

MASTERS IN ELECTRONIC AND COMMUNICATION ENGINEERING



DEPARTMENT OF ELECTRICAL AND
COMPUTER ENGINEERING

HANDBOOK

KING ABDULAZIZ UNIVERSITY
JEDDAH, KINGDOM OF SAUDI ARABIA

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A. General Information

1. Introduction

The Electrical Engineering Department at King Abdulaziz University (KAU) was established in 1974 alongside the Faculty of Engineering. Academic activities commenced in 1975-76 with three initial programs: Electrical Power and Machines Engineering, Electronics and Communications Engineering, and Computer and Controls Engineering. leading to the department's renaming as the Department of Electrical and Computer Engineering (ECE) in 1985. Currently, it offers four Bachelor of Science (BS) degree programs: Electrical Engineering (Power and Machines), Electrical Engineering (Electronics and Communications), Electrical Engineering (Computer), and Electrical Engineering (Biomedical).

In 2012, the Electrical Engineering (Computer) BS program was extended to female students with the establishment of the Faculty of Engineering - female section in 2011. Both male and female sections share the same mission, policies, and strategies.

The department's programs underwent evaluation by the Engineering Accreditation Commission (EAC) of ABET in 2002, resulting in recognition as "Substantially Equivalent." A general review visit in 2008 led to the accreditation of all programs. The most recent EAC of ABET review in 2015 reaffirmed the accreditation of the programs.

2. Professions/jobs for which students are qualified

The graduates are qualified for the following professions/jobs:

- Electronics engineer
- Communication engineer
- Telecommunication engineer
- Embedded systems engineer
- Signal processing engineer
- Control systems engineer
- RF (Radio Frequency) Engineer
- Instrumentation Engineer
- Research and development engineer
- Ph.D. student

3. Relevant Occupational/ Professional Sectors

- Telecommunications
- Electronics Manufacturing (Semi-conductor facilities)
- Information Technology (IT)
- Aerospace and Defense (Ministry of Defense)
- Energy and Power (Electrical power stations)
- Government Agencies
- Education and Academia (Universities & colleges)
- Broadcasting and Media (radio & TV stations)
- Networking and Cybersecurity (Security)
- Consumer Electronics
- Robotics and automation
- Research and development (Manufacturers)
- Healthcare technology management (Ministry of Health)

B. Mission, Goals, and Program Learning Outcomes

1. Program Mission

1.1 Program Mission

The mission of the master's degree program is to prepare students to become leaders and scientific practitioners in the field of electronics and communication engineering. The program is structured in a way that enables students to conduct high-impact research which contributes to the enrichment of engineering knowledge and the growth of industry.

1.2 Program Goals

- 1. Provide outstanding learning experience:** Provide an outstanding educational experience to target academic excellence and promote creativity and innovation to prepare students to become leaders in electronics and communication engineering industry and society.
- 2. Produce frontier research:** Conduct high-impact research and applications focusing on innovation and breakthrough discoveries in signal processing, electronics, and communication systems, to aid industry development and help society.
- 3. Create strong relationships with employers:** Establish solid and direct partnerships with industries that focus on electronics and communications engineering, government, and community organizations to address real-world challenges.
- 4. Promote sustainable educational community:** Boost institutional sustainability by cultivating a diverse and inclusive community of scholars, and maintaining a culture of excellence, integrity, and responsibility.
- 5. Highlight ethical conduct and values:** Emphasize the importance of ethical values, leadership, teamwork, and communication skills by training and preparing students for successful careers in research, industry, academia, and society.

Program Learning Outcomes	
Knowledge and Understanding:	
K1	Demonstrate a comprehensive understanding of the fundamental concepts and theories of mathematics and science in electronics and communication engineering (PLO1).
K2	Acquire Knowledge and proficiency in utilizing cutting-edge tools, software, and hardware to design, analyze, and implement electronic and communication systems (PLO2).
K3	Demonstrate in-depth knowledge and understanding in electronics and communications engineering to conduct research and develop breakthrough innovations (PLO3).
Skills:	
S1	Analyze, identify and formulate appropriate solutions to solve complex engineering problems in electronics and communications engineering using mathematical and quantitative tools (PLO4).
S2	Design, implement and evaluate electronic and communication systems via laboratory work, projects, research, and industry internships (PLO5).
S3	Develop and practice practical communication skills to present and explain ideas, research, and design solutions to diverse audiences, including technical and non-technical stakeholders (PLO6).
S4	Build critical thinking, long-life learning, scientific reasoning, and use advanced ICT tools to develop scientific solutions in electronics and communication engineering (PLO7).
Values, Autonomy, and Responsibility:	
V1	Recognize the importance of ethical conduct and integrity in academic and professional careers respecting Islamic values (PLO8).
V2	Develop leadership skills and teamwork abilities to collaborate with diverse groups of people when addressing complex challenges in electronics and communication engineering (PLO9).

C. Curriculum

1. Program Curriculum Structure

Program Structure	Required/ Elective	No. of Courses	Credit Hours	Percentage
Course	Required	6	16	45%
	Elective	4	12	33%
Thesis	Required	1	8	22%
Total		11	36	100%

2. Program Courses

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours
Level 1	EE 622	Digital signal processing	Required	-	3
	EE 623	Digital communications	Required	-	3
	EE 639	integrated Circuits	Required	-	3
	MATH 629	Advanced engineering mathematics	Required	-	3
	IE 501	Scientific research methodology and skills in engineering sciences	Required	-	3

	EE 695	Seminar	Required	-	1
Level 2	MATH 639	Advanced Numerical Analysis	Elective	-	3

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours
	EE 620	Effective Network Analysis	Elective	-	3
	EE 621	Advanced Communication Theory	Elective	-	3
	EE 624	Laser communications and Optical Communications	Elective	-	3
	EE 625	Fundamentals of design using field programmed gate arrays	Elective	-	3
	EE 626	Design of Arrays and Elements of Planar Antenna	Elective	-	3
	EE 627	Solid State Devices	Elective	-	3
	EE 630	Special Topics in Communications	Elective	-	3
	EE 631	Special Topics in Electronics	Elective	-	3
	EE 632	Digital Speech Processing	Elective	-	3
	EE 633	Advanced Digital Communication	Elective	-	3
	EE 634	Theory of Information and Blogging	Elective	-	3

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours
	EE 635	Mobile and Wireless Communications	Elective	-	3
	EE 636	Photos processing	Elective	-	3
	EE 690	Special Topics in Electrical Engineering	Elective	-	3
	IE 631	Total Quality Management	Elective	-	3
	IE 632	Design of Experiments	Elective	-	3
	IE 653	Project Management	Elective	-	3
Level 3	EE 699	Thesis	Required	-	8

D. Program Faculty

1. Faculty Qualifications

The Electrical Engineering Electronics and Communication Program is supported by 17 full-time faculty members who are knowledgeable in the curricular areas of the Program including the relevant areas that in common with the other three programs in the department.

The entire academic faculty hold Doctor of Philosophy (Ph.D.) degrees and possess a broad range of academic and research experiences gained from nationally and internationally respected teaching and research institutions. The majority have many years of teaching experience and are very enthusiastic and dedicated to improving the quality and effectiveness of the bachelor's degree Program. Many faculty members have either direct industrial experience or indirect experience through their consultation work. Several of the faculty members are active with sponsored research programs. They maintain close and frequent contact with professionals in industry and other faculty from peer institutions.

Given the university's emphasis on encouraging both pioneering research and academic excellence, the diversity of the faculty is one of the strengths of the Electrical Engineering Electronic and Communication Program. Faculty members represent several different countries and nationalities, thus strengthening the global perspective of the Program. All faculty members possess excellent oral and written communication skills. These attributes are considered in both the hiring and promotion processes.

Most of the faculty members attend/organize/participate in various relevant workshops and seminars in the Faculty of Engineering or in the Electrical Engineering Electronics and Communication Program. Some faculty members are active in professional societies.

2. Current ECE Staff

No	Faculty Name	Graduated From	Rank
1	Rabah Aldhaheri	Michigan State University	P
2	Adnan Afandi	University of Kent, UK	P
3	Hatem Rmili	University of Bordeaux, France.	P
4	Mohammed Ansari	KFUPM, KSA	P
5	Mohammed Abdulaal	University of Manchester, UK	ASCP
6	Sami Alghamdi	Purdue University, USA	ASCP
7	Amjad Hajjar	Colorado State University, USA	ASCP
8	Ahmad S. Balaamash	University of Michigan, Ann Arbor, USA.	ASCP
9	Khaled Hamed Alharbi	University of Glasgow, UK	ASTP
10	Fuaad E. Al-Saadi	University of Leeds, UK	P
11	Khalid Al Nabulsi	The university of Arizona in Tucson Arizona, USA	P
12	Muntasir Muhammed Shaikh	University of Arizona, Tucson, USA	ASTP
13	Lotfi M. Ladhar	Telecommunication and IT University Moscow- Russia	ASCP
14	Abdallah Dobai	CSU, Fort Collins, USA	ASCP
15	Rami Ahmad Zahrani	University of Southern California (Viterbi School of Engineering) - USA	ASTP
16	Ghaffer Iqbal Kiani	Macquarie University, Sydney, Australia	ASCP
17	Ahmad Salman alkasimi	UC DAVIS - USA	ASTP

Code: P = Professor, ASC = Associate Professor, AST = Assistant Professor, I = Instructor, A = Adjunct, O = Other.

E.Student Admission and Support

1. Student Admission Requirements

Local Students (Saudi/Non-Saudi)

- Approved official academic bachelor's degree qualification of grade no less than high "Good" from an Electronics and Communication Engineering program.
- Applicants from other relevant programs can be conditionally accepted until they pass a list of supplementary Electronics and Communication Engineering undergraduate courses determined by the program to amend their background before they start the program.
- English language exam minimum score of 3.5 in IELTS or equivalent.
- Approval of employer (if any).
- Good conductance and medical condition.
- Two recommendation letters from previous instructors.
- Applicant should not be previously dismissed from one of the educational institutions in Saudi Arabia.

International Students

- Age does not exceed (30) years for M.Sc. degree applicant.
- An approved official academic qualification of grade is not less than "Very Good", if the degree offered in grades in the applicant home country.
- Good conductance and medical condition.
- Two recommendation letters from previous instructors.
- Applicant should not be previously dismissed from one of the educational institutions in Saudi Arabia.
- Meet one of the following scores in English language exams:

Examination Type	Minimum Score
IELTS	3.5
Graduate Aptitude Test (GAT)	6.5

2. Guidance and Orientation Programs for New Students

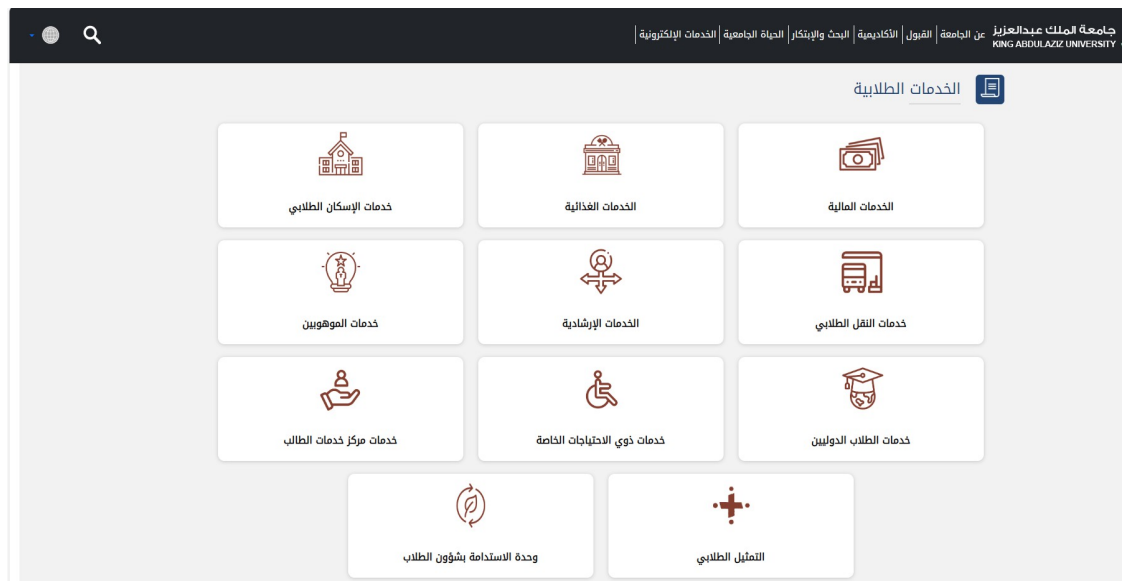
(Include only the exceptional needs offered to the students of the program that differ from those provided at the institutional level).

The ECE program offers a welcome event at the beginning of the academic year to its new graduate students (including both M.Sc. and Ph.D. students) where they meet the program coordinator and program faculty members to provide them with a brief orientation to the program requirements and study plan. This meeting also serves to introduce the new students to their respective academic advisors who will guide them throughout the duration of their program enrolment.

3. Student Counseling Services

The program students enjoy a wide range of support and services through King Abdulaziz University that include financial, meals, transportation, housing, guidance, international student assistance, and special needs assistance. A complete description of such services as well as how to access them can be accessed through the University Life portal available at:

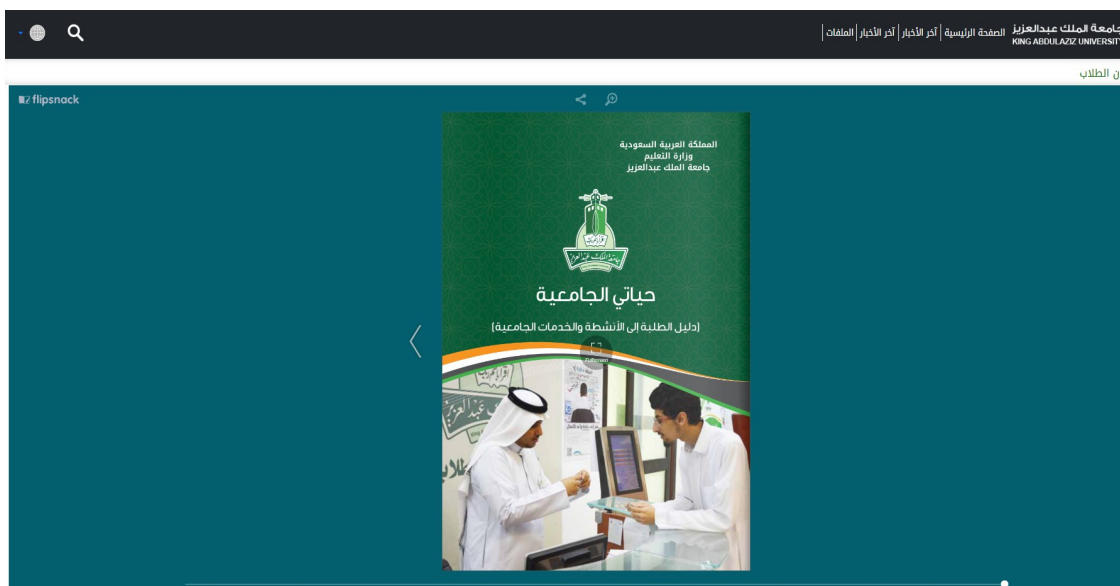
kau.edu.sa (جامعة الملك عبدالعزيز - الحياة الجامعية)



Of particular interest of these services are the student counseling services offered by the Student Services Center at King Abdulaziz university. The service helps students overcome the problems they face in any aspect of their personal or university life with

the help of specialized professionals in a calm, supportive and discreet manner. The guide for such services is available at:

[flip book \(kau.edu.sa\)](http://flipbook(kau.edu.sa)) - كتاب حياتي الجامعية



4. Student Rights and Obligations

University students represent one of the most important pillars on which society relies on for building the future, as well as interfacing with the intellectual, scientific, cultural, economic, and social variables, and adapting to the changes of these variables and then laying the foundations of the renaissance and sustainable development.

Based on the necessity of recalling the rights and responsibilities of the students, a regulation has been drafted to ensure their rights, raise awareness of their responsibilities toward the optimum Islamic and university behaviors, and work to develop a sense of belonging to their community and country. The content of this regulation has been divided into two main categories related to the rights and responsibilities of students in the academic and non-academic fields, as shown below:

Students' Rights

These are the rights guaranteed by the University's systems in the academic and non-academic fields to provide a supportive learning environment that ensures a stable academic life according to their potential.

Students' Responsibilities

It means the academic and non-academic responsibilities that the student must abide by towards the university to improve the quality of academic work, and work to strengthen the relationship between the student and the professor and all university's sectors.

The student has rights that include:

1. Having a study and academic environment that is suitable for high-quality learning consistent with the mission of the University.
2. Maintain the confidentiality of students' information and privacy in all matters and not allow access to or use students' personal information, academic records, personal files, and transcripts except for authorized personnel.
3. Notify the student before making any decision against him/her and bring to his/her attention in the event of any violation. Students shall be notified in writing of any decisions against him/her and shall be given the right to defend and discuss any decision contrary to his/her academic interest, in accordance with the regulations of the University.
4. Provide the students with freedom of expression and discussion in the educational matters concerning them, if this is within the limits of appropriate behaviors in accordance with university regulations.
5. The ability to grievance with the concerned entity in case of not obtaining the rights mentioned in these regulations.
6. The commitment of faculty members to the dates and times of lectures, office hours, and breaks between lectures, and not to cancel any lecture or change its time unless there is an urgent matter, and after announcing about this cancelation ahead of time, a makeup class to be given instead of those that have been canceled and making sure it does not conflict with the student's time or absorptive capacity.

The student has obligations that include:

- 1) Knowing and following university rules and regulations.
- 2) Dealing with respect toward faculty members, employees and other students within the university and respecting their rights and privacy.
- 3) Following scientific research and professional ethics.
- 4) Obey the local laws and present himself in a way becoming of a university student.
- 5) Respect and preserve the university properties.
- 6) Keeping the university credentials for his own use only and not allowing others to impersonate him to access university services.

Student Rights Unit

An official unit affiliated with the Deanship of Students' Affairs at King Abdulaziz University which oversees achieving the relationship between the students and university staff to achieve a harmonious university community in which the spirit of cooperation prevails.

Objectives

- 1) Investigate and adjudicate complaints and grievances filed by students.
- 2) Advising students on their academic and non-academic concerns related to the university.
- 3) Advising students about their rights and how to obtain them, and how to follow the legal and official channels within the University.
- 4) Enable students to challenge their penalties of discipline.
- 5) Review the procedures followed with the students who violate the University regulations.
- 6) Adopting the principles of justice and equity as the main pillar in building an ideal society within the university.
- 7) Supporting the rights of students on a basis consistent with the University's rules and regulations.

Location

Preparatory Year Building in Sulaymaniyah: Building (235), First Floor, Office (FF65), Ext. (41054).

5. Special Support

Low achievers

Low achievers are identified by their significantly low performance and reported by the course instructors to their respective academic advisors. The academic advisor investigates the student's case (for example, checks student course schedule and attendance records as well as performance in other courses) and an appropriate remedial plan is discussed with the student and his instructors as needed.

Disabled Students

The program students with disabilities receive special support from the special needs center at King Abdulaziz university. The services provided include taking care of the special needs of students starting with admission and registration until graduation, offering the following services:

- Register the student through contacting the Deanship of Admission and Registration.
- Provide training and rehabilitation courses for the students (including training students on how to use the special needs technologies and on the university daily life skills).
- Ensure accessibility of buildings, lecture halls, and labs for programs with special needs students.
- Provide the teaching aids and offer special labs for the disabled.
- Offer a special hostelry for the blind.
- Offer special parking permits for spots close to lecture halls of special needs students.
- Curriculum printing in Braille by copying and printing the books and lectures.
- Supervise the exams of special needs students including providing special exam halls for the disabled and providing volunteer readers and scribes to help the disabled do their exams.
- Help special needs students march during the graduation ceremony.

Furthermore, several allowances are offered by King Abdulaziz University to encourage disabled students to join its programs and help them cope with university life. For example, Blind students are eligible to receive an amount of SR 5240 as a Personal Reader Allowance. Also, disabled students are eligible for receiving an amount of SR 1500 as a Disability Allowance.

Talented Students

The talented program students receive special support from the Center of Talent and Creativity at King Abdulaziz University. The center is keen to develop the sense of creativity and innovation in the talented students and reach the creative innovations using the most recent applied scientific standards internationally known for being used in designing and performing inventions, getting the inaccessible information through the reverse engineering, and developing it considering the environmental requirements to reach the glorification of the level of innovations, outputs, and feedback. The center is keen to provide during-the-study applied and scientific enrichment programs suitable for the student's study load in many specialties and fields of creativity. The center also nurtures and develops talented students' creative ideas and appoints suitable academic, scientific, and applicative supervisors from within the university. Furthermore, the center arranges field visits to some of the institutions that contribute to the expansion of perceptions of the gifted students. Moreover, the center is keen to execute creative and innovative projects that enable talented students to achieve advanced positions in the local and international talent and creativity competitions.

F. Thesis and Its Requirements

1. Registration of the thesis

(Requirements/conditions and procedures for registration of the thesis as well as controls, responsibilities, and procedures of scientific guidance)

The student can register for the thesis course (EE 699) after finishing 50% of the program study plan credit hours provided that his GPA is higher than 3.75/5.0. The student request to register the thesis includes a thesis proposal with the thesis title in both English and Arabic, the supervision committee (advisor and co-advisor), and a plan for the thesis research. The thesis proposal is examined and approved by the department council then the thesis course is registered for the student electronically by the department chairman.

2. Scientific Supervision

(The regulations of the selection of the scientific supervisor and his/her responsibilities, as well as the procedures/ mechanisms of the scientific supervision and follow-up)

The thesis advisors must be of professorial or an associate professorial rank who are faculty members of the University. An assistant professor may be a master's thesis advisor if he has spent at least two years in the University as assistant professor and has at least two papers published or accepted for publication in his field of specialty in refereed journals. If the nominated supervisor is an assistant professor and hasn't got two published papers or accepted for publication in refereed journals, then the refereed books can be considered instead of papers. A faculty member can be a thesis advisor or co-advisor for a maximum of four master's thesis and/or Doctoral dissertations simultaneously. If it is highly and deeply necessary, the number can be raised to five following the recommendations of the Department Council concerned and the approval of the College Council, and the Council of the Deanship of Graduate Studies. For calculating a faculty-member's teaching load, the supervision of a thesis/dissertation will be counted as one credit hour, whether the faculty member is the sole advisor or the main advisor. If the advisor cannot continue supervising the thesis/dissertation, or if his service to the University is discontinued, the Department concerned should suggest a replacement, to be approved by the College Council and the Council of the Deanship of Graduate Studies. By the end of each semester, the advisor should report, in detail, to the Chairman of the Department, about the progress of the student's work. A copy of the report should be sent to the Dean of Graduate Studies. Student completion of the thesis/dissertation must be reported by the advisor to the Chairman of the Department concerned, to initiate the completion of the procedure determined by the Council of the Deanship of Graduate Studies. Based on the academic advisor's report, a lack of commitment by a student towards his studies and other academic duties will result in an academic warning by the Department Council concerned. If, after two warnings, no improvement is evident, the Council of the Deanship of Graduate Studies may dismiss the student as per the recommendation of the Department Council.

3. Thesis Defense/Examination

(The regulations for selection of the defense/examination committee and the requirements to proceed for thesis defense, the procedures for defense and approval of the thesis, and criteria for evaluation of the thesis)

The thesis defense committee can only be formed after all requirements of the program study plan are fulfilled with a minimum GPA of 3.75 and the thesis is approved by the scientific council of King Abdulaziz University. It is also a requirement to publish one scientific paper by the student before the defense committee formation. Also, the minimum study duration required must be at least 4 academic terms. The thesis defense committee must have an odd number of members that include the thesis main advisor, one internal examiner from the same department, and one external examiner from outside the department. The thesis defense committee members should meet the conditions of the thesis supervision. Also, at least one member of the Committee must be a professor or an associate professor. The defense committee formation is decided and approved by the department council. Then, the formation is sent for approval by the college dean and the dean of graduate studies at King Abdulaziz University. Once the formation is approved, the defense can be scheduled and announced. The thesis defense includes an oral presentation by the student followed by oral examination on the thesis. The committee members then deliberate to reach a consensus on the acceptance of the thesis. The decisions of the Committee should be based on a majority vote of at least two thirds of the total number of members. If the thesis has weaknesses that need to be addressed, the decision can be to allow a specific duration for the student to amend the thesis and then it can be re-examined by the same committee or by one of its members depending on the severity of the found weaknesses. Once the thesis is approved, the student can apply electronically for degree awarding.

G. Learning Resources, Facilities, and Equipment

1. Learning Resources

Learning resources required by the Program (textbooks, references, and e-learning resources and web-based resources, etc.)

The central library of King Abdulaziz University, maintained and operated by the Deanship of Library Affairs, is available for all KAU students. The library houses a full collection of engineering books, journals, and databases. Library material is shelved as an open stack policy using the Dewey Decimal Classification Scheme. The library collection is accessible to faculty members and students alike at their leisure. Professional librarians are available to assist.

The references staff handles Inter-Library Loans with other libraries in the Kingdom. The library contains nearly one million Arabic and non-Arabic books, reference materials, manuscripts, dissertations, and reports in different branches. The central library subscribes to various databases and has a wide range of periodicals, books, and other publications in aerodynamics, propulsion, control, materials, and structures. Reference services are available to the students and the faculty as well as access to PC networks. The Deanship of Library Affairs typically requests the program each year to provide it with up to one hundred new book titles related to the program to purchase in the following year.

The Deanship of Library Affairs has a digital library that allows students and faculty to access all information resources through the Internet and intranet. Examples of these resources include the Saudi Digital Library (SDL), ScienceDirect, Web of Science (ISI), IEEE, SpringerLink – Springer, Wiley, E-Journals, E-books, and different databases such as EBSCO, Cambridge Journals, and others. These resources may be accessed through the web page of the Deanship of Library Affairs at <http://library.kau.edu.sa>.

2. Facilities and Equipment

(Library, laboratories, classrooms, etc.)

A. Offices

The building of the Faculty of Engineering is a modern structure housing all offices, classrooms, and laboratory facilities for all engineering programs. The Department of Electrical and Computer Engineering (ECE) is located in building 40. It has a gross area of approximately 10,000 square meters. This space is used for academic and research purposes. The academic space consists of the following functions: classrooms, teaching laboratories, meeting and seminar rooms, chairman and faculty offices, staff offices of clerks and teaching assistants. The research space consists of research and support facilities. The students of the Program have access to the Central KAU Library which is managed by the Deanship of Library Affairs. Additionally, the KAU digital

library and the Saudi Digital Library provide comprehensive access to major scientific journal databases and eBooks. The department consistently maintains and updates the facilities allocated to its graduate programs to ensure that the instructional and learning environment is adequate and safe for the intended purposes. The Electrical and Computer Engineering Department facilities house:

- The department chairman's office.
- The secretarial office, which also contains photo-copying equipment and supplies are accessible to all faculty members.
- A large Department Council Meeting Room spacious enough for 40+ people and equipped with presentation projection equipment.
- A social area for faculty.
- Several prayer halls are set up for the daily prayer services and serving the whole faculty of engineering.

The Electrical and Computer Engineering Students Club is currently located in Room 14G31 in building 40. It has desks, shelves, sofas, chairs, and is equipped with PCs and printers for students use. The students use this room for a variety of purposes. Primarily, this facility serves as a study room or meeting place for organizational meetings. It also provides a social environment for the students to relax between classes or after an exam.

B. Classrooms and Associated Equipment

All classrooms and teaching spaces used by the students of the Program are clean, well lit, and air-conditioned. They provide non-crowded seating (up to a maximum of 30-40 students only), and have large and in some cases, multiple whiteboards. Each classroom is equipped with computer projection equipment and screens. Student presentations also routinely use computer projection. There is convenient access to electrical outlets and internet connections including wireless option throughout the faculty of engineering building.

It should be noted that several laboratories include a small teaching area which is provided with the same classroom facilities as mentioned above.

C. Laboratory Facilities

The program has several educational labs serving the graduate program with facilities located in Buildings 40. It is worth mentioning that each lab is equipped with a first aid kit, lab safety manual, and general safety instructions printed on a large-scale noticeboard. This is in addition to signs showing the lab title and the exit emergency doors. Safety glasses and ear protectors are available as appropriate. Fire protection is ensured through centrally installed fire alarm and fire extinguishing water systems as

well as carbon dioxide movable fire extinguishers. Departmental Lab Committee, Faculty of Engineering Safety and Emergency Committee (SEC), and the University General Administration for Security and Safety run periodic auditing of safety in laboratories and communicate findings to the head of the department.

With respect to safety outcomes, it is worth noting that there have been no incidents involving injuries to students, staff, or faculty members involved in instructional activities for at least the past 20 years.

The teaching and learning environment in the program are enhanced through excellent correlation between required course offerings and the laboratory facilities. These integrated laboratory experiences offer students substantial opportunities for hands-on training and experience that make their theoretical studies more meaningful. Instructional laboratories are spacious and equipped with instrumentation to perform both basic and advanced experiments and measurements. The student laboratory stations have test and measuring equipment that is appropriate for the designated type of experimentation. All labs are equipped with basic utilities such as DC and AC electric sources, signal (function) generators, oscilloscopes, and analog and digital multi-meters for measuring the basic quantities (voltage, current, and resistance). Labs also have a few integrated personal computer systems to operate the educational software. For the students to effectively apply the concepts learned in the classroom in a more conducive and learning environment, the maximum number of students per setup in any laboratory is limited to a maximum of 4 students.

The labs designated for special use by the program are as follows:

- **Microwave, Millimeter and sub-millimeter Devices Circuits and Devices Lab**

In this lab, students can design and fabricate microstrip integrated circuits such as antenna, couplers, mixers, and image-guided circuits using advanced design systems (ADS) software. Also, students can measure the antenna characteristics using the Near Field Scanner network. The lab is also equipped with an LFPK Laser Machine for PCB circuit printing which allows students to implement their designs. Also, in this lab the students can design and fabricate a micro strip antenna using high performed VNA – Vector Network Analyzer (AGILENT) up to 50 GHz frequency as well as measure the antenna characteristics using the Anechoic Room in the millimeter wave band (18 – 28 GHz).

- **High Frequency Simulation Lab**

It consists of 7 Powerful DELL Workstation connected to the Internet and can be accessed remotely. These powerful workstations run three different electromagnetic simulators (HFSS, CST and COMSOL). These software are very helpful to design and implement different RF components, Microstrip antennas in the microwave band, Frequency Selective Surfaces and Metamaterials up to Terahertz (THz) frequencies.

- **FSS and Metamaterials Research Lab**

This research lab deals with electromagnetic FSS / metamaterial structures and their applications to antennas, microwave, mm-wave and THz circuits. Students and researchers get involved in analysis, design and measurement of artificial periodic metamaterials, electromagnetic band gap (EBG) structures and frequency selective surfaces (FSS). The lab is equipped with Log Periodic Antennas for Transmission Measurements of Frequency Selective Surfaces, Vector Network Analyzer (10 MHz – 40 GHz), EXA Signal Analyzer (10 Hz – 32 GHz), MXG Analog Signal Generator (100 kHz – 32 GHz), Network Analyzer Electronic Calibration Kit and Metallic Sheet/stand with 30 x 30 cm window to measure transmission through FSS.

- **Microwave Circuits and Fabrication Lab**

This research lab is used for the fabrication of microwave circuits, patch antennas and printed circuit boards. This objective has been achieved using fabrication machine (LPKF-S103). The ProtoMat S103 works particularly fast and precisely with a speed of 100000 RPM, high positioning speed and high mechanical resolution. In combination with the machine's stable granite base, this ensures optimum accuracy for drilling and milling of even very fine structures. The high-frequency milling spindle and the milling depth sensor are self-cleaning and therefore low-maintenance. The system software in the ProtoMat S103 is highly flexible and easy to operate. The software is designed in order to meet the particularly high requirements of RF applications. A parameter library for different materials supports user-friendly operation.

The program also has access to general labs available to all programs within the Electrical and Computer Engineering Department that include:

- Basic Electrical Engineering Laboratory
- Electrical and Electronics Measurements Laboratory
- Electronics Laboratory
- Communications Laboratory
- Digital Systems Laboratory
- Microprocessor and Microcontroller Laboratory
- Computer Laboratory
- Design Projects Laboratory

The computer labs are equipped with more than 100 desktop computers and are open during the regular working period for the staff members. Also, the chairman of the Department can expand the regular working time of the labs when there is a demand of the facility. The necessary software packages needed for program courses are installed in the computers of the labs including Matlab, C++, and Microsoft Office, and their licenses allow them to also be installed on students' computers. All faculty members have PCs in their offices that are connected to the network.

The students of the program can also use the main library computer room facility. This facility is open for all students at King Abdulaziz University from 7:30AM to 10:00PM. The computers of this facility are equipped with internet connections, wireless connections, and basic word processing and computing applications. The main library computer room facility is equipped with open access to most of the international literature Databases. Installation of any specialized software on the hard disks of this facility is not allowed. Similarly, information storage on these hard disks is not allowed and students have no control over this option. However, they can store information on their personal USBs, personal external hard disks, or on their cloud storage.

The Deanship of Information Technology established a supercomputer center that supports the research and educational processes of all departments of the University. The supercomputer center started working in 2014. It should be noted that the Deanship of Information Technology is the central computing support unit and provides many other computing resources. The computer services provided by the Deanship of Information Technology are available to all students and faculty members as soon as they get their ID numbers. Upon application, a computer number and a password are assigned that permit users to access the computer on campus as well as off campus.

3. Procedures to ensure a healthy and safe learning environment

(According to the nature of the program)

A. General Safety Considerations and Housekeeping

The building of the Faculty of Engineering is a modern structure housing all offices, classrooms, and laboratory facilities for all engineering programs. The Department of Electrical and Computer Engineering (ECE) is in building 40. It has a gross area of approximately 10,000 square meters. This space is used for academic and research purposes. The academic space consists of the following functions: classrooms, teaching laboratories, meeting and seminar rooms, chairman and faculty offices, staff offices of clerks and teaching assistants. The research space consists of research and support facilities. The department consistently maintains and updates the facilities allocated to its undergraduate programs to ensure that the instructional and learning environment is adequate and safe for the intended purposes.

Offices, classrooms, laboratories, and supporting facilities are kept clean, well lit, and air- conditioned. They are cleaned regularly, and strict housekeeping practices are considered essential. Laboratory personnel are responsible for ensuring that their workspaces are kept as clean as the work allows. Laboratory supervisors are responsible for ensuring the overall cleanliness of the lab. They are responsible for enforcing the general safety considerations in labs.

They should:

- Know and understand the hazards, safe handling, and operating procedures of the materials, equipment, and methods being used.
- Familiarize themselves with the location of fire alarms, emergency exits, and fire extinguishers.
- Ensure that they are never doubtful of any aspect of the work to be done and, regarding safe handling of material, operation of equipment, experimental technique, etc.
- Ensure that smoking remains strictly prohibited in whole buildings as per the rules and regulations of King Abdulaziz University.
- Ensure that the students' footwear covers feet completely and that open-toe shoes are not allowed, and that approved eye or face protection is continually worn while working with chemicals.
- Restrain loose clothing, long hair, and dangling jewelry.
- Interdict running, horse playing, and joking in labs.

- Report accidents and near misses punctually to the head of the department.
- Follow proven housekeeping practices that lead to a neat, organized, efficient, and most importantly, safe work environment such as:
 - Stairways, hallways, and aisles near the lab are kept clear and never used for storage.
 - Access to emergency equipment and exits are clear of any obstacles.
 - Equipment and chemicals are properly stored and labeled.
 - Spilled chemicals are cleaned up immediately by authorized personnel.
 - Proper protective equipment must be worn when cleaning spills.
 - Waste is placed in appropriate and labeled containers.
 - Old or unlabeled equipment/chemicals are not allowed to accumulate. They must be identified, then disposed of immediately when no longer required.
 - Clean-up once experiments are completed and ensure that the work area is tidied at the end of each day.
 - Electrical cords, hoses, and air pipelines are secured.
 - Do not store large, heavy, bulky, or breakable items on high shelves.

For safety outcomes of KAU Faculty of Engineering, it is worth noting that there have been no incidents involving severe injuries to students, staff, or faculty involved in instructional activities in the past 20 years.

B. Enforcement of Safety Policies and Routine Safety Inspections

In King Abdulaziz University, the General Administration for Security and Safety (GASS) specifies the general safety requirements and precautions while the Faculty of Engineering applies them to various facilities. The safety requirements and precautions are based on national and international standards related to safety requirements and vocational health. The Safety and Emergency Committee in the Faculty of Engineering is responsible for implementing the requirements. It publishes a safety brochure and distributes it to the various departments and programs in the faculty.

The chairmen of all departments ensure through the Department Laboratory Committee (DLC) and the relevant staff members that the published requirements for the safety and protection of employees and students in all programs are correctly implemented. Visits by the Safety and Emergency Committee are made to the program's different facilities regularly to ensure that safety requirements and precautions are met and fulfilled.

C. Student Safety Training

Students are given clear instructions about safety precautions by instructors and technicians during their first lab sessions. The instructions are guidelines that include proper and safe use of tools and equipment in the laboratories and highlight safety. The department chairmen have the authority to take further necessary actions which they deem necessary to prevent accidents or damage to personnel or property, pending investigation by the relevant safety committees and other officers.

The department's policy devotes the first lecture in the labs and workshops to safety. Disposable items such as gloves and ear protectors are available at each lab for student use. Students are required to bring their safety goggles, work jackets, and boots, where appropriate. They are not allowed to enter the lab without wearing them. Personal protection is strictly enforced by the lab/workshop supervisor and the attending technician. The lab/workshop supervisors keep safety items in reserve for any student who might have forgotten to bring his items. Strict measures ensure all labs and workshop areas are clean and free of hazards. In addition to regular checks and inspection of all tools and equipment, a routine calibration check of sensors and equipment ensures the preservation of their accuracy.

Students are coached on how to act in the event of an emergency and safely evacuate the lab/workshop. A hard copy of the Faculty of Engineering Safety Manual is available in all labs and distributed electronically in PDF format to all faculty members, staff, and students. . It can also be downloaded from the Faculty of Engineering website at: <https://engineering.kau.edu.sa/Pages-Safety-Manual-E.aspx>. An Accident Report Form is also available in the labs and workshops and with the lab/workshop supervisor to report any accident to the university safety department and the Dean's office.

The Awareness and Training Division of the Occupational Safety and Health Administration at King Abdul Aziz University is responsible for the preparation of awareness and training programs and virtual experiences within the university on an ongoing basis, as well as the rehabilitation and training of administrative and field operations teams to occupational safety and health. This division is also responsible for connecting all university sectors for cooperation in occupational health and safety areas. The division assists education and training department specialists from inside and outside the university to implement all training and rehabilitation work carried out by the Occupational Safety and Health Administration.

The activities of the training division include the following:

- The preparation of workshops and training courses on occupational health and safety.
- The dissemination of knowledge and awareness about safety standards in the various types of university facilities and particular occupational health and safety conditions in laboratories, workshops, and warehouses.
- Increasing awareness about injuries and possible fatalities caused by accidents in educational facilities.
- Cooperation with experts and different public and private organizations to increase awareness about public safety in educational facilities.
- The documentation of studies is supported by field surveys and lessons learned to disseminate safety culture and continue improvement in occupational health and safety.

D. Protective Equipment for Students and Personnel

Classrooms, offices, and hallways of the department are equipped with smoke detectors, and fire alarms are installed in all corridors, designated locations as per design and need. Each lab has sufficient first-aid kits, lab safety manuals, and general safety instructions printed on a large-scale noticeboard. In addition to that, signs showing the laboratory name and the emergency exit doors are available near each lab. The engineering building has a centrally installed fire alarm system and fire extinguishing water systems. Portable fire extinguishers are regularly checked and dated by the University Maintenance Department. The Departmental Labs Committee, the Faculty of Engineering Safety and Emergency Committee (SEC), and the University General Administration for Security and Safety run periodic auditing of safety measures and requirements in laboratories.

E. Specific Safety Measures in Electrical and Computer Engineering Labs

The department laboratories utilize appropriate work procedures for electrical safety and make sure to mitigate electrical hazards whenever possible. Laboratory personnel are responsible for their electrical equipment. GASS personnel are responsible for the electrical infrastructure of the Faculty of Engineering building. Laboratory personnel are responsible for ensuring that any electrical equipment connected to the building power system is in good condition. All electrical equipment used in the department laboratories are periodically checked by a nationally recognized testing laboratory with a label showing its approval. All electrical apparatus must be properly grounded. The equipment and station area must be dry before energizing the equipment. No food or beverages are allowed inside the laboratories to avoid spillage. Guards or electrical interlocks are used wherever live parts of electrical equipment operating at 50 volts are present to protect against accidental contact. Equipment working at 600 V or greater should be in complete, insulated, secure, and marked enclosures. The use of extension

cords are avoided as much as possible by making permanent wiring solutions available in all laboratory stations. In case of experiencing shocks when the equipment is touched, abnormal heat generation, arcing, sparking, or smoking from the equipment, visible physical damage, or any other sign of malfunction, the lab personnel immediately take the equipment out of service and tag the equipment, "Do Not Use" and arrange for equipment repair either through the equipment manufacturer or through the Faculty of Engineering support as appropriate. Students are not allowed to work alone in the laboratory and laboratory personnel must always be present. Emergency procedures in each laboratory are clearly posted in multiple places on the laboratory walls including emergency phone numbers. The laboratory safety manual for each laboratory is designed to address the specific equipment present and the students are required to go over it during their first laboratory session.

H. Conclusion

In conclusion, the field of electronics and telecommunication encompasses a wide range of technologies and systems related to the transmission and reception of information over long distances. It deals with the generation, processing, transmission, reception, and utilization of signals, typically in the form of electrical or electromagnetic waves, to convey information. Here's an overview of key components and concepts within this field. These 2 mutual fields may have some details as follows:

Electronics: This branch focuses on the control of electrical energy with the help of active and passive devices such as diodes, transistors, integrated circuits (ICs), resistors, capacitors, and inductors. Electronics is fundamental to various aspects of technology, including digital and analog circuits, signal processing, power electronics, and embedded systems.

Telecommunication: Telecommunication involves the transmission of signals over a distance for the purpose of communication. This can include voice, data, video, and multimedia transmissions. Telecommunication systems typically consist of transmitting and receiving devices, along with communication channels such as optical fibers, coaxial cables, microwave links, and wireless networks.

Digital Communication: Digital communication involves the transmission of data in digital form, where information is represented using binary digits (bits). It encompasses various techniques such as modulation, coding, multiplexing, and error correction to ensure reliable and efficient transmission of data over communication channels.

Analog Communication: Analog communication deals with the transmission of continuous signals that vary in amplitude, frequency, or phase over time. Examples include Amplitude Modulation (AM), Frequency Modulation (FM), and Phase Modulation (PM). Analog Communication is still relevant in applications such as radio broadcasting and analog telephony.

Wireless Communication: Wireless communication enables the transmission of information without the need for physical wired connections. It includes technologies such as radio frequency (RF) communication, cellular networks, satellite communication, Bluetooth, Wi-Fi, and emerging technologies like 5G and Internet of Things (IoT) devices.

Optical Communication: Optical communication utilizes light signals to transmit information over optical fibers. It offers high data rates, low attenuation, and immunity to electromagnetic interference, making it suitable for long-distance communication in telecommunications networks, fiber-optic sensors, and laser-based communication systems.

Signal Processing: Signal processing involves the manipulation and analysis of signals to extract useful information or enhance their quality. This includes techniques such as filtering, modulation, demodulation, equalization, compression, and digital signal processing (DSP), which are essential in various communication systems and electronic devices.

Networking: Networking focuses on the interconnection of multiple devices to enable communication and resource sharing. It includes technologies such as Ethernet, Internet Protocol (IP) networking, routing, switching, network security, and protocols like TCP/IP, UDP, and HTTP, which form the backbone of modern telecommunications and internet infrastructure.

Overall, the electronics and telecommunication field play a crucial role in enabling global connectivity, powering modern communication systems, and driving innovation in areas such as wireless technology, digital multimedia, internet services, and smart devices. It continues to evolve rapidly, driven by advancements in semiconductor technology, wireless standards, networking protocols, and consumer demand for faster, more reliable communication solutions.