505	Computer Simulation of Engineering Systems Power System Operation and Control Numerical Linear Algebra	3 3 3
II	EE 502 EE 534	Modelling of Stochastic Engineering Systems Power Semiconductor Converters	3 3

	EE 546	High Voltage Test Techniques	3
III	EE 544 EE --- EE ---	Reliability Evaluation and Power System Planning *Course selected by the department from List 3-A** *Course selected by the department from List 3-A**	3 3 3
IV	EE 598 EE --- EE ---	Research Project (1) *Course selected by the department from List 3-A** *Course selected by the department from List 3-A or List 3-B **	3 3 3
V	EE 599 EE ---	Research Project (2) *Course selected by the department from List 3-A or List 3-B ** ***List 3-A*** EE 531 Advanced Theory of Electrical Machines EE 533 Electrical Machine Dynamics EE 536 Electrical Machines for Special Purposes EE 547 Selected Topics in Power Systems EE 548 Power System Protection EE 549 Power System Dynamics EE 581 High Voltage Transmission Systems EE 582 Power System Transients EE 583 Distribution System Engineering ***List 3-B*** EE 509 Embedded Systems EE 524 Communication Networks EE 551 Computer Controlled Systems EE 552 Advanced Microprocessors and their Applications EE 559 Intelligent Control Systems EE 560 Advanced Control Techniques	3 3

* This course is selected by the department according to its capabilities and circumstances.

4- Control Systems and Computers (Non-Thesis)

Level	Course Code	Course Title	Credit hours
I	GE 501 EE 551 Math 505	Computer Simulation of Engineering Systems Computer Controlled Systems Numerical Linear Algebra	3 3 3
II	EE 502 EE 552 EE 553	Modelling of Stochastic Engineering Systems Advanced Microprocessors and their Applications Computer Organization and Architecture	3 3 3
	EE 557 EE --- EE ---	Linear Systems *Course selected by the department from List 4-A** *Course selected by the department from List 4-A**	3 3 3
IV	EE 598	Research Project (1)	3

	EE --- EE ---	*Course selected by the department from List 4-A** *Course selected by the department from List 4-A or List 4-B **	3 3
V	EE 599 EE ---	Research Project (2) *Course selected by the department from List 4-A or List 4-B ** ***List 4-A*** EE 550 Internet Technologies and E-Services EE 554 Performance Evaluations of Computing Systems EE 559 Intelligent Control Systems EE 560 Advanced Control Techniques EE 561 Selected Topics in Computers EE 562 Selected Topics in Control ***List 4-B*** EE 509 Embedded Systems EE 524 Communication Networks EE 536 Electrical Machines for Special Purposes EE 571 Digital Image Processing EE 573 Information Theory	3 3

***** This course is selected by the department according to its capabilities and circumstances.

COURSE DESCRIPTION:
Please refer to the department website at:

http://engineering.ksu.edu.sa/en/master_courses_discription_EE

PHD PROGRAM IN ELECTRICAL ENGINEERING

Electrical Engineering is a fast changing profession and there are rapid advances in research and development of different specialization of electro technology. To cope with such advancements, some electrical engineers usually need a much higher level of education and training. The Ph.D. program was initiated in the Electrical Engineering Department in 1412H (1991G). This program responds to the needs of national research and development centers for highly qualified specialists in electrical engineering capable of effective contributions to complex scientific and technical projects.

A good deal of the scientific thesis work of graduate students deals with advanced research, development and application problems in various fields of electrical engineering. The Department has directed its research abilities so as to benefit from the rapid advances in all fields in electrical engineering to match the needs and requirements of the development plans of the Kingdom of Saudi Arabia.

Program Mission

The Doctor of Philosophy Program in Electrical Engineering aspires to provide *scholars with the aptitude and vigor to enhance the scientific knowledge in their area of specialization. Program graduates will demonstrate a prominent role in boosting the educational and academic activities of their organizations. They will also address the challenges faced by the society*, through sound research and innovative solutions.

Program Goals

Goal 1: To maintain an effective environment that attracts prominent researchers and supports the invention of innovative solutions.

Goal 2: To provide graduates with the aptitude and vigor to enhance the scientific knowledge in their areas of specialization.

Goal 3: To equip graduates with competence and leadership qualities to demonstrate a prominent role in boosting the educational and academic activities of their organizations.

PhD Program Learning Outcomes:

Knowledge:

K1: Exhibit extensive knowledge of the major field along with comprehensive insight into the associated research trends.

K2: Identify major simulation and experimental tools required to conduct a research.

Skills:

S1: Enhance scientific knowledge through sound and innovative research**.**

S2: Demonstrate pedagogical skills in classrooms.

Competence:

C1: Synthesize research results into value-added science and communicate the outcomes through distinguished journals and conference proceedings.

C2: Illustrate leadership skills and **confirm** commitment to ethical and professional responsibility.

Degree Requirements

1. Completing 18 credit hours of course work from the approved Post Graduate (Ph.D.) Courses.
2. Passing the Ph.D. qualifying comprehensive exam.
3. Satisfactory completion of the Ph.D. thesis. The student can register in the Ph.D. thesis only after he passes the qualifying comprehensive examination. He also has to meet residency requirements.

The available PhD courses, in different specializations, are given below.

Electronics

- EE 610 Semiconductor Characterization Techniques
- EE 611 Semiconductor Device Modelling
- EE 612 Design and Technology of Solar Cells
- EE 613 Design and Application of Photovoltaic Systems
- EE 614 MOS Devices for Advanced VLSI
- EE 615 Analysis and Design of VLSI Circuits
- EE 616 VLSI Layout and Processing
- EE 617 Layout Design of Bipolar Integrated Circuits
- EE 618 VLSI for Fast Processing Systems
- EE 619 Advanced Topics in Electronics

Communications

- EE 620 Signal Detection and Estimation
- EE 621 Channel Coding Theorem
- EE 622 Advanced Digital Communications
- EE 623 Digital Signal Processing
- EE 624 Antenna Theory and Design
- EE 625 Propagation of Electromagnetic Waves
- EE 626 Secure Communication Systems
- EE 627 Advanced Network Planning and Tele-traffic Engineering
- EE 628 Radar Systems
- EE 629 Advanced Topics in Communications

Electrical Machines and Power Electronics

- EE 630 Advanced Theory of Electro-Mechanical Energy Conversion
- EE 631 Computer Aided Analysis of Electrical Machines
- EE 632 Special Types of Electrical Machinery
- EE 633 Computational Methods in Electromagnetics
- EE 634 New Concepts in Electric Machine Design
- EE 635 Voltage and Frequency Converter Systems
- EE 636 Special Drives and Reactive Power Control
- EE 637 Advanced Topics in Drives & Power Electronics
- EE638 Linear Electric Machines

Electrical Power

- EE 640 Large Scale System Analysis

- EE 641 Stability of Large Power Systems
- EE 642 Power System Operation and Security
- EE 643 Optimal Power System Planning
- EE 644 Reliability Evaluation of Power System
- EE 645 Electromagnetic Transients in Power System
- EE 646 Advanced Power System Protection
- EE 647 High Voltage Insulation
- EE 648 Corona and Field Effects of High Voltage Systems
- EE 649 Advances in Power System

Control Systems and Computers

- EE 650 Artificial Intelligence in Engineering
- EE 651 Parallel Processing and Programming
- EE 652 Computer Network Protocols
- EE 653 Computer Vision and Image Processing
- EE 654 Microprocessor Based Instrumentation & Control
- EE 655 Digital Control Systems
- EE 656 Non-linear Control Systems
- EE 657 Stochastic Control Systems
- EE 658 Adaptive and Learning Control Systems
- EE 659 Advanced Topics in Computer & Control

Seminar Courses and Thesis

- EE 661 Seminar (1)
- EE 662 Seminar (2)
- EE 663 Seminar (3)
- EE 700 Ph.D. Research

COURSE DESCRIPTION:
Please refer to the department website at:

http://engineering.ksu.edu.sa/en/phd_courses_discription_ee

FACULTY

The Electrical Engineering Department currently has 49 faculty members holding Ph.D. in different electrical engineering disciplines. Out of these, there are 17 Professors, 10 Associate Professors and 22 Assistant Professors. In addition, the department has 5 Lecturers and 10 Teaching Assistants. In addition, there are many Technicians, Research Assistants, and Engineers working in different laboratories.

- **Chairman:** Dr. Ahmed Almaiman
- **Professors**

No.	Name	Major Area	University	E-mail
1	Adnan S. Nouh	Systems Engineering, Signal Processing, Digital System, Pattern Recognition	Carnegie Mellon University, USA, 1973	asnouh@ksu.edu.sa
2	Abdulrahman I. Alolah	Electrical Machines, Power Electronics	University of Bradford, UK, 1986	alolah@ksu.edu.sa
3	Abdullah M. Shaalan	Power System Planning.	University of Manchester, UK, 1984.	shaalan@ksu.edu.sa
4	Abdurahman A. Al-Arainy	Power Engineering, High Voltage Insulation and Testing, EM Interference, Insulation Coordination	University of Toronto, Canada, 1982	aarainy@ksu.edu.sa
5	Saad M. Alghuwainem	Power System Engineering Power System Protection, Renewable Energy Systems.	University of Michigan, Ann Arbor, USA, 1986.	saadalgh@ksu.edu.sa
6	Abdulrahman M. Alamoud	Microelectronics and Photovoltaics.	University of West Virginia, USA, 1984.	alamoud@ksu.edu.sa
7	Saleh A. Alshebeili	Statistical Signal Processing.	University of Toronto, Canada, 1992.	dsaleh@ksu.edu.sa
8	Abdullah M. Alsuwailem	Microprocessor-based System Design, Programmable Digital System Design.	Bradford University, UK, 1986.	suwailem@ksu.edu.sa

9	Abdel Fattah Sheta	Microwave Engineering, Microstrip Antennas for Wireless Applications, MIC and MMIC Components	University de Bretagne Occidental, Brest, France, 1996.	asheta@ksu.edu.sa
10	Majeed A. Alkanhal	Modern Communication and Wireless Systems, Electromagnetic Scattering, Propagation and Radar Cross-Sections, Antenna Engineering, Electronic Warfare.	Syracuse University, USA, 1994.	majeed@ksu.edu.sa
11	Ibrahim Elshafiey	EM Computational Modeling, Biomedical Imaging, Data Fusion, Nondestructive Evaluation.	Iowa State University, USA, 1994.	ishafiey@ksu.edu.sa
12	Mohamed Abou El-Ela			mabouelela@ksu.edu.sa
13	Yasin Z. Khan	High Voltage Engineering and Power Systems	Kyushu University, Japan, 2004	yasink@ksu.edu.sa
14	Nacer Amara Debbar	Physics, Processing and Characterization of Semiconductor Devices.	University of Michigan, Ann Arbor, USA, 1983	debbar@ksu.edu.sa
15	Mohammed S. Al-Numay	Control of None Minimum Phase Systems, Modeling and Simulation of Digital Systems. Discrete-Time Analysis of PWM Systems, Digital Control of PWM Systems.	Georgia Institute of Technology, USA, 1997	alnumay@ksu.edu.sa
16	Ehab Awad	Optoelectronic systems	University of Maryland College Park, USA, 2003	eawad@ksu.edu.sa
17	Mohamed Ramy Abdel-Rahman	VLSI Design and Fabrication, Microelectronic Devices and Circuits	University of Central Florida, Orlando, FL, U.S.A, 2004	mabdelrahman@ksu.edu.sa

- **Associate Professors**

No.	Name	Major Area	University	E-mail
1	Fahd A. Alturki	Control and Computer Engineering, Intelligent Control, Fuzzy Logic, Neural Networks.	University of Sheffield, UK, 1993.	falturki@ksu.edu.sa
2	Abdulhameed M. Al-Sanie	Communication Systems, Space Time Coding, Block Coded Modulation.	Syracuse University, USA, 1992.	sanie@ksu.edu.sa
3	Essam Al-Ammar	Power Systems, Electromagnetic Transients.	Arizona State University, USA, 2007.	essam@ksu.edu.sa
4	Mamdooh Saud Alsaud	Design and Operation of Distribution System, Power System Reliability and Security Assessment, Application of ANN in Power System Design.	McMaster University, Canada, 2007.	mamdooh@ksu.edu.sa
5	Yahya Alharthi	Radio Resource Management	University of Minnesota, USA	yalharthi@ksu.edu.sa
6	Ahmad Fauzi bin Abas	Optical Communications	University of Paderborn, Germany, 2006	aabas@ksu.edu.sa
7	Mohamed Abbas	VLSI Design and Fabrication, Microelectronic Devices and Circuits	The University of Tokyo, Japan, 2006	mohabbas@ksu.edu.sa
8	Hamsakutty Vettikalladi	Communication Systems. Antennas and Microwave Circuits	Cochin University, India	hvettikalladi@ksu.edu.sa
9	Mohammed Alresheedi	Visible Light Communication	University of Leeds, UK	malresheedi@ksu.edu.sa
10	Dr. Basil AsSadhan	Network Security	Carnegie Mellon University, USA	bsadhan@ksu.edu.sa

- **Assistant Professors**

No.	Name	Major Area	University	E-mail
1	Saeed A. Aldosari	Signal Processing, Communication Systems,	Carnegie Mellon University, USA, 2005	dosari@ksu.edu.sa
2	Yasir A. Al-Turki	Sensor Networks.	Strathclyde University, UK, 2007	yasir@ksu.edu.sa
3	Mubashir Alam	Digital signal processing	Georgia Institute of Technology, USA	mubalam@ksu.edu.sa
4	Sami Alhumaidi	Radar Systems	Florida Institute of Technology, USA	sami@ksu.edu.sa
5	Essam Altubaishi	Mobile Communications	University of Waterloo, Canada	ealtubaishi@ksu.edu.sa
6	Irfan Ahmad	Control Systems	University of Grenoble, France	irfahmad@ksu.edu.sa
7	Wonsuk Ko	Control Systems	University of Leeds, UK	wkoh@ksu.edu.sa
8	Majid Altamimi	Wireless Communication	University of Waterloo	mtamimi@ksu.edu.sa
9	Omar Aldayel	Signal processing	Pennsylvania State University	omaldayel@ksu.edu.sa
10	Tariq Alshawi	Multi-dimensional signal processing.	Gerogia Institute of Technology, 2018	talshawi@ksu.edu.sa
11	Yasser Binsalamah	Control and Artificial Intelligence	The Ohio State University	ybinsalamah@ksu.edu.sa
12	Majed AlOtaibi	Power System Planning and Operation	University of Waterloo	majedalotaibi@ksu.edu.sa
13	Ali Mohammad Albishi	Microwave Engineering	University of Waterloo	aalbishi@ksu.edu.sa
14	Anmar Arif	Power Systems	Iowa State University, Ames	anmararif@gmail.com
15	Ahmed Aalzuhair	Circuits and Embedded Systems	University of California, Los Angeles (UCLA)	aalzuhair@ksu.edu.sa

16	Saif Abdulmohsen Alsaif	Radar, Control and Intelligent Systems	The Ohio State University	saalsaif@ksu.edu.sa
17	Ahmed Almaiman	Optical fiber communications, free-space optical communications, All-optical signal processing	University of Southern California	ahalmaiman@ksu.edu.sa
18	Abdulaziz Alkuhayli	Power Systems	North Carolina State University	aalkuhayli@ksu.edu.sa
19	Yousef Hassoun	Communications	The Ohio State University	yhassoun@ksu.edu.sa
20	Naif Almakhdob	Software and System Security	Purdue University, West Lafayette, 2020	nalmakhdob@ksu.edu.sa
21	Faris Alfaris	Power electrics, power systems and Renewable Energy	North Carolina State University 2019	e-faris@hotmail.com
22	Abdullah Alghaihab	Wireless Circuits and systems. RF low power circuit design	University of Michigan-Ann Arbor, 2020	aalghaihab@ksu.edu.sa

- **Lecturers**

No.	Name	Major Area	University	E-mail
1	Ahmed Asalom	Power electronics	King Saud University, KSA	salloum@ksu.edu.sa
2	Khalid Al-Fayyadh	Electronics	Queen' University, Canada	alfayyadh@hotmail.com
3	Turki A-Madhu	Electronics	King Saud University, KSA	talmadhi@ksu.edu.sa
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- **Teaching Assistants**

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- **Lab Engineers**

Responsible of all Laboratories: Mr. Abdulaziz Al-Shehri

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EXTERNAL ADVISORY BOARD

The Electrical Engineering programs keep strong ties with industry through the External Advisory Board (EAB). EAB provides a reasonable cross-section of current and future employers of our graduates. The board contributes to the evaluation of department program objectives. With high level of knowledge of the current economic climate for electrical engineering and with experience of current and future employer needs in the Kingdom, EAB has a major role in continuous improvement of undergraduate and graduate EE programs.

Mission

Through a tight link with industry, our programs will flourish and develop and industry will value our programs and look for our graduates.

Organization

Chair of Electrical Engineering Department heads the board. Members represent different sectors of industry related to electrical engineering. In addition, board members include faculty members from EE department, EE accreditation committee and graduate studies committee.

Objectives

- Provide feedback on EE BS and graduate programs
- Propose suggestions on updating and developing program resources.
- Update students on current progress in industry in the Kingdom in the field of electrical engineering.
- Carry information about quality of EE graduates to industry.

History

EAB has been in close cooperation with EE BS program for more than a decade. In 2020, EE graduate programs started to prepare for accreditation, and EAB added MS and PhD programs to focal point of interest.

Current EAB Members

The EAB has been reformed with new members and a virtual meeting was held on Nov 1, 2020. The EAB members are:

Eng. Ibrahim Al-Abbas
Eng. Al-Abbas have over 30 years of experience in the Saudi marketplace with track record success in various capacities and functions.

Eng. Khalid Abdulrazaq Alsanea
Eng. Alsanea has more than 15 years of engineering, management and leadership. Currently he holds the Public Policy & Regulatory Consultations Director at STC.

Dr. Majid Ali Albahkali
Dr. Albahkali is the current co-director of the Center for Excellence for Earth and Space Science at Caltech and KACST. His research interests are related to remote sensing, radar imaging, surface, and subsurface SAR imaging algorithm problems.

Eng. Ziad H. Al-Musallam
Eng Al-Musallam is a senior technology executive with over thirty years of experience in strategically strengthening local hi-tech capabilities and localization of electronics manufacturing and software industries. He is currently the Executive VP of Engineering & Operations (E&O) at AEC

LABORATORIES

The laboratory facilities of the Department are one of the largest per international standards. Highly specialized engineers supervise these laboratories with the advice of concerned Faculty. The Department is continually modernizing and developing its laboratory facilities to cope with the rapid advances in all scientific fields and specialization so that it enables undergraduate and graduate students to attain the maximum benefit of modern techniques and instrumentations. The Major laboratories used by graduate students of the Department are listed below:

1. High-voltage Laboratory
2. Microwave Circuit Laboratory
3. Power system Laboratory
4. Communications Network Laboratory
5. Electrical Machine Laboratory
6. Microprocessor Laboratory
7. Automatic control laboratory
8. Graduation Project Laboratory
9. Optical Communications Laboratory
10. Microwave Laboratory
11. Electromagnetic field application Research Laboratory (EMFar)-SAR Laboratory
12. Liquid insulators Research Laboratory

The University provides annual fund for the Department every year to update all Labs with new equipment. The following table shows the fund provided by the University to the Electrical Engineering Department through the last four years.

A brief account of these facilities is given in ***Appendix - A***

RESEARCH UNITS

The department has a very well known reputation in the field of scientific electrical engineering research. A number of internationally known and heavily cited researchers are among staff of the department. Several research chairs and centers of excellence, have been established in the department over the last few years. More than 25 staff members are working in them as professors, research fellows, research assistants, lab engineers and technicians etc. A list is given below:

1. Saudi Aramco Chair in Electrical Power (2008)
2. Chair in Power System Reliability and Security
3. A State-of-the-Art VLSI Design Center (2005)
4. An Advanced Application Specific IC Research Center (2011)

DEPARTMENT COMMITTEES

The department has several committees and units that assist in managing academic and administrative affairs of the department. Each of these committees and units is composed of a coordinator and at least two faculty members,

1- Academic Accreditation and Quality Assurance Committee
2- Academic Plans Committee
3- Design Groups and Senior Design Project Committee
4- Practical Training Committee
5- Student Advising Unit
6- Annual Report Committee
7- Textbooks Committee
8- Registration Committee.
9- Timetables and Classrooms Committee
10- Examination Committee
11- Promotion Committee
12- Graduate Studies Committee
13- Comprehensive Exam Committee
14- Teaching Assistants and Scholars Affairs Committee
15- Social Activities Committee

In addition to these committees, the electrical engineering external advising board EAB is comprised of distinguished alumni of the department, representative from the employers of EE graduates, representative from the local industry. The EAB contributes to the evaluation of department program objectives. The EAB provides a reasonable cross-section of current and future employers of our graduates. The EAB possesses a good knowledge of the current economic climate for electrical engineering and is aware of current and future employer needs in the country. Thus, the primary vehicle for documenting input from employers of our graduates is through the EAB.

ADMISSION REQUIREMENTS & REGULATIONS

Admission of Students

- Students are accepted by merit according to the following rule:

0.25x Mark of Achievement test + 0.25 x Mark of Capabilities test + 5 x cumulative GPA of preparatory year + points of the course Math140 + points of the course Math150

It should be noted that the Capabilities Test administrated by the National Center for Assessment in Higher Education is similar to the General Aptitude Test (GAT) or to the SAT

- The college accepts 400 students for the first semester and 50 students for the second semester. The general rule of the college is to reach the target value of the student to faculty ratio of 20 recommended by the Ministry of Education (AFFAQ 2029)

Student and Course Transfer

Internal Student Transfer

- Student from Science Colleges of KSU must have a minimum cumulative Grade Point Average (GPA) of 4.0 out of 5.0
- Student from KSU Health Colleges must have a minimum cumulative Grade Point Average (GPA) of 4.0 out of 5.0, and they should have completed successfully or obtained an equivalence of the preparatory-year for the science colleges.
- The cumulative GPA is calculated after a student completes at least 12 hours after the preparatory year (not including courses of the university requirements: Islamic culture and Arabic language).
- If the college intake capacity is exceeded, the Dean of the College of Engineering may accept no more than fifty students satisfying the transfer criteria.

- Acceptance of students is done by merit when all the conditions are satisfied.
- Transfer from Humanitarian colleges is not accepted.

External Student Transfer

- The student must have a minimum cumulative GPA of 4.25 out of 5.0 or its equivalent from an accredited college of engineering
- The student must have a minimum score of 80% in mathematic courses studied in his college
- The student must have successfully completed at least 30 credit hours of his college requirements after the preparatory year (The equivalence of the preparatory year completed by the student is done according to the University regulations. If the student did not study a preparatory year in his college, the University has the right to ask the student to study the KSU preparatory year for science colleges or whatever the University sees suitable after carrying out all the equivalences for the student)

Once these conditions are satisfied the student is considered as a visiting student and is allowed to register at least 12 credit hours according to his study plan in his previous college and in coordination with the KSU college-of-engineering. The 12 credit hours should not include courses of Islamic culture and Arabic language. The student must also obtain a GPA in the semester of at least 4.5 out of 5.

Students Allocation to College Departments

- During their first year at the college after the preparatory year, students must attend introductory orientation-presentations offered by the college departments so as to get acquainted with the nature of the different engineering disciplines.
- After successfully passing 28 hours during the first year at the college, a student submits electronically a request to the Deanship of Admission & Registration, prioritizing his preference of the different disciplines.
- Each department is given a number of students in accordance to its capacity and arrangement with the department and college..
- The priority of acceptance for admission in a department is given to those applicants with the highest GPA.

Students Transfer from other Departments of the College

- Students from another department of the college must have a cumulative Grade Point Average (GPA) higher than the lowest GPA admitted to the department.

- A prescribed form must be filled-in by the student for final approval by the college students affairs unit
- The priority of acceptance is given to the students with the higher grades, on the basis of available seats in each department.
-

Credit Transfer

It is permissible for the students to transfer credits of courses studied in a reputable engineering college if the courses are equivalent to those offered by the college departments. Approval of the department is perquisite for the transfer acceptance. Transferred credits are not included in the GPA but a grade of at least C should be scored to pass courses.

Practical Training

- A student is allowed to register for the practical training after successfully completes 110 hours, through the student portal (e-educate). No other courses are allowed for him during the practical training period.
- Local companies are contacted by Vice Dean for academic affairs to enquire about the possibilities of training the department students and the number of students that can be accepted.
- Replies from companies are kept in the electronic system of the college.
- All available training opportunities are sent to the department, and announced by the department for students.
- Student fill-in a form for the practical training and submit it to the department practical-training committee showing his choice of companies.
- Vice Dean officially contacts the companies and secures the placement of students.
- Student must get the training for the period is 10 weeks and submit weekly reports to the convener of the department committee for practical training.
- Company reports a confidential assessment of the student performance to the department.
- Department allocates the grade of the training as pass or fail based on the company evaluation and weekly reports.

Although the practical training is non-credited, it is required to satisfy the undergraduate degrees requirements**.**

APPENDIX – A: LABORATORIES

The following describes briefly the laboratories used by graduate students.The labs and a list of major equipment are found in the department website at:

http://engineering.ksu.edu.sa/en/Labs_EE

High Voltage Laboratory

Besides conducting regular laboratory classes for undergraduate/graduate students, the High Voltage laboratory at KSU is also extensively engaged in research and development works in the areas of breakdown phenomenon in insulating Medias, withstand voltage in different types of air gaps, surface flashover studies on equipment and electrical interference studies due to discharges from the equipment operating on high voltages. This lab also provides test facilities for testing various HV equipment as per various international standards to electric utilities and companies in the Kingdom as well as in the region.

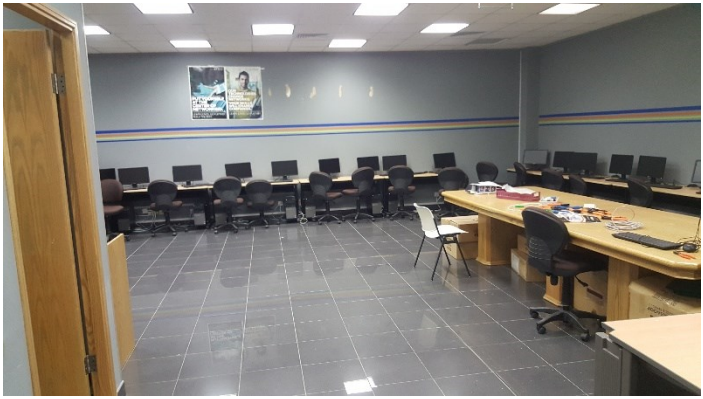
Microwave Circuit Laboratory

This lab is mainly used for implementing microwave circuits like antennas, filter, RFID chip printing etc.

Power System Laboratory

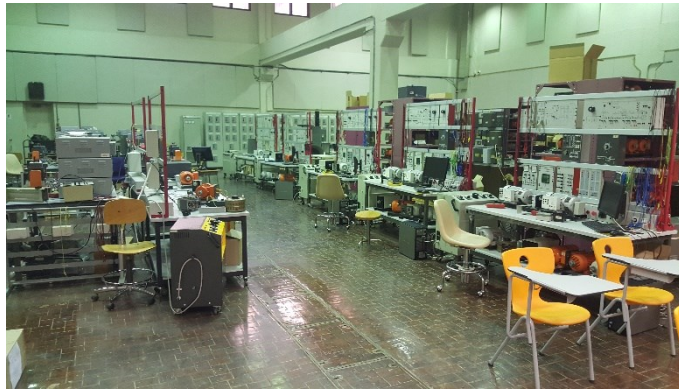
The laboratory is well equipped to meet the requirements of undergraduate as well as graduate studies and research work. Practical demonstrations by lab experiments for power system generation, transmission and distribution concepts. Students are familiarized with the use of digital computer in the different aspects of power system analysis by using different software programs such as ETAP, PTI, and POWER! Through the Electrical Power Simulator, lab experiments related to polyphase voltage regulation, characteristics of interconnected and isolated power system, load flow analysis, characteristics of overhead transmission lines and characteristics and coordination of power system relays etc. can be performed.

Communication network lab



Mainly used for computer communication. Graduate and research students use this lab for doing their projects

Electrical Machines Laboratory



This lab is purposely designed to teach the aspects of electrical machines. It consists of various electrical machines ranging from DC generators to AC induction and synchronous machines. It is also equipped with facilities to teach power electronics and electric drives.

Microprocessor Laboratory

This lab gives students the practical exposure to Assembly language programming of microprocessors, computer architecture of 8088/8086 microprocessor family, assembly program development using debugger software, use of flow charts and other aids in software development, memory and I/O interfacing circuitry for microprocessors, interrupts, serial and parallel

data communications. The lab also hosts hardware projects in more advanced areas.

Automatic Control Laboratory

This laboratory is equipped with basic instruments and real time experiments that are necessary to familiarize the students with the basic concepts and updated technology in the control field. The undergraduate experiments are designed to reinforce and expand many concepts covered in the automatic control course, digital control course, and projects. This Lab is also equipped with fire extinguisher system and emergency electric switch.

Graduation project lab

This lab is used for doing student graduation project for both undergraduates and graduates. It included all the equipment's needed for fulfilling their project.

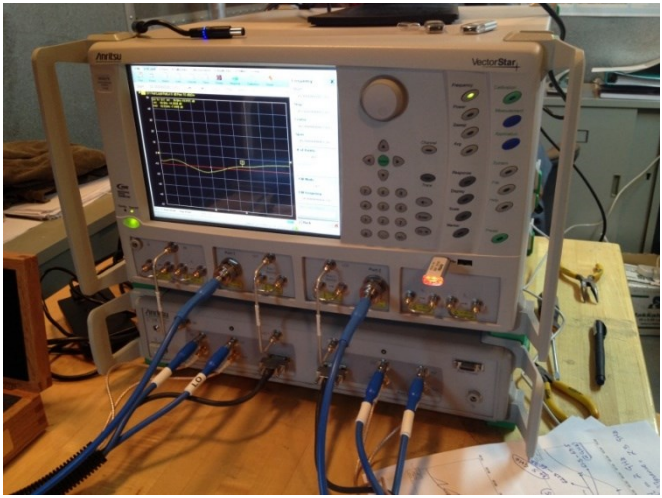
Optical Communications Laboratory

This is a new laboratory that will be equipped with advanced modern equipment in order for teaching and advanced research in the field of Light wave Technology and Optical Communication networks.

Undergraduate students will be served by this laboratory in different courses including Optoelectronics and Communication systems in addition to their senior gradation projects in the field of optical fiber communications and technologies.

This new lab is also intended to provide an appropriate environment for Master and PhD candidates in advanced fiber optic communication systems and subsystems. This includes Fiber-to-the-Home, Wavelength division multiplexing, Optical code division Multiplexing, next generation ultra-high speed and all-optical TDM and Ethernet technologies.

Microwave Laboratory



This laboratory helps the student in each of the design, simulation, fabrications and measurements of Microwave circuits. The Lab will help each of the undergraduate students and the teaching staff for their researches. This lab is well equipped with a microwave measurement system, Network Analyzer upto 40GHz and 145GHz and an anechoic chamber upto 18GHz. Also we have a time domain antenna radiation pattern set upto 18GHz. Undergraduate students will be served by this laboratory in their course project. This lab is also intended to provide an appropriate environment for Master thesis work, PhD thesis work and also faculty research in the field of Microwave and Millimeter wave systems

Electromagnetic Field Applications Research (EMFAR) Lab

The lab is used to investigate new applications of EM fields. The lab conducts research on communication systems and their interaction with human beings. Among the applications are characterizing the human exposure to electromagnetic fields by assessing specific absorption rate SAR. State of art SAM phantoms is used to assess SAR using a robotic arm is used to scan the field probe. Human tissue simulating liquids are used in the analysis. By focusing EM radiation as well as ultrasound radiation at particular regions, hyperthermia techniques are developed as an emerging tumor treatment modalities. The lab research projects cover real time communication systems and software define radio systems.

Liquid Insulators Research Laboratory

This lab is mainly focus on improvement and measuring dielectric properties of nanofluid as well as nano-composite insulators that are useful for researchers and designers of high voltage oil-filled components

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APPENDIX – B: SOFTWARE RESOURCES

There department supports students with software tools that are important for education and research in electrical engineering. Some of the available software's specific to department are shown below

1. Vivado of Xilinx
2. Tanner VLSI Design CAD tools from MentorGraphics
3. Cadence Design CAD tools
4. TINA 12 – Design suite Industrial version
5. TINA 12 – Design Suite Educational Version
6. COMSOL Multiphysics (MEMS module)
7. McLEOD thin film
8. Origin Lab
9. Matlab
10. CST Microwave Studio
11. Keysight pathwave like, Advanced system design(ADS), system design (System value), EM design (EMpro), RF system (Genesis) and RF IC Design (Golden gate).
12. Semcad software

In addition to this the college provide the following software tools to all the departments in the college.

S.NO	Software Name
1	Autodesk
2	Matlab
3	Solidworks
4	Hyperworks
5	ANSYS
6	Aspen
7	Acronis Deployment
8	Comsol
9	DPlot
10	EES
11	EMTP
12	Minitab
13	MD Solid
14	Techplot
15	Visual FEA
16	Working Model
17	Power word
18	PSIM
19	Visual Studio
20	Microsoft Office 2019
21	Creo Elements Direct 2D Access 17.0
22	Creo Elements Direct 3D Access 17.0 (x64)
23	Creo Elements Direct Drafting 17.0
24	Creo Elements Direct Modeling 17.0
25	Chemcad
26	EndNote
27	Labview
28	UserLock

29	Plaxis 3D
30	MS Project
31	Lingo
32	ProSim
33	Mathtype
34	SigmaPlot
35	ERDAS Foundation
36	Polymath
37	CES-Education
38	ArcGis

Electrical Engineering Program

The B.Sc. program in Electrical Engineering at King Saud University is accredited by the Engineering Accreditation Commission (EAC) of ABET http://www.abet.org

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