QU
Saudi Arabia

Qassim University
جامعة القصيم

COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
BSc STUDENT HAND BOOK

1442/1443 A.H.

2020/2021 A.D.

www.qu.edu.sa

BSc STUDENT HAND BOOK

ELECTRICAL ENGINEERING

COLLEGE OF ENGINEERING

JMD I 1443 H

JANUARY 2022 A.D

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Introduction

The Electrical Engineering Program Manual provides information about the requirements for the Bachelor of Science (BSc) Program, in Electrical Engineering. The Bachelor of Electrical Engineering consist of two tracks (Power Engineering Electronic and communication Engineering). Each of the two tracks, have their own courses. Students enrolled in Electrical Engineering are primarily interested in the area of Electrical Engineering,

ABOUT THE EE DEPARTMENT

Electrical engineers are essential to almost every industry. It is in fact difficult to imagine a modern industry without the services of electrical engineers. Electrical engineering has been and continues to be a corner stone in every new technical development. The job of Electrical engineers usually involves design, feasibility studies, cost analysis studies, installation, operation, and maintenance of plants, processes, or equipment. Figure 1 show the structure of the quality assurance teams in EE department.

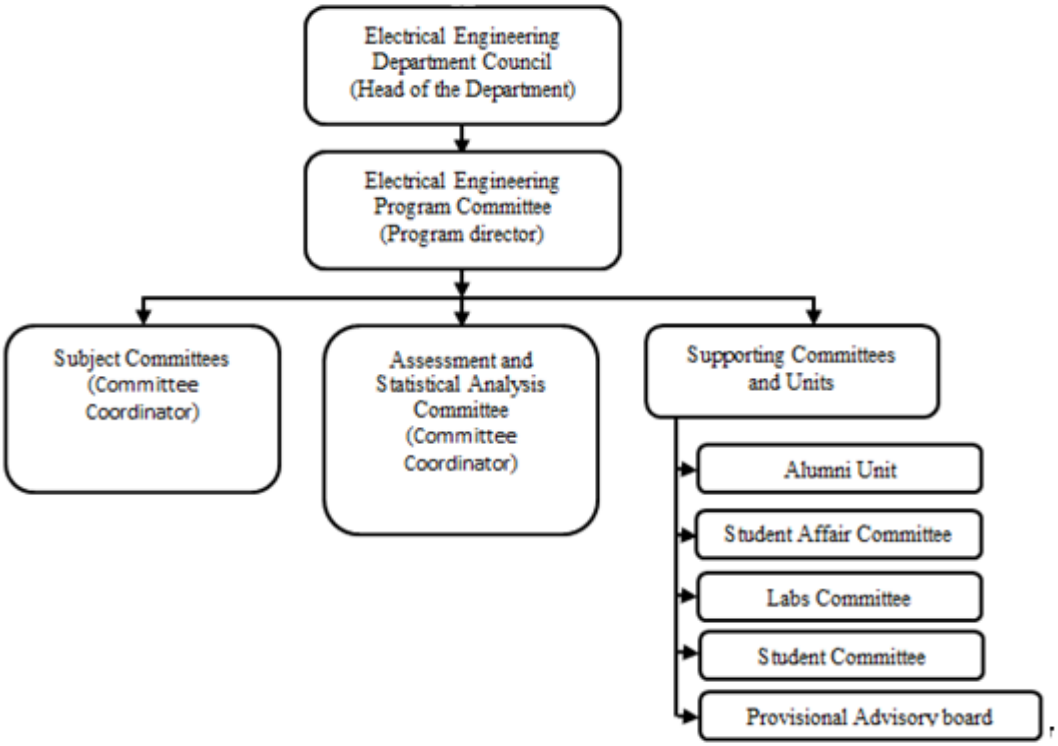


Figure 1: EE Department Structure

The focusing of the Electrical Engineering Department is on teaching, community service, and research. The department faculties recognize the need to provide the graduating engineer with the appropriate background in order to meet the challenges and large demands of a fast growing country such as the Kingdom. The department of Electrical Engineering mission is to provide education of quality, research, and community services that cover a broad spectrum of electrical engineering areas. These areas include design, operation, maintenance, and evaluation of governmental, industrial, and service systems.

Department Mission

The Electrical Engineering Department seeks to meet the needs of the Saudi society and the region through offering outstanding

BSc Program Mission

The electrical engineering program mission is "Graduating distinguished electrical engineers, and performing research and community services in an inspiring, energizing and governable environment to promote self-resources, adopt recent technologies and sustainably develop the Saudi society."

Program Education Objectives

The electrical engineering department in cooperation with its constituencies has identified the following list of program educational objectives

1) Preparation of the graduates to have a successful career as electrical engineers in governmental and private sectors.
2) Preparation of the graduates to pursue their professional development through self-learning and advanced degrees.
3) Preparation of the graduates to progress to positions of leadership in their profession.
4) Preparation of the graduates to effectively participate in the sustainable development of the Saudi Society.

Graduate Attributes:

The graduates of Electrical Engineering program should be able to:

1. Possession of facts, information, ideas, issues, trends, theories and knowledge relevant to Electrical Engineering.

2. The ability to analyze and critically evaluate information, concepts, methods and theories related to Electrical Engineering.
3. The ability to develop new knowledge gained through innovative scientific research that generally contributes to Electrical Engineering.
4. Possess the cognitive and technical skills to analyze and process data and information.
5. Possess effective communication, numerical and information technology skills.
6. The ability to independently create, design and implement research operations.
7. The ability to take appropriate decisions and assume the role of leadership, and address Engineering problems.
8. The ability to work in a team and solve real problems in the field by linking knowledge and its applications.
9. Awareness of professional ethics, ethics of scientific research, and ethics of dealing with technology and its tools.

NCAAA PLO's

The main goal of the Program Learning Outcomes (PLOs) is dedicated for the BSc program in department with information for evaluating student learning and identifying areas for instructional or curricular improvement. Table 1 shows the details of the PLOs:

Table 1. Program Learning Outcomes (PLOs) for EE Department

Knowledge and Understanding	
K1	Acquire knowledge of Basic sciences (math, physics, management, economy, etc.) and Basic Engineering sciences.
K2	Identify complex electrical engineering problems by recognizing the principles of electrical engineering, basic sciences and mathematics governing these problems.
K3	Relate knowledge of Math, Statistics, basic sciences to their engineering specialization, together with in-depth knowledge of that specialization.
K4	Comprehensively Identify research and inquiry methodologies

Skills	
S1	Formulate, and solve complex electrical engineering problems by applying principles of engineering, science, mathematics.
S2	Apply appropriate engineering techniques, and modern IT tools, including prediction and modeling to electrical engineering devices/equipment/components and systems to assess their characteristics and operating performance.
S3	Design a device/component/equipment/system or process related to the electrical engineering field.
S4	Communicate effectively, both orally and in written form using appropriate media, on complex engineering activities with the engineering community and withsociety.
S5	Conduct inquiries, investigations, and research for complex issues and problems.
S6	Investigate various electrical engineering problems through developing and conducting experiments, analyzing, interpreting data, and synthesizing ofinformation to provide valid conclusions.
Values	
V1	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.
V2	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technologicalchanges.
V3	Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meetobjectives.

ABET SO's

The student outcomes as per the newly adopted Criteria for Accrediting Engineering Programs as approved by ABET (Website: https://www.abet.org) have redefined student outcomes labeled as (1) through (7). They are reproduced below and, as per ABET's recommendation, they are to be applied to the cycle starting in 2019-2020 and afterward.

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.

Program Strategic Goals

The program goals of the Electrical Engineering Department are the attributes (knowledge, skills, and behaviour) that the program graduates will be able to successfully demonstrate during a short time. In order to accomplish its mission, the department in cooperation with its constituencies has identified the following list of Program Strategic Goals:

1. Prepare the graduates for a successful career as electrical engineers in governmental and private sectors
2. Carry out scientific applied research and offer consultation services
3. Strengthen the communication, cooperation and partnership with the community.
4. Participate in adopting advanced technologies and introducing innovations.
5. Contribute effectively in the sustainable development of the Saudi society

Career Opportunities

All engineering jobs in the government.

1- The projects operation and maintenance in the government.
3- The ministry of water and electricity.
4- The ministry of municipal and village affairs.
5- The Saudi commission for the engineers.
6- The general institution for the waters refinement.
7- The general institution for ports.
8- Saudi airlines.
9- The military occupations management.
10- The constructions and contracting companies.
11- The electronics and communication companies.
12- The power and electric energy companies.
13- The Ministry of transportations.
14- The Ministry of agriculture and water recourses.
15- The general institution for the electricity.
16- The water and sewage authority.
17- Saudi Arabia Aramco company.
18- Saudi company for the basic industries (SABIC).
19- The unified Saudi company for electricity (SCECO).
20- All factories.

Admission Conditions

The admission to College of Engineering requires the completion of the preparatory year program of Qassim University. The number of students who can be accepted in the College of Engineering is determined yearly by the University Council takinginto consideration the College capacity. Then, the students who have the desire to join the College of Engineering compete based on their GPA in the preparatory year program.

Admission to EE program

The admission to the department depends on:

- The student desire
- The Student GPA
- The capacity of the department

Studying System

According to the educational plans; a student may complete any of the departmental• programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the selected program if he completed (after the PYP) a total of 139 credit-hours. In details, the 139 credit-hours include:

- University requirements (12 credit-hours)
- College requirements (48 credit-hours)
- Program and/or Departmental requirements (73 credit-hours) for each of the two tracks offered by the department. The two tracks are the Power Engineering track and the Electronics & communication Engineering track. The student has to select one of these two tracks. The 73 credit hours for each track are divided to:
    - Common basic Courses (37 credit hours)
    - Compulsory track courses (30 credit hours)
    - Elective courses 6 credit-hours.
- The Free Courses: 6 credit hours are to be selected among the set of courses available in the university.

COLLEGE EDUCATION SYSTEM

The educational system in the college is based on two main semesters per educational year - each semester is fifteen weeks' length. In addition, an optional eight weeks summer semester may be offered.

Course Requirements

According to the educational plans, a student may complete any of the engineering programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the selected program if he completes, after the PYP, a total of 139 credit hours as shown in the table below.

Requirement		CR	%
University Requirements (12 CR)		12	8.63
College Requirements (48 CR)	Compulsory	42	30.22
	Elective	6	4.32
Program/Department Requirements (73 CR)	Compulsory	63	45.32
	Elective	10	7.19
Free Courses (6 CR)		6	4.32
Total		**139**	**100**

University Requirements

Twelve credit-hours are required by the University in order for graduation. A listof these courses comes next.

College Requirements

The college of engineering requires that student must complete 48 credit hours before graduation. Six out of the 48 credit hours are elective courses and the rest are Compulsory courses.

Program and/or Departmental Requirements

Each department requires the completion of 73 credit hours distributed between specialized courses offered by the department itself or offered by other departments of the college.

Free Courses

Six credit hours have to be selected among the set of courses offered by the university.

Academic Supervision

An academic advisor is assigned to each student. In addition, there is full-time staff in the Students Affairs Office to help them in this regard. The student is advised to meet with his academic advisor at least once per semester which should be prior to course registration. The academic advisor may assist the students on:

- Course choices, selections, and degree requirements.
- Selecting the elective and free course that match student's future development and career goals.
- Regulations, policies, and procedures on transfer credits, and academic curricula.
- Getting information about scholarships, coop training opportunities, fellowships, and undergraduate research opportunities within the department.
- Identifying and assessing alternatives and consequences of their decisions related to career goals.

Withdrawal

A student has the right to withdraw from an academic semester -without being considered fail within the withdrawal period announced in the academic calendar for the current semester. The withdrawal must be submitted to the college dean. No withdrawal is allowed during the last five weeks before the final examinations.If the college council accepted the student excuse, the council may search for additional chance of final examinations.

Transfer to the college of engineering

The college of engineering accepts the transfer applications from other colleges whether from Qassim University or from outside Qassim University. A transfer may be approved if the applicant completed his PYP and has achieved a minimum GPA set by the College council. The accepted applicant may transfer his previous achieved courses to the equivalent courses at the college of engineering in Qassim University.

Attendance

Regular engineering courses require full time attendance for academic success. The college requires that students should attend at least 75% of the lectures, practical and laboratorial sessions A student failing to meet this limit in any of his registeredcourses will be prohibited from attending the final examination of this course. His GPA for this course will be ZERO.

Status of Discontinuity

A student is considered to be in a Status of Discontinuity in one semester if:

1- He did not, or failed to, register in one semester.
2- He withdrew from this semester.

The validity of the causes is not an issue for discussion. It is permissible for a student to be in a discontinuity status for a maximum of two successive semesters, or a total of three non-successive semesters during his enrollment at QEC. Exceeding these limits ends up by terminating the student's enrollment at QEC.

Any student, who loses his QEC- studentship due to any of the discontinuity conditions mentioned above can appeal to be readmitted to the college based on the following conditions:

1- The student discontinuity did not exceed four semesters
2- He has to satisfy all the admission conditions announced at readmission.
3- He should keep the same university personal identification number (PIN) as well as his records he had prior to the discontinuity status.
4- The student's appeal must be approved by the College Dean.
5- The Dean, based on a recommendation from the associated department council, may require the student to retake any course that he has passed before.
6- If the student discontinuity exceeded four semesters, and it was not due misconduct, he can apply for admission as a new student or freshman. In this case all his academic records will be ignored.

Examinations and Grading System

The final grade of a specific course is the summation of the final exam grade and a grade corresponding to the class work during the semester. Each course has a total of 100 points. The grade of the semester work is within 50% to 60% of the total final grade of the course. The rest, however, is assigned for the final exam. A student must have a total of at least 60% of the total marks to pass a specific course. The grading system of QEC is explained in the next table:

Grade Letter	Numerical average %		Points
	From	To less than	
A+	more than or equal to 95		5.00
A	90	95	4.75
B+	85	90	4.50
B	80	85	4.00
C+	75	80	3.50
C	70	75	3.00
D+	65	70	2.50
D	60	65	2.00
F	Less than 60		1.00

A student's semester Grade Point Average (GPA) is calculated by dividing the cumulative point value of all his semester's courses by the total number of semester credit hours he registered for. The following is an example of a hypothetical student's report having six hypothetical courses.

Subject	Credit Hours	Grade Letter	Points	Point product
1	2	B+	4.50	4.5 x 2 = 9
2	3	D	2.00	2 x 3 = 6
3	3	C	3.00	3 x 3 = 9
4	4	D+	2.50	2.5 x 4 = 10
5	1	B	4.00	4 x 1 = 4
6	5	C	3.00	3 x 5 = 15
Total	18			53

This student's semester Grade-Point-Average (GPA) is 53/18 = 2.944

The cumulative GPA of a student is calculated by considering all the achieved courses since he was first admitted to the college till the time his-GPA is required to be calculated at. The graduation grade of a student is considered based on his cumulative GPA according to the following table:

Cumulative GPA	Graduation Grade
From 4.5 and up	Excellent
From 3.75 to less than 4.5	Very good
From 2.75 to less than 3.75	Good
From 2.00 to less than 2.75	Sufficient

Academic Evaluation for Student Standing

It is expected from all QEC-students to be in good academic standing. A student with GPA less than 2 is not eligible for graduation. A student fails to maintain an accumulating GPA less than 2.0 in any semester will be warned. Three warnings will put the student in dismissing conditions from the college and the university rules -on this case- will be applied.

Education Resources

- Textbooks
- Lectures
- The World Wide Web (Internet)
- Seminars
- Conferences
- Training Courses

COLLEGE FACILITIES

Students Affairs Office

The college has a students' Affairs Office which is headed by an engineer and has two full-time expert members. The office is supported and linked to the Deanship of Admission and Registration. The office is equipped with computers connected to the university local network. The main tasks of this office are:

- The office helps in the registration of students, and supplies the necessary data concerning the students' enrolment and their progress. These documents help in the evaluation process.
- The office staff has access to the registration program to help solve problems which face the students during the registration.
- The office director participates in the committee which distributes the students after the first level to the different departments of the college.
- The office monitors the attendance of the students so that the rules of exclusion of attending the final exams are firmly applied.

- The Student Affairs Office arranges and controls all matters related to the midterm, final written exams and written outcomes achievement exam. In this regard, the office prepares the exams time table, assigns exams places, assigns exams supervisors, collects the exam questions from the faculty members, and arranges for supplying the answer sheets.
- The office also participates in informing the students about any important activities, dates, news, rules through the college web-site and/or by cellular SMS's.

Students' Activities

The student affairs deanship supervises most of the students' activities. This includes cultural, recreational, and social activities. These activities enhance the students' learning ability as well as it demonstrates good chance for entertainment and stress relief. Samples of these activities are:

1- Cultural activities: in all fields
2- Social activities like traveling and visiting major industrial cities and large scale engineering projects.
3- Recreational activities such as arranging races in football, tennis and billiards.

In addition, the college has a mosque, a cafeteria, and a student club. The club is a complementary part to of the college mission and it is a center for student activities such as discussions, workshops, competitions, culture, training, sports, social and various student related activities. Students from various departments are enrolled as club members. Members usually contribute with their creative ideas, and discuss events for the future planned activities, during meetings held by the club. All teaching staff supporting student activities can participate in this club.

College Scientific Journal

The college of engineering supervises the publication of the bi-annual Qassim University Journal of Engineering and Computer Sciences. Contributions to this journal are not limited to staff members of the college but are open to contributors from inside and outside the Kingdom of Saudi Arabia. Papers are published after being refereed by national and international specialists. This journal is considered a good journal for publication and its papers are considered by the scientific councils in all KSA universities for promotion.

PHYSICAL FACILITIES

In addition to the specialized laboratories in each department -which will be explained in the hereafter- the college contains a number of laboratories, drawing halls, teaching halls and computer laboratories which will serve all the college departments. These physical facilities are:

- Workshop
- Computer laboratories
- Drawing halls
- Active learning halls
- Teaching halls

Workshop

A workshop with many equipment and tools is used in conjunction with teaching GE 105: Basics of Eng. Technology. The workshop is located in the Department of Mechanical Engineering and has Lathes, Milling machines, Shaper, Drill Press, Band Saws, Grinder, Welding and Hydraulic Cutter.

Students of the junior levels get trained in the workshop and perform experimental exercises for different industrial programs. Moreover, the students carry out manufacturing of equipment and experimental models for their graduation projects. The workshop is utilized also in research projects performed by the college staff members.

Computer Laboratories

The college has two computer laboratories supervised by teaching staff members. The laboratories are well equipped with extensive licensed software libraries and up• to-date printers and scanners. The laboratories are utilized in graduation projects and in teaching computer sciences as well as these engineering courses which require computer application. The computer facilities include the service of electronic mail, internet. The capacity of each laboratory is about 40 students.

Drawing Halls

The college has two halls for engineering drawing. These halls are utilized in teaching GE 104: Basics of Engineering Drawing. The halls are equipped with thirty drawing tables equipped with all facilities necessary for drawing.

Active Learning Halls

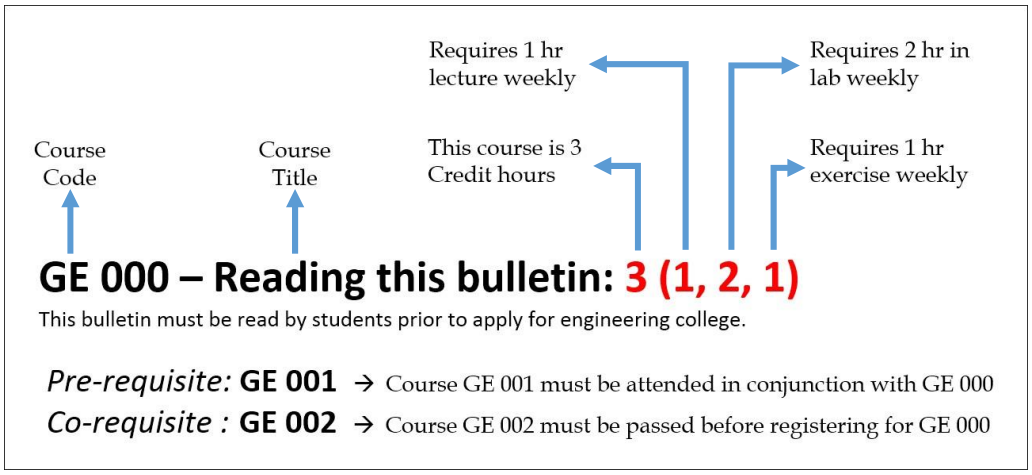
Four new active learning halls are constructed and well prepared for engineering design courses (GE 211 & GE 213). Two halls are assigned for each course. The active learning halls are prepared with the necessary equipment required for creating the appropriate active learning environment. In these courses teams of students (usually five students each) meet to discuss the assignments and to perform active learning procedures.

Teaching Halls

The college contains a number of teaching halls. The halls are equipped with the most recent educational equipment like whiteboards, overhead projectors, internet connections, electric supplies, air conditioners and more.

Electrical Engineering Degree Requirements

The following are the requirements for the degree of Bachelor of Science in Engineering for different programs offered by QEC. A hypothetical course is given next as an example of how to read codes and terminologies.



The following set of symbols, *arranged in alphabetic order*, is used in this bulletin:

Symbol	Meaning
ARAB	Arabic Language
CE	Civil Engineering
CEN	Computer Engineering
CHEM	Chemistry
CSC	Computer Science
ECON	Economy
EE	Electrical Engineering
GE	General Engineering

Symbol	Meaning
GEO	Geology
IC	Islamic Culture
MATH	Mathematics
ME	Mechanical Engineering
MGMT	Management
PHYS	Physics
STAT	Probability & Statistics

University-Course Requirements

The following courses are required by the University for graduation.

No	Course Code	Course title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	ARB 101	Linguistic skills	2	2	-	-	-	-
2	ARB 103	Arabic Writing	2	2	-	-	-	-
3	IC 101	Introduction to Islamic culture	2	2	-	-	-	-
4	IC 102	Islam and Community Building	2	2	-	-	IC 101	-
5	IC 103	Economic System in Islam	2	2	-	-	IC 101	-
6	IC 104	Political System in Islam	2	2	-	-	IC 101	-
Total credit hours: **12**								

College-Course Requirements

Compulsory Courses

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	CHEM 111	General Chemistry	4	3	2	-	-	-
2	CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
3	ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
4	GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
5	GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
6	GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
7	GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
8	MATH 106	Integral Calculus	3	3	-	1	-	-
9	MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
10	MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
11	MATH 208	Differential equations	3	3	-	1	MATH 203	-
12	MGMT 402	Project Management	3	3	-	1	Pass 90 cr	-
13	PHYS 131	General Physics	4	3	2	-	-	-
14	STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
Total credit hours: **42**								

Elective Courses

Two elective courses may be selected from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
GE 412	Value Engineering	3	3	-	1	GE 213	-
MATH 244	Linear Algebra	3	3	-	1	MATH 107	-
MATH 254	Numerical Methods	3	3	-	1	MATH 106 MATH 107	-
MATH 328	Applied Operations Research	3	3	-	1	MATH 107	-
MGMT 411	Development of Management skills	3	3	-	1	GE 211	-

PREPARATORY YEAR PROGRAM

The Preparatory Year Program (PYP) is taken into consideration as levels 1 and 2 in the graduation program. In these levels, students study the following courses:

1st Level

Course Code	Course Title	Credit Hours
CSC 105	Computer Skills	4
ENG 0011	Preparatory English (1)	8
PHYS 110	Physics (1)	2
PSYCH 101	Thinking Skills and Learning Styles	2
STAT 100	Statistics	2
Total Hours		**18**

2nd Level

Course Code	Course Title	Credit Hours
CSC 111	Computer programming	3
ENG 0012	Preparatory English (2)	5
ESP 102	English for Engineering and Computer Science	2
MATH 105	Calculus	3
PHYS 115	Physics (2)	3
Total Hours		**16**

COURSES DESCRIPTION

The next section shows the degree of Bachelor of Science in Engineering for different programs offered by QEC.

Compulsory Courses

CHEM 111 - General Chemistry: 4 (3, 2, 0)

Stoichiometry: SI Units, chemical formulas, the mole, methods of expressing concentration, Calculations based on chemical equations. Gases: laws, kinetic theory, deviation and van der Waals equation. Thermochemistry: Types of enthalpy changes, Hess Law and its applications, first law of thermodynamics. Solutions: Type of solutions and laws related, colligative properties. Chemical kinetics: Law of reaction rate, reaction order, factors affecting the rates. Chemical Equilibrium: Relation between Kc & Kp, Le Chatelier's principle and factor affecting equilibrium. Ionic equilibrium: Acid and base concepts, pH calculations of acid, base and buffer solutions. Atomic Structure: emission spectrum, Bohr's theory de Broglre's hypothesis, quantum numbers, electronic configuration of elements, consequences of the periodic table.

CSC 209 - Computer Programming: 3 (2, 2, 0)

Introduction to computers and computing fundamentals in JAVA, Data Types, Variables, Operators, Control Structures, Simple input/output statement, Classes & Objects, Methods, Relational and logical expressions, IF-ELSE control structure, The WHILE statement, The FOR statement and looping structure, Introduction to Swing & graphical user interfaces, Arrays Matrix Methods, Vectors, String, Engineering Applications.

ECON 401- Engineering Economy: 3 (3, 0, 1)

Introduction to engineering economy. Interest formulas and equivalence. Bases for comparison of alternatives. Decision making among alternatives. Evaluating replacement alternatives. Break-even and minimum cost analysis. Cost accounting. Depreciation. Economic analysis of operations. Economic analysis of public projects.

GE 104 - Basics of Engineering Drawing: 3 (2, 2, 0)

Geometrical construction and basics of lettering, Sketching, Orthographic projection, Sectional and auxiliary views, Dimensioning, Introduction to computer graphics.

GE 105 - Basics of Engineering Technology: 2 (1, 2 , 0)

Introduction; Function and planning of workshop; Properties of materials and their applications; Non-ferrous Metals - Ferrous Alloys Production of Iron and Steel, Plain Carbon and Alloy Steels - Tool Steels and the Iron-Carbon Diagram - Heat Treatments of Steels: Heating, Quenching, Tempering, Annealing, Aging, and Surface Hardening, Destructive and Nondestructive Testing of Metals. Workshop metrology; Basic bench work operations; Machining operations; Tools, equipment and machinery used in basic workshop processes: turning, milling, grinding, forging, sheet metal-work; Welding processes: gas welding, arc welding, spot welding. Casting processes: sand casting, die casting; Industrial safety.

GE 211- Introduction to Engineering Design-I: 3 (2, 4, 0)

Engineering design or how engineers approach and solve problems; process and product design; quality principles; working in teams; presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc

GE 213 - Introduction to Engineering Design-II: 2 (2, 2, 0)

Computer or mathematical modeling of process and product, continuation of quality principles, working in teams, presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self-regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc.

Pre-requisite: GE 211

MATH 106 - Integral Calculus: 3 (3, 0, 1)

Fundamental theorem of calculus, the definite and indefinite integral, numerical integration. Area, volume of revolution, work, arc length. Differentiation and integration of inverse trigonometric functions. The logarithmic, exponential, hyperbolic and inverse hyperbolic functions. Techniques of integration:

substitution, by parts, trigonometric substitutions, partial fractions, miscellaneous substitutions. Indeterminate forms, improper integrals. Polar coordinates.

Pre-requisite: MATH 105

MATH 107 - Linear Algebra & Analytic Geometry: 3 (3, 0, 1)

Introduction to the conic sections, The parabola; translation of coordinate axes, The ellipse, The Hyperbola, Rotation of axes; second degree equation. Systems of linear equations and matrices: Introduction, Gaussian elimination, Matrices and matrix operations, Inverses; Rules of matrix arithmetic, Elementary matrices and a method for finding A-1, Further results on systems of equations and inevitability, Diagonal, Triangular and symmetric Matrices. Determinants: Determinants by cofactor expansion, Evaluating determinants by row reduction, Properties of the determinant function, A combinatorial approach to determinants Vectors in 2-space and 3-space: Introduction to vectors, Norms of a vector; vector arithmetic, Dot product, Lines and planes in 3-space.

MATH 203 - Differential and Integral Calculus: 3 (3, 0, 1)

Infinite series, convergence and divergence of infinite series, integral test, ratio test, root test and comparison test. Conditional convergence and absolute convergence, alternating series test. Power series. Taylor and Maclaurin series. Functions in two or three variables, their limits, continuity and differentiability, The chain rule, Directional derivatives; gradient, Tangent planes, Maxima and Minima for function in two or three variables, Lagrange multipliers, Double integral and its applications to area, volume, moments and center of mass. Double integrals in polar coordinates. Triple integral in rectangular, cylindrical and spherical coordinates and applications to volume, moment and center of mass. Vector fields, line integrals, surface integrals, Green's theorem, the divergence theorem. Stoke's theorem.

Pre-requisite: MATH 106

MATH 208 - Differential equations: 3 (3, 0, 1)

Different types of first order differential equations and its applications. Linear differential equations of higher order. Linear differential equations with constant coefficients. Reduction of the order. Series solution of ordinary differential equations. Frobenius's method. Fourier series of odd and even functions. Integration of Fourier series.

Pre-requisite: MATH 203

MGMT 402 - Project Management: 3 (3, 0, 1)

Basic Management Process approach, Defining Project, Project life cycle, Balancing competing demands with triple constraints, Strategies and planning, methods, Project planning and scheduling, integrated project planning, Quality management, Bar• charts and Gantt Chart, critical path methods, PERT method, resource leveling and allocation, time-cost trade off. Construction and organizational approaches, leadership elements, and decision making. Time and cost control, Project Closing. computer applications.

PHYS 131 - General Physics: 4 (3, 2, 0)

Electromagnetism: Coulomb's law in the electric fields, Gauss law, Electric potential, Energy stored, Capacitance and dielectrics, Current and resistance, Electric energy and power, Direct current circuits, Kirchhoff "s Rules, Magnetic fields, Motion of a charged particle in a magnetic field, Sources of the Magnetic fields, Ampere's law, Faraday 's law, in the inductance, Mutual inductance, Alternative current circuits, RMS values, Impedance, Resonance, Power in RLC circuits. Nuclear Physics: Photoelectric effect, Atomic spectrum, Bohr model, Nuclear structure, Radioactivity Decay, Half life, Radioactive Decay.

STAT 328 - Probability and Statistics: 3 (3, 0, 1)

Some discrete probability distributions (Uniform, binomial, multinomial, hyper-geometric, negative binomial, geometric and Poisson distributions, Mean and variance for these distributions, relationship between Poisson and hyper-geometric with binomial distributions) Some continuous probability distributions (Uniform, standard Normal, Normal, Area under the normal curve, Application of the normal distribution, mean and variance, Normal approximation to the binomial) Fundamental sampling distributions and data descriptions (Random sampling, some important statistics, Sampling distribution (central limit theorem), Sampling distribution of mean and difference between two means for large samples (and for small samples taken from normal distribution), t-distribution (its applications) One- and Two-sample estimation Problems (Statistical Inferences, Classical method of estimation, Estimating the mean, Standard error of a point estimate, Prediction Interval, Estimating the difference between two means (for known and unknown (equal) variances), Estimating a Proportion, determination of the sample size at a specified error) One-and two-sample tests of hypotheses (Null and Alternative hypotheses, type I error, type II error, one and two tailed tests, P value, tests concerning a single mean, tests on two means (for variance

known and unknown), test on a single proportion) Simple Linear Regression (Least squares and the fitted model, Properties of the least square estimators, Inferences concerning the regression coefficients, prediction).

Elective Courses

GE 412 - Value Engineering: 3 (3, 0, 1)

Introduction, Defining value; overview of value engineering, Project budget; capitalized value. Determining value through cost, market, and income approaches. Models for value engineering. Function identification analysis and FAST diagrams. Weighted evaluation and decision analysis techniques. Bidding and Procurement. Developing a detailed implementation plan. Life cycle costs including maintenance and operating costs. Value engineering workflow.

Pre-requisite: GE 213

MATH 244 - Linear Algebra: 3 (3, 0, 1)

General review of vectors in space and its engineering applications, Euclidean n–space, linear transformation from n-space to m-space and its properties. General vector in space, subspaces, linear independence, row space, column space, and null space. Inner products in space, angle and orthogonality in inner product spaces, best approximation: least squares, orthogonal matrices. Eigenvalues and eigenvectors.

Pre-requisite: MATH 107

MATH 254 - Numerical Methods: 3 (3, 0, 1)

Numerical Solution of non-linear equations and associated errors, convergence rate, solution of system of equations by direct and repeated methods and associated errors, Interpolation and polynomial approximation and associated errors, Numerical differentiation and integration and associated errors, Introduction to numerical solutions for ordinary differential equations.

Pre-requisite: MATH 106, MATH 107

MATH 328 - Applied Operations Researches: 3 (3, 0, 1)

Introduction to operation research methodology and applications, Building of mathematical models, Linear programming models, The simplex algorithm, Duality

and sensitivity analysis, Transportation and assignment models, Network models, Integer programming, Using Optimization Software.

Pre-requisite: MATH 107

MGMT 411 - Development of Management Skills: 3 (3, 0, 1)

Course definition and introduction to management and quality, Basics and definitions of management, Basics and definitions of quality, Qualities top issues. Kaizen Systems: Total Quality Management TQM, Totally Productive Maintenance, Suggestion System, Just in Time: Production System, Activities in small Groups QC. Leadership.

Pre-requisite: MATH 107

ELECTRICAL ENGINEERING PLAN

Core Courses

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
1	EE 201	Fundamentals of Electric Circuits	3	3	-	1	PHYS 131	-
2	EE 202	Electric Circuit Analysis	3	3	-	1	EE 201	-
3	EE 203	Electromagnetism	3	3	-	1	PHYS 131	-
4	EE 205	Electric Circuits Laboratory	1	-	2	-	-	EE 202
5	EE 208	Logic Design	3	3	-	1	-	-
6	EE 210	Logic Design Laboratory	1	-	2	-	-	EE 208
7	EE 300	Instruments & Electrical Measurements	3	2	2	-	EE 205	-
8	EE 301	Signals and systems Analysis	3	3	-	1	EE 202	-
9	EE 312	Electronics - 1	3	3	-	1	EE 202	-
10	EE 313	Electronics Laboratory - 1	1	-	2	-	-	EE 312
11	EE 351	Principles of Control Systems	3	3	-	1	EE 301	-
12	EE 354	Microprocessors and Interface Circuits	3	2	2	-	EE 208	-
13	GE 406	Summer Training	2	2	-	-	Pass 100 cr	-
14	EE 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
15	EE 492	Senior Design Project - 2	2	1	2	-	EE 491	-
	Total		37					

Compulsory Courses

Power Engineering Track

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
1	EE 330	Electric Machines - 1	3	3	-	1	EE 202	-

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
							EE 203	
2	EE 331	Electric Machines - 2	3	3	-	1	EE 330	-
3	EE 332	Electric Machines Laboratory	1	-	2	-	-	EE 331
4	EE 340	Fundamentals of Power Systems	3	3	-	1	EE 202 EE 203	-
5	EE 343	Power Systems Analysis	3	3	-	1	EE 340	-
6	EE 344	Power Systems Laboratory	1	-	2	-	-	EE 343
7	EE 432	Power Electronics	3	3	-	1	EE 312	-
8	EE 437	Power Electronics Lab	1	-	2	-	-	EE 432
9	EE 446	High Voltage Engineering	3	3	-	1	EE 340	-
10	EE 482	Design of Electrical Protection Systems	3	3	-	1	EE 340	-
11	GE 210	Engineering Mechanics	3	3	-	1	MATH 106	MATH 107
12	ME 322	Mechanical power engineering	3	3	-	1	PHYS 131	-
	Total		30					

Electronics & communication Engineering Track

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
1	CEN 354	Principles of Networks Engineering	3	3	-	1	-	-
2	EE 317	Electronics - 2	3	3	-	1	EE 312	-
3	EE 319	Electronics Laboratory - 2	1	-	2	-	EE313	EE 317
4	EE 320	Communications Principles	3	3	-	1	EE 301	-
5	EE 322	Digital Communications	3	3	-	1	EE 320	-
6	EE 326	Communications Laboratory	1	-	2	-	EE 320	EE 322
7	EE 405	ICs Technology and Applications	3	3	-	1	EE 317	-
9	EE 406	Integrated Circuits Laboratory	1	-	2	-	-	EE 405
8	EE 420	Information Theory and Coding	3	3	-	1	EE 320	-
10	EE 423	Wave Propagation and Antennas	3	3	-	1	EE 203	-
11	EE 463	Mobile Communications	3	3	-	1	EE 320	-

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
12	GE 210	Engineering Mechanics	3	3	-	1	MATH 106	
	Total		30					

Elective Courses

Power Engineering Track

Students should complete 6 credit hours from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
EE 401	Electrical Standard Specifications	3	3	-	1	EE 343 EE 331	-
EE 433	Special Electrical Machines	3	3	-	1	EE 331	-
EE 434	Selection and Installation of Motors	3	3	-	1	EE 331	-
EE 435	Electric Drive Systems	3	3	-	1	EE 432 EE 331	-
EE 436	Advanced Topics in Power Electronics	3	3	-	1	EE 432	-
EE 438	Selected Topics in Electrical Machines	3	3	-	1	EE 331	-
EE 441	Electric Energy Utilization	3	3	-	1	EE 340	-
EE 443	Control and Operation of Power Systems	3	3	-	1	EE 343	-
EE 444	Planning and Design of Power Systems	3	3	-	1	EE 343	-
EE 445	Industrial Power Systems Design	3	3	-	1	EE 340	-
EE 447	Computer Applications in Power Systems	3	3	-	1	EE 343	-
EE 448	Selected Topics in Power Systems	3	3	-	1	EE 343	-
EE 455	Applied Control	3	3	-	1	EE 351	-
EE 456	Digital Control Systems	3	3	-	1	EE 351	-
EE 483	Principles of Photovoltaic Energy Systems	3	3	-	1	EE 340	-

Electronics & communication Engineering Track

Students should complete 6 credit hours from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co- Req.
EE 411	Programmable Logic Controllers	3	3	-	1	EE 354	-
EE 412	Industrial Electronics	3	3	-	1	EE 317	-
EE 413	Power Electronics	3	3	-	1	EE 312	-
EE 417	Communication Electronics	3	3	-	1	EE 317 EE 320	
EE 418	Design of Analog and Digital Filters	3	3	-	1	EE 317	-
EE 419	Selected Topics in Electronics	3	3	-	1	EE 317	-
EE 421	Telephone Systems and Traffic Analysis	3	3	-	1		EE 322
EE 424	Optical Communication Networks	3	3	-	1	EE 317 EE 320	-
EE 425	Computer Network Security	3	3	-	1	CEN 354 EE 320	-
EE 427	Design of Microwave Systems	3	3	-	1		EE 322
EE 428	Satellite Communications	3	3	-	1		EE 322
EE 429	Selected Topics in Communications	3	3	-	1		EE 322
EE 450	Industrial Instrumentation	3	3	-	1		EE 317
EE 456	Digital Control Systems	3	3	-	1	EE 351	-
EE 464	Error Control Coding	3	3	-	1	EE 322	EE 420
EE 465	Network Architecture and Protocols	3	3	-	1	CEN 354 EE 320	-

BSc PROGRAM CURRICULUM

Electrical Power Engineering (EPE) Track

3rd Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 101	Introduction to Islamic culture	2	2	-	-	-	-
ARAB 101	Linguistic skills	2	2	-	-	-	-
PHYS 131	General Physics	4	3	2	-	-	-
GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
MATH 106	Integral Calculus	3	3	-	1	-	-
CHEM 111	General Chemistry	4	3	2	-	-	-
Total Credit hours		18					

4th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 102	Islam and Community Building	2	2	-	-	IC 101	-
GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
GE 210	Engineering Mechanics	3	3	-	1	MATH 106	MATH 107
EE 201	Fundamentals of Electric Circuits	3	3	-	1	PHYS 131	-
EE 203	Electromagnetism	3	3	-	1	PHYS 131	-
Total Credit hours		19					

5th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
MATH 208	Differential equations	3	3	-	1	MATH 203	-
GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
EE 202	Electric Circuit Analysis	3	3	-	1	EE 201	-
EE 205	Electric Circuits Laboratory	1	-	2	-	-	EE 202
EE 208	Logic Design	3	3	-	1	-	-
EE 210	Logic Design Laboratory	1	-	2	-	-	EE 208
Total Credit hours		17					

6th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 103	Economic System in Islam	2	2	-	-	IC 101	-
STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
EE 300	Instruments & Electrical Measurements	3	2	2	-	EE 205	-
EE 301	Signals and systems Analysis	3	3	-	1	EE 202	-
EE 312	Electronics - 1	3	3	-	1	EE 202	-
EE 313	Electronics Laboratory - 1	1	-	2	-	-	EE 312
Total Credit hours		17					

7th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ARAB 103	Arabic Writing	2	2	-	-	-	-
ME 322	Mechanical power engineering	3	3	-	1	PHYS 131	-
EE 330	Electric Machines - 1	3	3	-	1	EE202 EE 203	-
EE 340	Fundamentals of Power Systems	3	3	-	1	EE202 EE 203	-
+++	College Elective – 1	3	3	-	-	-	-
EE 351	Principles of Control Systems	3	3	-	1	EE 301	-
Total Credit hours		17					

8th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 104	Political System in Islam	2	2	-	-	IC 101	-
EE 331	Electric Machines - 2	3	3	-	1	EE 330	-
EE 332	Electric Machines Laboratory	1	-	2	-	-	EE 331
EE 343	Power Systems Analysis	3	3	-	1	EE 340	-
EE 344	Power Systems Laboratory	1	-	2	-	-	EE 343
EE 354	Microprocessors and Interface Circuits	3	2	2	-	EE 208	-
+++	Free Course	3	3	-	-	-	-
Total Credit hours		16					

9th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
EE 432	Power Electronics	3	3	-	1	EE 312	-
EE 437	Power Electronics Laboratory	1	-	2	-	-	EE 432
EE 4xx	Elective Course - 1	3	3	-	1	-	-
+++	Free Course	3	3	-	-	-	-
EE 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
Total Credit hours		16					

10th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
MGMT 402	Project Management	3	3	-	1	Pass 90 cr	-
EE 446	High Voltage Engineering	3	3	-	1	EE 340	-
+++	College Elective – 2	3	3	-	-	-	-
EE 482	Design of Electrical Protection Systems	3	3	-	1	EE 340	-
EE 4xx	Elective Course - 2	3	3	-	1	-	-
EE 492	Senior Design Project - 2	2	1	2	-	EE 491	-
GE 406	Summer Training	2	2	-	-	Pass 100 cr	-
Total Credit hours		19					

Elective Courses

In the eighth semester a student must select at least 6 credit hours out of the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req	Co-Req.
EE 401	Electrical Standard Specifications	3	3	-	1	EE 343 EE 331	-
EE 433	Special Electrical Machines	3	3	-	1	EE 331	-
EE 434	Selection and Installation of Motors	3	3	-	1	EE 331	-
EE 435	Electric Drive Systems	3	3	-	1	EE 432 EE 331	-
EE 436	Advanced Topics in Power Electronics	3	3	-	1	EE 432	-
EE 438	Selected Topics in Electrical Machines	3	3	-	1	EE 331	-
EE 441	Electric Energy Utilization	3	3	-	1	EE 340	-
EE 443	Control and Operation of Power Systems	3	3	-	1	EE 343	-
EE 444	Planning and Design of Power Systems	3	3	-	1	EE 343	-
EE 445	Industrial Power Systems Design	3	3	-	1	EE 340	-
EE 447	Computer Applications in Power Systems	3	3	-	1	EE 343	-
EE 448	Selected Topics in Power Systems	3	3	-	1	EE 343	-
EE 455	Applied Control	3	3	-	1	EE 351	-
EE 456	Digital Control Systems	3	3	-	1	EE 351	-
EE 483	Principles of Photovoltaic Energy Systems	3	3	-	1	EE 340	-

Electronics and Communication (ECE) Track

3rd Level

Course Code	Course Title	CR	LT	LB	TU	Pre- Req.	Co-Req.
IC 101	Introduction to Islamic culture	2	2	-	-	-	-
ARAB 101	Linguistic skills	2	2	-	-	-	-
PHYS 131	General Physics	4	3	2	-	-	-
GE 104	Basics of Engineering Drawing	3	1	4	-	-	-

MATH 106	Integral Calculus	3	3	-	1	-	-
CHEM 111	General Chemistry	4	3	2	-	-	-
Total Credit hours		18					

4th Level

Course Code	Course Title	CR	LT	LB	TU	Pre- Req.	Co-Req.
IC 102	Islam and Community Building	2	2	-	-	IC 101	-
GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
GE 210	Engineering Mechanics	3	3	-	1	MATH 106	MATH 107
EE 201	Fundamentals of Electric Circuits	3	3	-	1	PHYS 131	
EE 203	Electromagnetism	3	3	-	1	PHYS 131	-
Total Credit hours		19					

5th Level

Course Code	Course Title	CR	LT	LB	TU	Pre- Req.	Co-Req.
MATH 208	Differential equations	3	3	-	1	MATH 203	-
GE 211	Introduction to Engineering Design -I	3	2	4	-	-	-
CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
EE 202	Electric Circuit Analysis	3	3	-	1	EE 201	-
EE 205	Electric Circuits Laboratory	1	-	2	-	-	EE 202
EE 208	Logic Design	3	3	-	1	-	-
EE 210	Logic Design Laboratory	1	-	2	-	-	EE 208
Total Credit hours		17					

6th Level

Course Code	Course Title	CR	LT	LB	TU	Pre- Req.	Co-Req.
IC 103	Economic System in Islam	2	2	-	-	IC 101	-
STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
EE 300	Instruments & Electrical Measurements	3	2	2	-	EE 205	-
EE 301	Signals and systems Analysis	3	3	-	1	EE 202	-
EE 312	Electronics - 1	3	3	-	1	EE 202	-
EE 313	Electronics Laboratory - 1	1	-	2	-	-	EE 312
Total Credit hours		17					

7th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ARAB 103	Arabic Writing	2	2	-	-	-	-
EE 317	Electronics - 2	3	3	-	1	EE 312	-
EE 319	Electronics Laboratory - 2	1	-	2	-	-	EE 317
EE 320	Communications Principles	3	3	-	1	EE 301	-
+++	College Elective – 1	3	3	-	-	-	-
EE 351	Principles of Control Systems	3	3	-	1	EE 301	-
CEN 354	Principles of Networks Engineering	3	3	-	1	-	-
Total Credit hours		18					

8th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 104	Political System in Islam	2	2	-	-	IC 101	-
EE 322	Digital Communications	3	3	-	1	EE 320	-
EE 326	Communications Laboratory	1	-	2	-	EE 320	EE 322
EE 354	Microprocessors and Interface Circuits	3	2	2	-	EE 208	-
EE 405	ICs Technology and Applications	3	3	-	1	EE 317	-
EE 406	Integrated Circuits Laboratory	1	-	2	-	-	EE 405
+++	Free Course	3	3	-	-	-	-
Total Credit hours		16					

9th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
~~ECON 401~~	~~Engineering Economy~~	~~3~~	~~3~~	~~-~~	~~1~~	~~Pass 90 cr~~	~~-~~
EE 423	Wave Propagation and Antennas	3	3	-	1	EE 203	-
EE 4xx	Elective Course - 1	3	3	-	1	-	-
+++	Free Course	3	3	-	-	-	-
EE 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
Total Credit hours		15					

10th Level

Course Code	Course Title		CR	LT	LB	TU	Pre-Req.	Co-Req.
MGMT 402	Project Management		3	3	-	1	Pass 90 cr	-
EE 420	Information Theory and Coding		3	3	-	1	EE 320	-
EE 463	Mobile Communications		3	3	-	1	EE 320	-
+++	College Elective – 2		3	3	-	-	-	-
EE 4xx	Elective Course - 2		3	3	-	1	-	-
EE 492	Senior Design Project - 2		2	1	2	-	EE 491	-
GE 406	Summer Training		2	2	-	-	Pass 100 cr	-
Total Credit hours			19					

Elective Courses

In the eighth semester a student must select at least 6 credit hours out of the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
EE 411	Programmable Logic Controllers	3	3	-	1	EE 354	-
EE 412	Industrial Electronics	3	3	-	1	EE 317	-
EE 413	Power Electronics	3	3	-	1	EE 312	-
EE 417	Communication Electronics	3	3	-	1	EE 317 EE 320	
EE 418	Design of Analog and Digital Filters	3	3	-	1	EE 317	-
EE 419	Selected Topics in Electronics	3	3	-	1	EE 317	-
EE 421	Telephone Systems and Traffic Analysis	3	3	-	1		EE 322
EE 424	Optical Communication Networks	3	3	-	1	EE 317 EE 320	–
EE 425	Computer Network Security	3	3	-	1	CEN 354 EE 320	-
EE 427	Design of Microwave Systems	3	3	-	1		EE 322
EE 428	Satellite Communications	3	3	-	1		EE 322
EE 429	Selected Topics in Communications	3	3	-	1		EE 322
EE 450	Industrial Instrumentation	3	3	-	1		EE 317
EE 456	Digital Control Systems	3	3	-	1	EE 351	-
EE 464	Error Control Coding	3	3	-	1	EE 322	EE 420
EE 465	Network Architecture and Protocols	3	3	-	1	CEN 354 EE 320	-

COURSE DESCRIPTIONS

Core Courses

EE 201 - Fundamentals of Electric Circuits: 3 (3, 0, 1)

Basic circuit elements and concepts; Basic laws of circuit theory: Ohm's law, Kirchoff's law; Circuit theorems: superposition principle, Thevenin and Norton theorems; maximum power transfer theorem, Techniques of DC circuit analysis: Nodal and mesh analysis; Sinusoidal sources and the concept of phasor in circuit analysis Techniques of AC circuit analysis: Nodal and mesh analysis.

Pre-requisite: PHYS 104

EE 202 - Electric Circuit Analysis: 3 (3, 0, 1)

Introduction to concept of active, reactive, complex power and power factor. Three phase circuits; Introduction to Op-Amp: ideal characteristics with simple applications; Frequency response of RLC and resonance; Natural and step response of first and second order circuits; Laplace transform in circuit analysis; Introduction to frequency selective circuits: passive filters, Bode plots; Two-Port networks; Mutual inductance and transformers.

Pre-requisite: EE 201

EE 203 - Electromagnetism: 3 (3, 0, 1)

Review to vector calculus; Electrostatic fields; Gauss's law and divergence; Electric potential; Dielectrics and capacitance; Poisson's and Laplace's equations; Charge images; Current density and conductors; Magnetostatic fields; Biot–Savart and Ampere's laws; Curl and Stoke's theorem; Magnetic materials and circuits; Self and mutual inductances; Energy in static Fields, Introduction to electromagnetic waves.

Pre-requisite: PHYS 104

EE 205 - Electric Circuits Laboratory: 1 (0, 2, 0)

General introduction to the laboratory Voltage, current, and power in DC circuits using KVL and KCL. Superposition, Thevenin's, and Maximum power transfer theorems in DC circuits; Series and parallel AC circuits; Resonance in series and parallel circuit; Maximum power transfer theorem and power factor improvement in AC circuits; Transients in DC circuits; Magnetically-coupled circuits; Three phase circuits.

Co-requisite: EE 202

EE 208 - Logic Design: 3 (3, 0, 1)

Introduction to Numbering Systems, including: Binary system, hexadecimal system, Binary codes (Gray and ASCII codes), Logic fates and logic functions, Boolean Algebra, De-Morgan laws, Representation of negative and fractional numbers in binary systems. Combinational Logic Circuits, including: Canonical forms, Simplification using logic algebra and Karnaugh maps (K-maps), Arithmetic logic Units, Half and full Adders, Subtractors, and multipliers. Multiplexers and Demultiplexers, Encoders and decoders, Comparators and Parity generators. Programmable Logic Devices (PLD's) and VHDL, including PAL' PLA's, GAL's, CPLD's and FPGA's, Fundamentals of VHDL. Sequential Logic Devices, including: State machines, Methods of representation, state transition diagrams and tables. Flip-flops (S-R, D, J-K, T, Master-Slave), Gated and clocked flip flops, edge-triggered flip flops. Registers, their types, their operation and applications. Counters, their types, their operation and applications. Introduction to Memory Devices, SRAM and DRAM cells, their operation and organization. Flash memory and its architecture and operation.

EE 210 - Logic Design Laboratory: 1 (0, 2, 0)

Familiarization with logic circuits laboratory; Introduction to logic gates; Implementation of Boolean functions using AND and OR gates; NAND and NOR implementation; XOR and address; Design of combinational circuits; Flip-flops; Design of sequential circuits; Sequential PLA's.

Co-requisite: EE 208

EE 300 - Instruments & Electrical Measurements: 3 (2, 2, 0)

Measurements fundamentals: units and standards, errors, statistical analysis; DC/AC meters construction; loading effect; insertion loss; Difference and instrumentation amplifiers; Oscilloscope: CRT, amplifiers, triggered sweep circuits, attenuation, specifications; Spectrum analyzer, Transducers and sensors: passive and self-generating transducers; Liquid crystal displays (LCDs), CCDs, and optical fiber sensors; Digital measurements: Data conversion principles; Digital voltmeter.

Pre-requisite: EE 205

EE 301- Signals and systems Analysis: 3 (3, 0, 1)

Introduction, including: continuous-time and discrete-time signals and systems, analog-to-digital and digital-to-analog conversion. Continuous Signals, including: linear time-invariant (LTI) systems and their properties, Fourier series, Fourier

Transform (FT) and its inverse (IFT) and their properties. Convolution and Correlation theory. Discrete Signals, including: linear shift-invariant (LSI) systems and their properties, Discrete Fourier Transform (DFT) and its inverse (IDFT) and their properties. Z-Transform, its inverse and their properties. Mapping Theory, Fast Fourier transform (FFT). Parseval Theory. Sampling Theory, including: Nyquist sampling criterion, signal aliasing and reconstruction. Fundamentals to Signal processing, including: types of filters (LPF, HPF, BPF, SBF).

Pre-requisite: EE 202

EE 312 - Electronics - 1: 3 (3, 0, 1)

Introduction to Semiconductors, including: Crystal lattice, bonds and energy bands in solids. P-N Junction including: Junction formation, I-V characteristics, forward and reverse bias, breakdown voltage. Applications of P-N Junction including Rectification, Zener diode, solar cells and light emitting diode (LED). Bipolar Junction Transistor (BJT), including: BJT types and operation, and its currents and current amplification factor. BJT modes of operation and biasing configurations. BJT current equations and Ebers Moll model. Operating point and bias stability. BJT small signal models and BJT operation as an amplifier. Metal-Oxide-Semiconductor Field Effect Transistor (MOSFET), including: MOSFET types and theory of operation. Channel formation in Enhancement-mode MOSFET and its I-V characteristics in linear and saturation modes. MOSFET biasing configurations. MOSFET small signal models and MOSFET operation as an amplifier.

Pre-requisite: EE 202

EE 313 - Electronics Laboratory - 1: 1 (0, 2, 0)

Introduction to the lab tools. I-V characteristics of diode. Clipping circuits using diodes. Rectification using diodes. Zener diode and regulators. BJT dc biasing. CE BJT amplifier. MOSFET dc biasing. CS MOSFET amplifier. Simple AM receiver circuit, MOS digital circuits.

Co-requisite: EE 312

EE 351 - Principles of Control Systems: 3 (3, 0, 1)

Dynamic system representations (block diagram, transfer function, signal-flow graph, and state-space representation); modeling of electric and mechanical systems; state variable analysis; transient response specifications; steady-state error analysis; stability by Routh-Hurwitz criterion; root-locus technique; Bode plots; Nyquist diagram; pole-placement technique; PID controller design; simulation by Matlab/Simulink.

Pre-requisite: EE 301

EE 354 - Microprocessors and Interface Circuits: 3 (2, 2, 0)

Introduction to Microprocessor Systems, including: microcomputer architecture, data, address and control buses, memory access and interrupts. Architecture of 80x86 Microprocessors, including 16-bit, 32 bit microprocessors, Pentium and Core2 microprocessors. Memory Organization & Segmentation, including memory segmentation and address generation (20-bit and 32-bit addresses). Instruction Set of 80x86 Microprocessors, including addressing modes, data-transfer instructions, logic and mathematic instructions, flow control, subroutines and interrupts, program control instructions, instruction decoding. Assembly Language and Programming of Intel microprocessors, including, DEBUG and Macro-assembler, Procedures and subroutines. Memory Interface Circuits. Interface Circuits for Input/Output Devices, programmable I/O (8255 PIO), examples, handshaking and microprocessor communications.

Pre-requisite: EE 208

GE 406 - Summer Training 2 (-, -, -)

The student performs the summer training in one of the summer terms provided that he finished 100 credits at least. The student will be trained in an approved body in the private or governmental sectors. The training lasts for two months, and

at the end of the training period, the student should submit a report and a student portfolio, and will be evaluated through discussing its contents with the student by a specialized committee.

EE 491 - Senior Design Project - 1: 3 (1, 4, 0)

The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary field studies, visibility studies, final design drawings, bill of quantities, and the total operating cost of the project. The graduation project shall continue for one semesters. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

Pre-requisite: Pass 100 Cr

EE 492 - Senior design Project - 1: 2 (1, 2, 0)

The course is the second part for the senior design project. It aims to expose the students to the practical experience of real civil engineering projects/projects components in order to gain the necessary experience which relates the design process to the full course work studied during the program. The previously selected team of students shall continue the design process for this part of the project. The students are responsible for and shall utilize all the knowledge and skills gained through the program as well as in order to complete the task. At the end, students will be examined in final project report which is done in the form of an oral presentation as a team.

Pre-requisite: EE 491

Compulsory Courses

General

GE 210 - Engineering Mechanics: 3 (2, 2, 0)

Force and moment for planner systems; Basic equilibrium conditions Centroids; friction, area and mass moments of inertia. Kinematics of a particle: rectilinear and curvilinear motion. kinetics of particles: Newton's law, work and energy; kinematics of rigid body in plane motion. Relative velocity and acceleration; Kinetics of a rigid body in plane motion: translation, fixed axis rotation, general motion, work and energy.

Co-requisite: MATH 106

Electrical Power Engineering Track (EPE)

EE 330 - Electric Machines - 1: 3 (3, 0, 1)

Transformers (construction, operation of single-phase transformers, equivalent circuit, voltage regulation and efficiency, auto-transformers, three-phase transformers), AC machinery fundamentals, Synchronous machines (components, internal voltage, equivalent circuit, phasor diagram, performance of turbo-alternator, generator operating alone, parallel operation of alternators, synchronous motors, steady-state operation, motor starting), synchronous machine dynamics: the swing equation, steady state and transient stability.

EE 331 - Electric Machines - 2: 3 (3, 0, 1)

Three-phase induction machines (construction, operation, equivalent circuit, performance characteristics, starting of induction motors, speed control), single-phase induction motors, fundamentals of d.c machines, DC machines (components, classification, performance, motor characteristics, starting of d.c motors, speed control of d.c motors).

EE 332 - Electric Machines Laboratory: 1 (0, 2, 0)

Equivalent circuit of transformers; Three-phase connections and harmonic problems; Equivalent circuit of three-phase and single-phase induction motors; Load testing of induction motors; Starting of single-phase induction motors; Equivalent circuit of synchronous machine: Performance of synchronous motors; Terminal characteristics of dc machines

EE 340 - Fundamentals of Power Systems: 3 (3, 0, 1)

Power system components and elements: generation – transmission - distribution; Generation of electrical energy: main sources – alternative sources; Transmission line conductors; Electric insulators: types – parameters; Transmission line parameters: series impedance, shunt admittance; Analysis of transmission lines: short line – medium line – long line; Power cables parameters: series impedance, shunt admittance; Analysis of distribution systems: radial system – ring system.

EE 343 - Power Systems Analysis: 3 (3, 0, 1)

Per unit system; Power system matrices: bus admittance matrix – bus impedance matrix; Load flow analysis: Gauss-seidel method – Newton-Raphson method; Economic operation of generators: neglecting transmission line losses – including transmission line losses; Symmetrical faults: Thevenin's method – bus impedance matrix method; Unsymmetrical faults: symmetrical components – Thevenin's method – bus impedance matrix method; Stability analysis: steady state stability – transient stability – equal area criterion.

EE 344 - Power Systems Laboratory: 1 (0, 2, 0)

Transmission line characteristics; Reactive power compensation; Symmetrical and unsymmetrical fault analysis; Load-flow simulation; Transient stability simulation; Active and reactive power generator control; Characteristics of isolated and interconnected systems; Characteristics and coordination of protective relays.

EE 432 - Power Electronics: 3 (3, 0, 1)

Power semiconductor devices: terminal characteristics; Power converters: ac-ac converters, rectifiers, inverters, dc-dc converters and resonant converters; Applications in power systems.

Pre-requisite: EE 312

EE 437 - Power Electronics Laboratory: 1 (0, 2, 0)

Diode characteristics, Single phase uncontrolled half wave rectifier circuits, Single phase uncontrolled half full rectifier circuits, SCR characteristics, Single phase controlled half wave rectifier circuits, Single phase controlled half full rectifier circuits, AC voltage controllers, Three phase uncontrolled half wave rectifier circuits, Three phase uncontrolled half full rectifier circuits, Three phase controlled half wave rectifier circuits, Three phase controlled half full rectifier circuits, DC Chopper circuits, Single phase Inverters.

Co-requisite: EE 432

EE 446 - High Voltage Engineering: 3 (3, 0, 1)

Effect of Impulse voltage on the Circuit Breaker performance during short circuit interruption. Effect of Lightning on the high voltage network. Surge Over Voltage Protection (Switching - Lightning). Methods of Earthing (Protective - Systems). Electrical Insulators (Solid - Liquid - Gases). High Voltage Test techniques. High Voltage Generation (DC - AC -Impulse).

Pre-requisite: EE 340

EE 482 - Design of Electrical Protection Systems: 3 (3, 0, 1)

Protection system components: Objectives, system components, requirements, protection zones, main and backup protection; Protection Instrument transformers (CT, VT & CVT): Types, construction, equivalent circuit, ratio error, burden, accuracy classes; Protective relays: Types (electromechanical, solid state, digital, numerical), function classifications, merits & demerits, JED; Circuit Breakers: introduction, types (air, vacuum, oil, SF6), principle of operation, applications, merits and demerits, during fault behavior, rapture capacity; Transmission Line Protection and Design: Overcurrent protection schemes, distance protection schemes, power line carrier protection (PLC), case study (design of a TL protection scheme); Generator Protection and Design: Stator protection schemes, rotor protection schemes, case study (design of a generator protection scheme); Transformer Protection and Design: Overcurrent protection, restricted earth fault, differential, Buchholz, case study (design of a transformer protection scheme).

Pre-requisite: EE 340

ME 322 - Mechanical power engineering: 3 (3, 0, 1)

First law, second law. Properties of vapors and perfect gases, Air standard cycles. Carnot, Rankine and Gas Turbine Cycles. Refrigeration cycles. Heat Transfer: Conduction, convection and radiation. Fluid Mechanics: Properties of fluids, fluid static and Kinematics. Similitude and dimensional Analysis. Dynamics of Ideal and Viscous Flows. Renewable energy resources.

Pre-requisite: PHYS 104

Electrical Communication Engineering Track (ECE)

CEN 354 - Principles of Network Engineering: 3 (3, 0, 1)

Introduction to networking principles. Communication channels and their capacity. Multiplexing and switching principles. Packet switching networks. Network structures. High speed networks. Local area networks (LAN's). Ethernet. Wide area networks (SONET, ATM, Fiber to the home, GPON, GEPON). Switches, Routers and Hubs. Internet, Extranet and Intranet principles. Network standards and OSI model. Network services and their benefits, IPv4, Delivery and Forwarding of IP packets, routing protocols (RIP, OSPF, BGP)

Co-requisite: MATH 106

EE 317 - Electronics - 2: 3 (3, 0, 1)

Introduction to Semiconductors, including: Introduction, including basic electronic device and their theory of operation. Multi-stage a1nplifier, including: RC-Coupled Amplifiers, their frequency response and Bode plots. Feedback and Oscillators, including: Negative and positive feedback, Voltage and current feedback circuits, Stability of feedback amplifiers, Bode contours and Nyquist stability Criteria. Parkhausen criterion. Feedback oscillators (Phase-shift, Wien bridge, Hartley, Colpitts and Clapp oscillators), Negative resistance oscillators, Voltage-controlled osc11lator (VCO) and phase-locked loops (PLL). Operational Amplifiers and their Applications, including: Opamp building blocks, linear and non-linear applications,

Analog-to-digital and digital-to-analog converters (ADC and DAC), Multivibrators. Digital Circuits, including: Transistor (BJT and MOSFET) as a switch, Switching parameters, like fan-out, noise margins and propagation delay. Transistor-transistor logic (TTL) circuits and CMOS logic

Pre-requisite: EE 312

EE 319 - Electronics Laboratory - 2: 1 (0, 2, 0)

PSPICE simulation of electronic circuits. Linear applications of op-amp. Wein• bridge oscillator. Active filters: LPF, and HPF. Schmitt trigger and unstable multi• vibrator. Differential amplifier using BJT. Design and implementation of digital circuits using VHDL. CMOS inverter characteristics. TTL inverter characteristics.

Co-requisite: EE 317

EE 320 - Communications Principles: 3 (3, 0, 1)

Basic Elements of a Communication System, including: types of communication systems and their building blocks, receiver, transmitter and channel. Wireless communication systems, Super heterodyne transceivers (TRX). Basic Modulation Techniques, including: Amplitude modulation (AM), Frequency modulation (FM), and phase modulation (PM). Pulse modulation Techniques, including: PAM, PWM and PPM, Pulse Code Modulation (PCM), Differential PCM (DPCM), Delta Modulation (OM). Signal Multiplexing, including: time division multiplexing (TDM), and frequency-division multiplexing (FDM). Introduction to Digital Modufation (Shift Keying), including amplitude-shift keying (ASK), frequency-shift keying (FSK) and phase-shift keying (PSK).

Pre-requisite: EE 301

EE 322 - Digital Communications: 3 (3, 0, 1)

Introduction to Digital Communications, including: random variables and probability distributions, signal-to-noise (SIN) ratio, probability of error. Coherent Digital Modulation Techniques, including amplitude-shift keying (ASK), frequency-shift keying (FSK) and phase-shift keying (PSK), quadratic PSK (QPSK), Minimum-shift keying (MSK), Gaussian MSK (OMSK). Orthogonal Digital Modulation Techniques. Orthogonal FDM (OFDM). Comparison between Digital Modulation Techniques, including bandwidth, power spectrum and probability of error.

Introduction to Information Theory, including: Channel Capacity, source coding, channel coding, inter-symbol interference, error correcting coding techniques.

Pre-requisite: EE 320

EE 326 - Communications Laboratory: 1 (0, 2, 0)

Basic Modulation & modulation Techniques, including: Amplitude modulation (AM), Frequency modulation (FM). Si al Multiplexing, including: time division multiplexing (TOM), and frequency-division multiplexing (FDM). Super heterodyne radio receiver (RX), measurement of sensitivity, selectivity and fidelity, Pulse modulation Techniques, including: PAM, PWM and PPM, Pulse Code Modulation PCM), Differential PCM (DPCM), Delta Modulation (DM). Digital Modulation Shift Keying), including amplitude-shift keying (ASK'.), frequency-shift keying FSK) and phase-shift keying (PSK: BPSK, PSK, M-ary PSK, GM.SK). Coding, including: Source Coding, Channel Coding and Error Correcting Codes.

Pre-requisite: EE 320
Co-requisite: EE 322

EE 405 - ICs Technology and Applications: 3 (3, 0, 1)

Introduction to IC Technology, including: crystalline silicon preparation, oxidation, impurity diffusion, ion implantation, die separation, pad contacts, Heat sinking, BJT and CMOS technology. Linear IC's and their Applications, including: operational amplifiers (OpAmps), the 74 1 IC, and operational trans-conductance amplifiers (OTA). Digital IC's and their Applications, including: Combinational logic MSI circuits, sequential logic IC's, VLSI circuits and memory IC's. Mixed IC 's and their Applications, including: analog-to-digital converters (ADC) and digital-to-analog• converters (DAC), Timers and multi-vibrator IC's (555/556/557) and their applications in communications. Switched-mode power supplies (SMPS) IC's, PWM and DC-DC converter IC's.

Pre-requisite: EE 317

EE 406 – Integrated Circuit Laboratory: 1 (0, 2, 0)

Electronic Design Automation. Linear IC Measurements and Testing, Digital IC and their Testing, Mixed-Signal IC's measurement and Testing. Switched-m ode Power Supply IC's.

Co-requisite: EE 405

EE 420- Information Theory and Coding: 3 (3, 0, 1)

Basic definitions: Information, entropy for zero-memory (memory less) sources. Variable length codes: Huffinan code, Shannon_Fano code and code efficiency. Markov (memory) information sources. Rate distortion theory. Channel coding and channel capacity. Error detecting and error correction codes.

Pre-requisite: EE 320

EE 423 - Wave Propagation and Antennas: 3 (3, 0, 1)

Introduction to antennas and propagation; Basic propagation models and antenna parameters; Ground wave propagation; Sky wave propagation; Space wave propagation; Statistical models and diversity principles; Propagation models in mobile radio systems; Antenna engineering in LF, MF, VHF and UHF systems; antenna a linear and planar arrays.

Pre-requisite: EE 203

EE 463 - Mobile Communications: 3 (3, 0, 1)

Practical and theoretical aspects of mobile communication system design are studied; particular emphasis is on mobile communications. frequency reuse, hand-off, cell splitting, indoor/outdoor propagation, co-channel interference, frequency management channel assignment techniques cell-site antennas, handset antenna/human body interaction, switching and traffic, AMPS, GSM, TDMA, and CDMA are studied.

Pre-requisite: EE 320

Elective Courses

Electrical Power Engineering Track (EPE)

EE 401 - Electrical Standard Specifications: 3 (3, 0, 1)

Introduction; harmonized standards; CE marking and conformity assessment of electric products; underwriter laboratories (UL) mark: mission of UL, types of UL marks; IEC standard marking (nameplate data & terminal marking) of electric products, motor marking, contactor marking, fuse marking, circuit breaker marking; safety of low voltage equipment (LVD), safety classification, IP code, electrical hazards; IEC standard sites and electric operating conditions for motors, HVF, imbalance factor, motor derating, standard motor testing, electromagnetic compatibility (EMC): emission; immunity, harmonic currents, third harmonic emission limits, flicker; standard classification of hazardous areas; types and standard marking of motors and electric equipment suitable for use in potentially explosive atmospheres.

Pre-requisite: EE 343, EE 331

EE 433 - Special Electrical l Machines: 3 (3, 0, 1)

Reluctance motor, stepper motor, eddy current motors, hysteresis motors, ac commutator motors, universal motor, two phase servo motor, linear induction motor, linear d.c. motor.

Pre-requisite: EE 331

EE 434 - Selection and Installation of Motors: 3 (3, 0, 1)

Motor duty types; motor mounting arrangement: IM code, cable selection, cable layout (power cable, control cable); motor methods of cooling: IC code, motor auxiliaries, impeded temperature detectors (ETD), requirements of motors

thermal protection; short circuit protection: selection and sizing of load break switch, fuse and circuit breaker; selection and sizing of motor automatic starter: DOL, star/delta (open& closed transition) starter, auto transformer starter, SRIM starter, DC motor starter, Automatic starting of synchronous motor; selection of motor overload protection; selection and sizing of motor power factor correction capacitors; selection and sizing of motor controller.

Pre-requisite: EE 331

EE 435 - Electric Drive Systems: 3 (3, 0, 1)

Drive system components, D.C motor drive systems, D.C motors fed from single• phase rectifier circuits, D.C motors fed from three-phase rectifier circuits, chopper• fed D.C motors, induction motor drive systems, induction motors fed from A.C voltage controller, inverter-fed induction motors.

Pre-requisite: EE 331, EE 432

EE 436 - Advanced Topics in Power Electronics: 3 (3, 0, 1)

Advanced rectifier converters (star-double star with inter-phase reactor, 12 pulse rectifiers), rectifier converter operation (overlap, regulation, and power factor), frequency converters, analysis of three-phase ac voltage controllers, thyristor triggering circuits, thyristor commutation techniques, applications of power electronics.

Pre-requisite: EE 432

EE 437 - Power Electronics Laboratory: 1 (0, 2, 0)

Diode characteristics, Single phase uncontrolled half wave rectifier circuits, Single phase uncontrolled half full rectifier circuits, SCR characteristics, Single phase controlled half wave rectifier circuits, Single phase controlled half full rectifier circuits, AC voltage controllers, Three phase uncontrolled half wave rectifier circuits, Three phase uncontrolled half full rectifier circuits, Three phase controlled half wave rectifier circuits, Three phase controlled half full rectifier circuits, DC Chopper circuits, Single phase Inverters.

EE 438 - Selected Topics in Electrical Machines: 3 (3, 0, 1)

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student.

Pre-requisite: EE 331

EE 441 - Electric Energy Utilization: 3 (3, 0, 1)

Illumination: types of lamps, illumination schemes, calculation of illumination, requirements of proper lighting. Electric Heating: advantages of electrical heating, heating methods, design of resistance heating element. Electric Welding: advantages of electric welding, welding methods, comparison between AC and DC arc welding, welding control circuits. Electrolytic Processes: laws of electrolysis, process of electro-deposition, factors affecting electro-deposition, manufacturing of chemicals by electrolysis process. Refrigeration and Air Conditioning: principle of air conditioning, refrigeration cycle, eco-friendly refrigerants, electrical circuits used in refrigerator and air-conditioner. Electric Traction: advantages of electric traction, systems of electric traction, types of motors used for electric traction, starting and braking of traction motors.

Pre-requisite: EE 340

EE 443 - Control and Operation of Power Systems: 3 (3, 0, 1)

Concepts of power system operation; Network topology and incidence matrices; Formation of bus impedance matrix; Unit commitment; Optimal power flow; Automatic generation control (AGC); Energy management systems (EMS) and control centers operation; State estimation (SE); Dynamic security assessment (DSA).

Pre-requisite: EE 343

EE 444 - Planning and Design of Power Systems: 3 (3, 0, 1)

Introduction to Power System Planning: Definitions, objectives, procedures, requirements; Load Characteristics: Definitions, types, load curves; Load Forecasting: Definitions, objectives, types, methodologies (time series); Introduction to Power System Reliability: Introduction, terms and definitions, reliability indices, reliability evaluation, service interruption, failure mode, outages; System Cost Assessment: Present worth value, investment and fixed costs, operating costs, case study (generation cost assessment); Transmission Line Planning and Design: Introduction, Kelvins law, Tollgem Theory, case study (design of a TL planning);Distribution System Planning and Design: Introduction, distribution system components, distribution substation site location, substation rating, substation service area with many primary feeders, percentage voltage drop, design of primary system, design of secondary system, case study (design of distribution system).

Pre-requisite: EE 343

EE 445 - Industrial Power Systems Design: 3 (3, 0, 1)

Construction of site Plans, site plan interpreting, unit substation, feeders and bus systems, Panel boards, using wire tables for determining conductor sizes, motor installation calculations, system protection and include: circuit barkers, fuses, over current protect ion devices, short circuit protection devices and their time- current characteristic charts.), lighting protection, installation in hazardous locations

Pre-requisite: EE 340

EE 447 - Computer Applications in Power Systems: 3 (3, 0, 1)

Computer applications in power system planning, Computer applications in power flow solution and control, Computer applications in power system fault analysis, Computer applications in power system dynamics and control, Computer applications in power system economic operation.

Pre-requisite: EE 343

EE 448 - Selected Topics in Power Systems: 3 (3, 0, 1)

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student

Pre-requisite: EE 343

EE 455 - Applied Control: 3 (3, 0, 1)

Introduction to control systems and their classifications. Advantages of using feedback in control systems. Basics of system modeling and analysis. Examples of applied control systems: speed control system, temperature control system, liquid• level control system. State-space models. Derivation of state-space model from transfer function and vice versa. Time response of state-space model. Transient response characteristics. Classifications of industrial controllers. Automatic controller. Basics of PID controller. PID controller design methods; Transducers and actuators; Control applications in power systems: turbine-governor control, generator voltage control, and load frequency control.

Pre-requisite: EE 351

EE 456 - Digital Control Systems: 3 (3, 0, 1)

Transducer fundamentals. Basic sampling concepts. Sample and hold circuits and analog multiplexers. Data conversion systems. Z-transform applied to discrete-time system with transformation form the s-plane to the z-plane. Analysis of digital

control system using Nyguist, Bode plots and root-locus. Stability analysis of digital systems. Data loggers and acquisition systems. Application of microcomputers to closed-loop industrial systems.

Pre-requisite: EE 351

EE 483 - Principles of Photovoltaic Energy Systems: 3 (3, 0, 1)

Introduction: Renewable Energy Technologies, History of Photovoltaics, Environmental Characteristics: Solar Angles, Sun Path Diagrams, Solar Radiation, Thermal Radiation, Extraterrestrial Solar Radiation, Atmospheric Attenuation, Terrestrial Irradiation, Total Radiation on Tilted Surfaces, Typical Meteorological Year, Photovoltaic Systems: PV Cell Characteristics, Types of PV Technology, Related Equipment: Batteries, Inverters, Charge Controllers, Peak-Power Trackers, Applications: Direct Coupled PV System, Stand-Alone Applications, Grid-Connected Systems, Hybrid-Connected Systems, Design of PV Systems, Solar Economic Analysis: Life Cycle Cost Analysis, Time Value of Money, Payback Time, Optimization Using P1 and P2 Method, Uncertainties in Economic Analysis.

Electrical Communication Engineering (ECE) Track

EE 411 - Programmable Logic Controllers: 3 (3, 0, 1)

Introduction (What's PLC?), PLC Architecture; including PLC building blocks (I/O ports, internal relays, timers, counters, serial ports, high-speed counters), PLC operation, scan cycle, PLC response time, case study: Siemens S7 PLC's, PLC's Memory Organization ; including: input memory, output memory, S-memory, variable memory, config memory, external EEPROM, PLC Programming; including: PLC programming Languages (LAD, functional and STL), LAD and STL basic instructions, programming devices and compilers (STEP-7), program editing, designing and editing a PLC project, compiling, downloading, testing (simulation) and running, PLC Wiring; including: DC inputs, AC inputs, transistor and relay outputs, analog and digital Inputs, analog and digital outputs, PLC Communications; including: PLC communication busses, Fieldbus, Profibus, industrial Ethernet, Examples; including miscellaneous industrial applications.

Pre-requisite: EE 354

EE 412 - Industrial Electronics: 3 (3, 0, 1)

Power Devices, including: Power diodes, power BJT, thyristors, phase control,

thyristor protection circuits. Stabilized Power Supplies, including: DC power supplies, stabilization using zener diodes, series regulators, shunt regulators, IC regulators, switch mode power supplies (SMPS). Energy Conversion, including: static converters, commutation circuits (natural and forced). Inverter Circuits, including: inverter circuits, push-pull and bridge inverters, commutation of inverters, sinewave inverters. Converters Circuits, including: DC-DC converters, Flyback DC converters, push-pull DC converters, bridge converters, DC• up and Dc-down converters. Transducers, including: strain gauges, temperature sensors, pressure and force measurements, optoelectronic sensors, proximity sensors. Operational Amplifiers Industrial Applications, including: Instrumentation Amplifiers, Bridge amplifiers. Assembly, Testing & Troubleshooting of Electronic Circuits, including: electronic circuits assembly, automatic test equipment, computer-aided assembly (pick and place) and manufacturing (CAM) systems.

Pre-requisite: EE 317

EE 413 - Power Electronics: 3 (3, 0, 1)

Power semiconductor devices: terminal characteristics; Power converters: ac-ac converters, rectifiers, inverters, de-de converters and resonant converters; Applications in power systems.

Pre-requisite: EE 312

EE 417 - Communication Electronics: 3 (3, 0, 1)

Introduction to Analog and Digital Transceivers, including: Wireless and Cable systems, Heterodyne and Homodyne (Zero-IF) Radio Receivers, all-digital transceivers. Design and Synthesis of analog RF Transceiver, including: Functional block diagram, Design of LNA, Mixers, VCO, Phase-locked loops (PLL), Frequency synthesizers, IF amplifiers, AM detectors, and FM discriminators. Design and Synthesis of Digital/Mixed-signal RF Transceiver, including: QPSK modulator/demodulator (modem), Timing and Clock recovery circuits, FSK circuits, GMSK modems, ASK and QAM circuits. Line Coding and Pulse Modulation Circuits, including: PCM modulators, sss.- modulators and their variants. TV Receivers, including: Functional blocks of Monochrome TV, Video Transmission Standards (PAL, SECAM, NTSC) and Camera systems, Design of video amplifiers, SAW-IF amplifiers, sync separators, horizontal and vertical oscillators and AFC. Function al block diagram of Color TV receivers, Color signal representation and processing, Digital Video Broadcasting (DVB) and High-definition TV (HDTV).

Pre-requisite: EE 317 & EE 320
Co-requisite: EE 322

EE 418 - Design of Analog and Digital Filters: 3 (3, 0, 1)

Introduction to Theory of N-port networks, including: Transfer functions of linear and discrete systems and their representation in the frequency domain and using Z• Transform, Poles and Zeros. Filter Design, including: Types of filters in the frequency domain low-pass, high-pass, band-pass and stop-band filters, Types of Filters according to their Approximate characteristics, like Butterworth, Tchebychev, Elliptic (Cauer) and Gaussian filters. Analog Filter Synthesis (implementation), including: Sallen-Key general structure using Op-Amps, Quad filters, Negative• impedance converters (NIC) and Gyrators, Leapfrog filters, and gm-C filters (using OTA). Applications including: RF, IF filters in cellular phones and radio transceivers, equalization of telephone cables and CATV. Digital Filters, including: Finite impulse response (FIR) and Infinite impulse response (IIR) filters. Fast Fourier Transform and Digital Signal Processors (DSP). Applications, including: voice and image processing and remote sensing.

Pre-requisite: EE 317

EE 419 - Selected Topics in Electronics: 3 (3, 0, 1)

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student.

Pre-requisite: EE 317

EE 421 - Telephone Systems and Traffic Analysis: 3 (3, 0, 1)

The public telephone network hierarchy. PABX and Centrex. Transmission system: two-wire and four-wire, pair-gain systems. Transmission impairments: cross-talk, hybrid circuit, echo suppressor an d echo canceller. Conventional and common channel signaling. Space and time division digital switching and blocking probability. Data and integrated services digital networks (ISDN) and packet switching. Traffic analysis: loss system and delay system. Network blocking probability.

Pre-requisite: EE 320
Co-requisite: EE 322

EE 424 - Optical Communication Networks 3: (3, 0, 1)

Optical Fiber waveguides: light propagation in fiber, step-index and graded index fibers, optical fiber transmission modes and optical fiber fabrication and connections standard. Photonic semiconductor materials: spontaneous emission and lasing (stimulated) emission. Optical sources: LED and laser diodes. Photodetectors: PIN photodiode and APD avalanche photodiode. Optical amplifier and Erbium-Doped Fiber Amplifier (EDFA). Wavelength division multiplexing (WDM) and optical networking.

Pre-requisite: EE 317, EE 320

EE 425 - Computer Network Security: 3 (3, 0, 1)

Introduction to cryptography and cryptanalysis; Basic definitions: Security services, attacks and mechanisms; conventional encryption algorithms: DES, IDEA, RCS and Blowfish, key distribution; introduction to number theory, public key encryption algorithm: RSA; message authentication code; hash function; digital signature and authentication protocols.

Pre-requisite: EE 320, EE 355

EE 427 - Microwave System Design: 3 (3, 0, 1)

Different types of waveguides. Limitations of low-frequency components. Microwave materials (semiconductors, ferrites, etc.). Microwave tubes and solid• state devices: klystrons, magnetron, Gunn diodes, Impart diodes, etc. Microwave circuit design. Directional couplers. Power dividers, equalizers, phase shifters. Microwave integrated circuit design: filters and amplifiers. Applications of microwaves.

Pre-requisite: EE 320
Co-requisite: EE 322

EE 428 - Satellite Communications: 3 (3, 0, 1)

Overview of satellite systems. Orbits and launching methods. The geostationary orbit. Modulations schemes and satellite multiple access (FDMA, TDMA, and CDMA). Space link analysis: Uplink, downlink and systen1 noises. Satellite antennas: Antenna polarization and radiation pattern. Applications of satellites: Asynchronous transfer mode (ATM) over satellite networks, the internet, Direct broadcast satellite (DBS) television and satellite mobile services.

Pre-requisite: EE 320
Co-requisite: EE 322

EE 429 - Selected Topics in Communications: 3 (3, 0, 1)

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student.

Pre-requisite: EE 320

EE 450 - Industrial Instrumentation: 3 (3, 0, 1)

Instrumentation and control. Signal and data acquisition and processing. Interfacing techniques. Physio-chemical principles of instrumentation. Force, torque, and pressure measurements. Temperature, flow, moisture, and humidity sensors. Digital transducers. Calibration techniques. Errors in measurements. Introduction to actuators. Norms and standardization. Introduction to intelligent instrumentation.

Pre-requisite: EE 208, EE 317, EE 351

EE 456 - Digital Control Systems: 3 (3, 0, 1)

Transducer fundamentals. Basic sampling concepts. Sample and hold circuits and analog multiplexers. Data conversion systems. Z-transform applied to discrete-time system with transformation from the s-plane to the z-plane. Analysis of digital control system using Nyguist, Bode plots and root-locus. Stability analysis of digital systems. Data loggers and acquisition systems. Application of microcomputers to closed-loop industrial systems.

Pre-requisite: EE 351

EE 464 - Error Control Coding: 3 (3, 0, 1)

Linear block codes: Cyclic Codes: Generating Polynomial, Encoder for cyclic codes, Some important cyclic codes: BCH & Reed-Solomon codes. Convolutional codes: Code tree, Trellis and state diagram, The Viterbi algorithm. Trellis coded modulation, Ungerboeck codes for 8-ary PSK. Spread spectrum modulation. Techniques of multiple accesses: FDMA, TDMA and CDMA.

EE 465 - Network Architecture and Protocols: 3 (3, 0, 1)

Basic network architecture. The ISO-OSI layered protocols. TCP-IP Internet protocols. Frame relay, cell relay, and ATM protocols. LAN protocols. Network management: ITU functions, SNMP, and TMN.

Pre-requisite: EE 320, EE 355

LABORATORIES AND EQUIPMENT

1. Circuit and Electrical Measurement Lab

EE 202: Electric circuit analysis
EE 205: Electric Circuits Laboratory
EE 300: Instruments & Electrical Measurements

Equipment available include: Cathode Ray Oscilloscope, Function Generator, Variable DC supply, Digital Multimeter, Analog Multimeter, LCR meter, Resistor Box, Capacitor Box, 3 phase extra low voltage transformer

This lab is the first the student is faced to at the beginning of his study in the Department of Electrical Engineering. In this lab the student is requested to make some simple circuits and asked to test them and make some measurements. The student is also trained to use basic instrumentations as Galvanometer, Ammeter and Voltmeter and the measure of capacity.

2. Logic circuit Design lab

EE 208: Logic Design
EE 210: Logic Design Laboratory

Equipment available includes: Digital Board XLAS, Logic Probe, Logic Pulser, IC trainer Kit (WUEKRO-w5 I 01-30), Field service toolbox, TTL IC Tester, Computers, ICs.

In this lab students learn how to install and test simple logical circuits, after that pass to more complicated ones. He also learns how to design logical circuits by using the computer assistance and Xilinix software. Then apply them in the practice using the programmable integrated circuits FPAG

3. Electronics Lab

EE 319: Electronics Laboratory - 2
EE 406: Integrated Circuits Laboratory

Equipment available include: Oscilloscope 2ch 50 Hz, Oscilloscope 2ch 100 Hz, Oscilloscope 4ch 50 Hz, Oscilloscope 2ch 200 Hz, Function Genator Max Freq. 15Mhz, Function Genator Max Freq. 30Mhz, Dual DC Power Supply, Digital Multimeter, LCR Meter, Decade resistance box, Decade inductor box, Decade capacitance box, Bread Board

This lab is equipped with all the necessary electronic devices and tools where the student can install and test electronic circuits associated with the theoretical electronics course. The students can work on many devices that would enable them to perform experiments. Laboratory also used to assist students in completing pa1ts of laboratory projects graduation.

4. Electric power system Lab

EE 344: Power Systems Laboratory

Equipment available includes: Transmission line model 380 kV, 3-PL transformer, Double Bus-bar, Bus bar feeder, bus bar connector, bus bar extension, bus bar tap, circuit breaker, Inductive load, capacitive load, Resistive load, Multifunction meter, Multimeter, Transformer, Differential Prot Relay, Directional Power Relay, Over current relay, Over voltage relay, Power brake with controller, switchable capacitor bank, Earth Fault compensation, KWH meter., VAR meter, Effective Power Controller, Generator controller, Automatic synchronizer, Excitation voltage controller Synchroscope, Double Voltmeter, Double Freq. meter, Synchronous machine, Pendulum machine, Pendulum machine controller, Squired case Motor.

Laboratory simulation systems is also available in the college, it allows the simulation of generating stations and transmission lines and prevention systems. The generation, transfer and distribution of electrical energy can be studied in this lab, as well as to study how to operate, control and protect the power systems.

5. Electric machines Lab

EE 332: Electric Machines Laboratory

Equipment available includes: Synchronous machine, Slip ring induction, Powder brake, machine Control Unit, Three phase transformer, Single phase transformer, Powder meter/Factor, meter Tacho meter, RMS meter, Digital handheld tachometer, Console 380 V KLM 1notion starter, resistors, Star Delta switch, on/off switch, Motor protection switch, Cassy, Synchronoscope, Synchr. Indicator, 6 lamps.

This laboratory includes many different electric machines as generators and engines operate on DC and others operating on AC as well as electrical transformers and various instrumentations. These devices are used in teaching laboratory

courses for Electrical Engineering Department students and are also used in various research for graduate students, such as masters and doctorate.

6. Automatic control Lab

EE 351: Principles of Control Systems
EE 455: Applied Control
EE 456: Digital Control Systems

Equipment available includes: Universal control unit COM3 Lab, Continuous and discontinuous control Multimeter, Oscilloscope, Power supply, Principal control card CONTROL I, Advanced control card CONTROL 2.

We offer in this lab the application of undergraduate courses in Basic and Advanced Automatic Control, Nonlinear Control, Hybrid and Embedded Syste1ns, Modeling, Introduction to MATLAB and Project Course in Control

7. Microprocessor and logic controllers Lab

EE 354: Microprocessors and Interface Circuits
EE 411: Programmable Logic Controllers

Equipment available includes: Microprocessor Training System, Operating Program (Assembler), Microcontroller Training System, Switch and Lamp unit. Application board for FLT 32, 4 mm I/O module, BTEC level course.

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 an d 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.

8. Drives and Power Electronics Lab

EE437: Power Electronics Lab

Equipment available includes: Static converters valves, Line commutated static valves, converters and choppers, switched mode, power supply, Inverters circuits, Converter fed DC machine, AC drive.

Review of power semiconductor devices: diodes, thyristors, transistors BJTS and MOSFETS. Diode characteristics. Diode circuit rectifiers. Thyristors characteristics.

Principles of thyristor controlled rectifiers. AC voltage controllers. Thyristors commutation techniques. Power transistor characteristics. DC-choppers. Pulse-width-modulation techniques for inverters. Resonant pulse inverters. (All design and analysis concepts are supported by computer aided.design analysis).

9. Communication Lab

EE 326: Communications Laboratory

Equipment available includes: Analog Communications: Frequency Synchronizer, CF transmitter 20 kHz, CF Receiver 20 kHz, TF transmitter 16 kHz, TF Receiver 16 kHz, FM/PM Modulator, FM/PM Demodulator, Frequency Multiplier, DC Power supply ±15 V. Digital Oscilloscope, Analog Multimeter, Set of I 0 Bridging plugs. Digital Communications: PAM Modulator, PAM Demodulator, PCM Modulator, PCM Demodulator, PTM Modulator, PTM Demodulator, Delta Modulator, Delta Demodulator ASKIFSKIPSK Modulator, ASK/FSK Demodulator, FSK Demodulator. Fiber Optic Communications: Noise source, Fiber Optic Transmitter, Fiber Optic Receiver, Fiber optic microscope.

In this Laboratory the students identify the modem communication systems used in working life and proceed on practical tests. The lab contains also special devices measuring the properties of microwave antennas and the use of instruments to measure their properties. Functional blocks of analog communication systems. Desi of mixers, converters, RF and IF amplifiers, AM detectors, and FM discriminators. Functional blocks of monochrome TV receivers.

Functional blocks of digital communication systems: PAM, PWM, PPM and PCM. Design of S/H circuits, AID and DIA converters, and timing (clock generator) circuits. Circuit design using PLL, VCO and multipliers. Design of PAM, PPM, PWM and PCM transmitters and detectors. Special circuits for phase shift keying.

10. Wireless Communications Lab

EE 424: Optical Communication Networks
EE 427: Microwave Engineering
EE 463: Mobile Communications

Equipment available includes: Antenna Measuring station, Rotating antenna platform, Gunn power supply with SWR Meter, Gunn oscillator, Isolator, PIN Modulator, Large horn antenna, Support for waveguide components, Stand base MF, Set of microwave absorbers, Dipole antenna, kit Yagi-Uda antennas, kit Physics

microwave accessories, waveguide propagation accessories, Telephone switching module, Telephone set analog, RJ12, USB PCI Interface card.

Characteristic s of HF transmission lines. Lossless and lossy transmission lines. Microstrip transmission lines. Smith chart. Impedance matching techniques. Theory of waveguides (rectangular and circular). Microwave components and cavity resonators. Introduction to radio wave propagation.

11. Computer Labs

GE 104: Basics of Engineering Drawing
GE 208: Programming in C Language

Equipment available includes: Network transformer (24 output), Cables cat 6, Printer with network card, PC for students P4, PC Instructor P4, PC distributing files P4. In this lab the students apply simulations methods of many theoretical ideas faced in the courses. Also it permits them to try theoretical circuits and enhance their knowledge in programming.