ABET
Self-Study Report

for the

Computer Engineering Program

at

Umm Al-Qura University

Makkah

Saudi Arabia

June 2018

Table of Contents

0. BACKGROUND INFORMATION 0-1

A. Contact Information 0-1

B. Program History 0-1

C. Options 0-1

D. Program Delivery Modes 0-1

E. Program Locations 0-2

F. Public Disclosure 0-2

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them 0-2

1. CRITERION 1: STUDENTS 1-1

A. Student Admissions 1-1

B. Evaluating Students Performance 1-2

B-1 Examination and Grading System 1-2

B-2 Academic Probation 1-3

C. Transfer Students and Transfer Courses 1-4

C-1 Transfer from Other Universities 1-4

C-2 Transfer of students within the University 1-5

C-3 Transfer to a department within the College 1-5

D. Advising and Career Guidance 1-6

D-1 Registration Procedure 1-6

D-2 Academic advising 1-6

D-3 Functions of the Academic Advisor 1-6

E. Work in Lieu of Courses 1-7

F. Graduation requirements 1-7

G. Transcripts of Recent Graduates 1-7

2. CRITERION 2: PROGRAM EDUCATIONAL OBJECTIVES 2-1

A. Mission Statement 2-1

A-1 Mission of the University 2-1

A-2 College of Computer and Information Systems Mission 2-1

A-3 Computer Engineering Department Mission 2-1

B. Program Educational Objectives (PEOs) 2-3

C. Consistency of the Program Educational Objectives with the Mission of the Institution 2-3

D. Program Constituencies 2-4
E. Process of Revision of PEOs 2-4
3. CRITERION 3: STUDENT OUTCOMES 3-1
A. Student Outcomes 3-1
B. Relationship of SOs to PEOs 3-1
4. CRITERION 4: CONTINUOUS IMPROVEMENT 4-1
A. Student Outcomes 4-1
A-1 Data Collection Elements 4-1
A-2 Assessment Processes 4-5
A-3 Assessments Management 4-7
A-4 SO Evaluation Processes 4-9
A-5 SO Attainment Data Extraction from CLOSO 4-17
A-6 SO Attainment indicated by Summative Assessment 4-29
A-7 SO Attainment indicated by Course-wise Student Survey 4-30
A-8 SO Attainment through indicated by Course-wise Faculty Survey 4-30
A-9 SO Attainment indicated by Exit Surveys 4-30
A-10 SO Attainment indicated through Alumni Survey 4-31
A-11 SO Attainment indicated through Employer Survey 4-32
B. Continuous Improvement 4-32
B-1 Course Improvement Plan (CIP) 4-32
B-2 Improvement Planning based on Student Weaknesses 4-38
B-3 Improvement Planning based on Course Readiness 4-39
B-4 Improvement Planning based on Exit Surveys 4-45
B-5 Improvement Planning based on Alumni and Employer Surveys 4-46
B-6 Improvement through Curriculum 4-46
C. Additional Information 4-47
References 4-48
5. CRITERION 5: CURRICULUM 5-1
A. Program Curriculum 5-1
A-1 Plan of Study 5-1
A-2 Curriculum Alignment to Program Educational Objectives 5-1
A-3 Curriculum Alignment to Student Outcomes 5-1
A-4 Prerequisites Flowchart 5-1

A-5 Curricular Areas 5-1
A-6 Major Design Experience for Engineering Practice 5-9
A-7 Cooperative Education 5-10
A-8 Materials Available for Review during Visit 5-11
B. Course Syllabi 5-12
6. CRITERION 6. FACULTY 6-1
A. Faculty Qualifications 6-1
B. Faculty Workload 6-1
C. Faculty Size 6-1
D. Professional Development 6-2
E. Authority and Responsibility of Faculty 6-2
7. CRITERION 7. FACILITIES 7-1
A. Offices, Classrooms and Laboratories 7-1
A-1 Offices 7-1
A-2 Classrooms 7-1
A-3 Laboratory Facilities 7-1
B. Computing Resources 7-2
C. Guidance 7-2
D. Maintenance and Upgrading of Facilities 7-2
E. Library Services 7-2
F. Overall Comments on Facilities 7-4
F-1 General Safety Measures 7-4
F-2 Laboratory Safety Guidelines 7-4
F-3 Safety of Computer Software 7-4
8. CRITERION 8: INSTITUTIONAL SUPPORT 8-1
A. Leadership 8-1
B. Program Budget and Financial Support 8-1
B-1 Sources of Financial Support 8-1
B-2 Support for Teaching Activities 8-2
B-3 Support for Facilities 8-2
B-4 Adequacy of Resources 8-3
C. Staffing 8-3
D. Faculty Hiring and Retention 8-3

E. Support of Faculty Professional Development 8-3
9. PROGRAM CRITERIA 9-1
A. Curriculum 9-1
Appendix A – Course Syllabi 9-0
Appendix B – Faculty Vitae 9-0
Abdellatif I M Semeia 9-1
Abdulaziz Miyajan 9-3
Abdulbasit Abid 9-4
Abdulghani Sayegh 9-5
Abdullah Baz 9-6
Adnan Gutub 9-7
Ahmad Alzahrani 9-9
Ahmad Muaz Qamar 9-11
Anas Basalamah 9-13
Ayman Alharbi 9-15
Emad Felemban 9-16
Fahad Ahmed Alzahrani 9-18
Fahd M. Aldosari 9-19
Faisal R. Al-Osaimi 9-21
Hussam Aleem Mohammed 9-23
Imran Tasadduq 9-24
Khalid Alhindi 9-26
Khalid Muhammad Jamil A. Khayyat 9-27
Khaled Almotairi 9-28
Loai Tawalbeh 9-29
Maher I. Rajab 9-30
Majed M. Gethami Al Otaibi 9-31
Mohsin Murad 9-33
Muhammad Rashid 9-34
Mohammed Hussein Sinky 9-36
Mohammad Al-Turkistany 9-37
Muhammad Yousuf Irfan Zia 9-38
Omar Sonbul 9-39

Saleh Basalamah 9-40
Turki Al-Somani 9-41
Waleed Alasmary 9-43
Appendix C – Equipment 9-1
Appendix D – Institutional Summary 9-1
A. The Institution 9-1
A-1 Name and address of the institution 9-1
A-2 Name and title of the chief executive officer of the institution 9-1
A-3 Name and title of the person submitting the self-study report. 9-1
A-4 Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations 9-1
B. Type of Control 9-1
C. Educational Unit 9-1
D. Academic Support Units 9-2
E. Non-academic Support Units 9-3
F. Credit Unit 9-3
G. Tables 9-3
Table D–1: Program Enrollment and Degree Data 4
Table D–2: Personnel 5
Signature Attesting to Compliance 6

BACKGROUND INFORMATION

A. Contact Information

Dr. Ayman Alharbi
Head of Computer Engineering Department
College of Computer and Information Systems
Umm Al-Qura University
Makkah, Saudi Arabia
Phone: +966-2-527-0000 Ext 6710
E-mail: cis_ce@uqu.edu.sa

B. Program History

The College of Computer and Information Systems was established in the year 2005 with three constituent departments – Computer Engineering, Computer Science and Information Systems. The degree offered by Computer Engineering program is called Bachelor of Science in Computer Engineering.

Before establishment of the College of Computer and Information Systems, computer engineering program used to be offered by the Electrical and Computer Engineering Department of College of Engineering and Islamic Architecture.

The program curriculum has gone through several changes since it started. The curriculum that was introduced nine years ago has gone through several changes based on the recommendations of various constituencies. Course descriptions of various courses have been revised several times. Course learning outcomes of all the courses have been revised from time to time along with their mappings with the student outcomes. As a persistent continuous improvement policy, the program goes through a review every five years and recommendations of all the constituencies are considered. A further improvement is planned on the basis of the feedbacks from various constituencies.

This is the second accreditation of this program. A previous evaluation was done by ABET in the 2013-14 review cycle. The weakness identified during evaluation was addressed in the due-process response and was resolved according to ABET final statement dated August 21, 2014. The program was accredited to September 30, 2018. The accreditation was retroactive from October 01, 2011. RFE for the re-accreditation for the 2017-2018 cycle was submitted but was withdrawn. Since the previous accreditation expires on Sept 30, 2018, this accreditation will be considered as an Initial General Review.

C. Options

At present, the department of computer engineering offers a single option. The graduates from the program obtain a degree of Bachelor of Science in Computer Engineering. In the senior level year, the students have to choose three electives.

D. Program Delivery Modes

The program is delivered basically through daytime classes. Most classes are between the time spans of 8 AM to 4 PM. However, due to non-availability of classrooms or faculty engagement in certain projects, classes are also offered in the evening. No classes are offered during the weekend. The courses are delivered in traditional lecture/laboratory environment.

E. Program Locations

The program is offered at the new Abdia campus in the holy city of Makkah.

F. Public Disclosure

	Item for public disclosure	URL
1	Program Education Objectives (PEOs)	https://uqu.edu.sa/en/cis_ce/19504
2	Student Outcomes (SOs)	https://uqu.edu.sa/en/cis_ce/19507
3	Annual student enrollment and graduation data	https://uqu.edu.sa/en/cis_ce/19513

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

No deficiencies, weaknesses or concerns exist from the previous evaluation, that was done by ABET in the 2013-14 review cycle. The program was accredited to September 30, 2018. The accreditation was retroactive from October 01, 2011.

CRITERION 1: STUDENTS

A. Student Admissions

In general, students applying to the College of Computer and Information Systems are centrally admitted by the Deanship of Admission and Registration. The new students are not accepted directly to the Computer Engineering program but they must spend one year in the Preparatory Year Program (PYP). University Council decides the number of students to be admitted for each academic year according to the recommendation of various academic colleges. The deanship of admissions and registration implements all policies in coordination with the colleges. Admission takes place only once each year in the beginning of the academic year.

Requirements of admission to the computer engineering program:

1) Secondary School Certificate (Natural Sciences) or its equivalent from inside or outside the Kingdom of Saudi Arabia.

2) Score of "Entrance Examination" which consists of an aptitude test, and a subject test. The test is administered by the National Center for Assessment in Higher Education, Saudi Arabia. It has two parts. The first part is General Aptitude Test. This test measures a student's analytical and deductive skills. It focuses on testing the student's capacity for learning in general regardless of any specific skill in a certain subject or topic. The other part is called "Achievement test for Science Colleges". This part covers the general and key concepts in biology, chemistry, physics and mathematics covered in the courses of the three years of General Secondary School.

3) Record of good conduct.

4) Appearance in interviews required by the university council.

5) Certificate of physically fitness.

6) Permission from the employer (For employed candidates).

7) No record of suspension from UQU or any other university.

Students applying for admission fulfilling all the above conditions are considered as applicants. A merit list of all applicants is prepared by the Deanship of Admissions and Registration on the basis of the following weights to the three types of scores:

a) Secondary school certificate score (50%).

b) Aptitude test score (30%).

c) Achievement test score (20%).

Students are offered admissions in a college of their choice in the order of their position in the merit list subject to the availability of seats. Once seats are exhausted in a particular college, the admission to that college is closed and remaining students have to make their choices from other colleges.

All newly admitted students to the College of Computer and Information Systems seeking acceptance to the Computer Engineering program spend their first academic year in the PYP. The major objectives of this program are:

a) to improve the students' English language proficiency to enable them for the engineering education in English language which is the principal language of instruction.

b) to strengthen the students' abilities in mathematical and analytical techniques and calculus-based physics.

c) to improve computer skills of the students.

The duration of the PYP is one academic year, divided into two semesters, as well as a summer term, if needed. Based on their performance in the PYP, and in accordance with the implementation rules, students will be able to select the major of their choice. An orientation session is held during the second semester of PYP for students to learn about all programs in the engineering college to help them select the program that suits them the most.

On successful completion of the PYP, the performance of students seeking admission to the Computer Engineering program is evaluated based on the GPA in the PYP. A merit list of these students is prepared and the department accepts the allocated number of students from the top of the list.

The admission procedures are regulated by the "Education and Examination Regulations" available at the following URL:

https://uqu.edu.sa/en/isarch.dep/App/FILES/5643 (Click "(UQU-01) Regulations of Study and Examinations of UQU Regulations of Study and Examinations")

B. Evaluating Students Performance

Each Computer Engineering student is assigned to a faculty who acts for him as an academic advisor. The academic advisor assists him in choosing courses for registration in each semester according to the study plan of the Computer Engineering program. The study plan is documented in the chapter on Curriculum. The study plan is available for the students and the academic advisors at the URL https://uqu.edu.sa/en/cis_ce/51109. The academic advisors of the Computer Engineering program may access students' registration record for academic advisement. Based on this study plan a student can register on-line.

The maximum course load allowed to a student is 18 credit hours. Exceptions to this rule can only be allowed by the coordinator of Students Registration for the College based upon the performance of the student during the last few semesters.

Normally a student is not allowed to register a course without taking the prerequisite courses as specified in the study plan. The instructors or the academic advisors are not authorized to allow a student to register in a course without satisfying the pre-requisites under any circumstances. If a student somehow does get registered in a course without satisfying the pre-requisites, the chairman of the department cancels the registration of such a course.

However, under certain circumstances a student may be allowed to take a course without a perquisite if the college coordinator for registration sees a need for it (e.g. his graduation will be delayed by a year). In this case evidence must be provided that the pre-requisite abilities have been attained by the student by taking outside courses, training, or due to his own lifelong learning with interest in the topics related to the pre-requisite subjects. This strictly required the approval of the instructor teaching the course.

The instructor evaluates students' performance in each course. The instructor designs the assessments for finding out the attainment of the course learning outcomes. The instructor may use homework assignments, quizzes, periodic examinations, and a final examination to evaluate students' performance in terms of the attainment of the course learning outcomes (CLOs). In the courses that involve laboratory classes, laboratory written reports (for the lab work throughout the semester) and the laboratory final examination are used to assess the attainment of the learning outcomes. Each question of an assessment is tagged for the CLO, SO and Bloom's level it is addressing. The scores of students in all questions of all assessments are input to the CLOSO software and finally converted into the attainment of the course learning outcomes (CLOs) and student outcomes (SOs).

B-1 Examination and Grading System

Success in a course is usually based on the combination of grades awarded to term work and final examination. Each course has a total of 100 points. Out of this, the instructor may allocate 40% to 60% marks to the term work consisting of quizzes, homework, term projects and mid-term or other periodic assessments while the remainder is allocated to the final examination.

The rubrics used for the grading system of Umm Al-Qura University are shown in Table 1-1. The instructor awards the grade as marks out of 100. The marks are converted to a letter grade and grade points as shown in Table 1-1. Table 1-2 shows a sample of student's grade report for six subjects in a typical semester.

Table 1-1 Grading system at UQU

Marks out of 100	Letter Grade	Description	Grade Points per Credit Hour
95-100	A+	Excellent	4.00
90-less than 95	A		3.75
85-less than 90	B+	Very Good	3.50
80-less than 85	B		3.00
75-less than 80	C+	Good	2.50
70-less than 75	C		2.00
65-less than 70	D+	Poor	1.50
60-less than 65	D		1.00
Below 60	F	Failure	0.00

Table 1-2 Sample calculation of GPA

Course	Credit Hours (CH)	Assigned Course Grade	Grade Points per Credit Hour (QP/CR)	Total Grade Points (CH) × (QP/CR)
Course 1	2	A	3.75	7.5
Course 2	3	D	2.00	6.0
Course 3	3	C	3.00	9.0
Course 4	4	D+	2.50	10.0
Course 5	4	B+	4.50	18.0
Course 6	2	C+	3.50	7.0
Total	**18**			**57.5**
Computed GPA = Total Grade Points / Credit Hours = 57.5 / 18 = **3.19**				

Grade of “Incomplete” (IC) is given to the student if the course requirements are not completed by the student. This is usually allowed in courses that require a project to be completed by the students. It is awarded only on the recommendation of the instructor and approval of the Department Council. The student getting IC must complete the requirements during the next semester otherwise the IC automatically changes to “F”.

Some courses need more than one term to complete the requirements particularly the Graduation Project. For these courses, the student gets “In Progress” (IP) grade. IP grade does not require the approval of the departmental council. Student getting an IP is required to continue the work and appear for the assessment when the work is completed.

Umm Al-Qura University requires that students do not miss more than 25% of the total number of lectures, labs and tutorials. Students failing to meet this requirement in any of the courses are prohibited from attending the final examination of that course and earn a DN (Denied) grade in that course. A student who is absent in the final examination of a course(s) for a valid reason accepted by the department council and the Dean of the college is allowed to take the examination at a later date.

B-2 Academic Probation

At the beginning of each term, the Deanship of Admission and Registration provides each student with his full academic advising record showing the results of all the courses that have been studied from the study plan as well as the number of academic warnings that have been issued. The student gets a warning

if his CGPA is below 1.0 out of 4.0 in a term. The student is suspended if he gets a maximum of three (3) such consecutive warnings. After the third warning, being suspended for one term, College Council, in coordination with the Deanship of Admission and Registration, may recommend to the University Council to give a fourth chance to those students who can raise their CGPA by taking courses according to the rules of registration. The student will also be suspended if he is not able to complete the graduation requirements within a period of 15 terms. The academic suspension is governed by the Article #20 of the Policy on Regulations of Study and Examinations. The English translation of implementation rules of Article #20 is documented in https://uqu.edu.sa/en/isarch.dep/App/FILES/5643 (Click "(UQU-01) Regulations of Study and Examinations of UQU Regulations of Study and Examinations")

C. Transfer Students and Transfer Courses

Transfer to the College can be done through three different channels as follows:

C-1 Transfer from Other Universities

A student may be accepted to transfer from outside UQU if he has studied at a recognized university or college and has not been suspended from that institution based on disciplinary or academic reasons. The transferring applicant must not have spent more than 6 terms at the university he is transferring from and he must study at least 60% of the required courses at UQU. The applicant is required to get an approval from the Dean of College and head of the department he is transferring to. These requirements and process for accepting transfer students are governed by the Article #42 of the Policy on Regulations of Study and Examinations available in https://uqu.edu.sa/en/isarch.dep/App/FILES/5643.

Credits for courses taken by the students outside the university (UQU) may be transferred provided the college council based on the recommendations of the concerned department offering the equivalent courses approves the transfer of credits. The equivalent courses are documented in the academic record of the student being transferred. The equivalency credits are granted for only those courses in which the students have obtained a letter grade of 'C' or above. But the points for the equivalent courses are not used in the computation of CGPA of the student.

The transferred student submits an application for getting equivalency credits to the Deanship of Admission and Registration along with the original academic record and certified detailed description of the courses taken by student outside UQU. The Deanship of Admission and Registration refers the application to the concerned department for evaluation of equivalency credit. This evaluation is performed by the academic advisor in coordination with the chairman of the department on a case-by-case basis. The department, after getting the approval of the college council on the equivalency evaluations, sends the results to the Deanship of Admission and Registration. These requirements and process for courses equivalency and transfer credits are governed by Article #43 of the Policy on Regulations of Study and Examinations available in https://uqu.edu.sa/en/isarch.dep/App/FILES/5643.

The student should have a minimum cumulative GPA of 3.0 (out of 4.0) or equivalent from a reputable college. This is complemented with other conditions developed by the College Council on a yearly basis. The procedure for evaluating transfer applications to the College from outside the university is as follows:

- Fill in the university application form online
- Upon receiving all applications, the university registrar office sends all applications that satisfy the College requirements to the College's Vice Dean of academic affairs office. The college Vice Dean of academic affairs office prepares the applicants information for the College dean. The college dean evaluates the presented applications information and makes decisions on transfer applications.
- The maximum allowable percentage of credit hours that could be transferred by students from other universities is 40% of the total credit hours in the curriculum.

Students who want to study some courses in other universities must do the following:

i. Fill in a course transfer form and submit it to the chairman of the department.

ii. The chairman consults the faculty who teaches the course.

iii. The faculty reviews the syllabus of the transfer course in light of the departmental course syllabus checking the equivalency of the syllabus and credits.

iv. The chairman approves the equivalency and signs the form.

v. The student should then get the approval of the vice dean.

vi. The student hands in the form to university registrar office and gets an official acceptance letter to study the course at the specified university.

vii. After studying the course, the student should get an official completion letter and the transcript from the registrar office of the university where the transfer course was completed.

viii. Finally the student should hand the official completion letter to the UQU registrar office.

C-2 Transfer of students within the University

Students can apply for transfer only after studying at least one semester in the College they are registered. (Summer semester is not counted). The student must satisfy the College admission conditions which are announced on a yearly basis. The procedure for evaluating transfer applications is as follows:

1. Fill in the transfer form online (Inter-College Transfer Form).
2. College Vice Dean receives all online applications.
3. Upon receiving all applications, a designated college-based committee (which consists of the Vice Dean and the chairs of all departments) meets and recommends on transfer applications. If the number of eligible applicants is high, students with the highest cumulative GPA are tentatively accepted.
4. The tentative transfer decisions are then forwarded to the dean for final approval.
5. The academic committee of each department reviews transcripts of all tentatively accepted transfer students and decides on the equivalency of credits based on an equivalency table of credits approved by the College Council.

C-3 Transfer to a department within the College

The procedure for evaluating transfer applications between departments within the College is as follows:

1. Fill in the Inter-departmental Transfer Form online.
2. Upon receiving all applications, a designated college-based committee (which consists of the Vice Dean and the chair and representatives of all departments) meets and decides tentatively on transfer applications. If the number of eligible applicants is high, students with the highest cumulative GPA are tentatively accepted.
3. The tentative transfer decisions are then forwarded to the dean for final approval.
4. The academic committee of each department reviews transcripts of all tentatively accepted transfer students and decides on the equivalency of credits based on equivalency tables of credits approved by the College Council.

D. Advising and Career Guidance

The University considers student advising by faculty as an important academic activity. A faculty member is expected to advise students in planning their academic programs during early registration, and throughout the academic year whenever a student seeks his advisor's input in academic matters.

D-1 Registration Procedure

Under normal circumstances, all students are registered automatically through the University computerized registration system following a model study plan set by the department. This plan includes all prerequisites and maximum and minimum allowable number of credit hours per semester. The system allows the student to make changes and adjustments within the preset rules. It is during the first week of classes that students are allowed to make changes, such as add and drop. Afterwards, only course withdrawals are allowed provided they are done five weeks before the final examination period, and with the head of department's approval.

Nevertheless, a student can only drop a course or withdraw from course(s) if his workload will not fall below a minimum of 12 credit hours. This procedure can be repeated for four times during the course of a student's study.

The student must confirm his registration within the first week of the semester. The load for each student is determined as follows:

- Students with GPA of at least 2.0 are eligible to register for 14 credit hours.
- Students with GPA of 3.5 or above are eligible to register for up to 20 credit hours.
- Allowed credits range between 14 and 20 based on GPA.

D-2 Academic advising

According to the department council recommendation, the chairman of the department allocates groups of students to academic staff. Then this allocation is entered into the University's electronic registration system for student's access. The name of the advisor for each student is included in the electronic registration system.

D-3 Functions of the Academic Advisor

Academic advisors are meant to provide educational counseling for students. The academic advisor's primary responsibility is to ensure that he takes all courses to satisfy the requirements for his graduation while it meeting each student's specific needs. To be effective, the advisor must recognize that each student has different abilities, interests, aspirations, needs, experiences, and problems so that his approach in dealing with students can be different from one to the other. The general advising duties can be stated as follows:

- The advisor is expected to deal with students' academic problems.
- The academic advisor helps his advisee students examine the course offerings in their major and understand their graduation requirements.
- The academic advisor helps the student explore the career fields within his major, and obtain related career information and survey job opportunities.
- The academic advisor serves as a link between the student and the administration by counseling the student on matters of failure, on the procedures for dropping and adding courses, course scheduling, and academic progress.
- The academic advisor must alarm students of the exclusion procedure well in advance, and of any subsequent changes that might be enforced during the course of their studies.

E. Work in Lieu of Courses

The university only grants credit(s) for the academic courses that are successfully completed. No credit is offered towards achieving life experience, advanced placement, dual enrollment, military experience. Nevertheless, two credit hours are awarded for completing summer training which is explained under the graduation requirements.

F. Graduation requirements

Head of the Computer Engineering Department and the Deanship of Admissions and Registration are jointly responsible to ensure that all graduating students have met all the graduation requirements. With the help of the online registration system, the Deanship of Admissions and Registration ensures that graduating students are fulfilling all the requirements for graduation.

The Computer engineering curriculum consists of 165 credit hours. According to the University regulations, the student cumulative average should be 1.0 out of 4.0 or better at the time of graduation. The University Council has approved that the minimum CGPA for graduation will be 2.0 out of 4.0 for all the engineering disciplines. The implementation of this decision is in process.

University Council has the right to specify additional course load for a student to improve his cumulative average in case he passes the required courses but fails to fulfill the cumulative average. The requirement of 165 credit hours is distributed amongst various components as shown in Table 1-3.

Table 1-3 Graduation requirements

Curriculum Component		Credit Hours
Mathematics and Basic Sciences		35
General Education		34
Others		24
Engineering courses	Core Courses	59
	Electives	9
	Summer Training	4
Total		165

G. Transcripts of Recent Graduates

Sample copies of transcripts of graduating students will be available for the team visit.

CRITERION 2: PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

A-1 Mission of the University

The existence of Umm Al-Qura University in the Holy City of Makkah gives it a distinguished character as an academic institution that serves Islam and contribute to the development of human resources and the provision of services at the levels of both the public and private sectors in the light of the requirements of the comprehensive development plans of the country. The major objectives of the University as set by the Council of Ministers Decree number 190 on 21/7/1981 include the following:

- Provision of higher education and graduate studies to enable citizens to contribute to the development of their country in the light of Islamic principles in the following fields:
    - Islamic studies.
    - Natural and applied sciences.
    - Humanities, social sciences and languages.
- Contribution to enhancement of scientific research by conducting and encouraging research and establishing research centers, and suggesting means for provision and satisfaction of present-day needs.
- Preparation of specialized scientists and teachers.
- Helping other Islamic societies in the specialized education of their citizens in the different fields of knowledge.

The University mission, vision and objectives are available online at:

https://drive.uqu.edu.sa/_/quality/files/AR_UQU_Strategic_plan_1-1-1433H.pdf

A-2 College of Computer and Information Systems Mission

The mission statement of the College of Computer and Information Systems is as follows:

"To provide high quality education, to conduct innovative research and to offer professional services to the Saudi Community. This includes preparing students to be leaders in their profession, creating and disseminating knowledge by means of scholarly and creative achievements, and establishing partnerships with local industry, Governmental organizations and leading international academic institutions".

This mission statement is available online at: https://uqu.edu.sa/en/cis.

A-3 Computer Engineering Department Mission

The mission of the computer engineering department is:

"To educate students to be computer engineers who are competent and conscientious, and who have the ability to become intellectual professionals in industry, government, and academia. Fostering an academic environment ideal for having applied and innovative research, and for providing professional services to the Saudi community."

This mission statement is available online at: https://uqu.edu.sa/en/cis_ce/AboutUs.

In order to show coherence between the Department mission and the College and University missions, the mission statements will be divided into simpler statements. These simple statements will then be mapped to each other as shown in Table 2-1, Table 2-2 and Table 2-3.

The University mission can be summarized into three sub-missions:

1. Leadership in Quality Education.
2. Leadership in Scientific Research.
3. Local and Global Community Service.

The College mission aims to:

1. Provide high quality education.
2. Conduct innovative research.
3. Offer professional services to the Community.

Table 2-1 illustrates how the College mission helps in achieving the overall University mission.

Table 2-1 Mapping of College mission to the University mission

College Mission	University Mission		
	1	**2**	**3**
1	✓		
2		✓	
3			✓

The mission of the CE department can be summarized as:

1. Graduate students who are competent and conscientious, and who have the ability to become intellectual leaders in industry, government, and academia
2. Fostering an academic environment ideal for applied and innovative research
3. Fostering an academic environment ideal for providing professional services to the Saudi community

Table 2-2 and Table 2-3 illustrate how the mission of the Computer engineering department helps achieve the mission of the College and the University.

Table 2-2 Mapping of Department mission to the University mission

Department Mission	University Mission		
	1	**2**	**3**
1	✓	✓	
2		✓	
3			✓

Table 2-3 Mapping of Department mission to the College mission

Department Mission	College Mission		
	1	**2**	**3**
1	✓	✓	
2		✓	
3			✓

B. Program Educational Objectives (PEOs)

The Computer engineering department has defined a set of PEOs that translate its mission into definite abilities they attain a few years after graduation. The PEOs of computer engineering program are defined as:

Graduates of computer engineering will:

1. Practice as computer engineers in problem solving, designing, implementing and maintaining computing systems.
2. Utilize their professional education/knowledge for the benefits of the society or/and the profession.
3. Keep their professional knowledge updated through further education or exploring available resources and through engineering educational seminars or workshops.
4. Assume leadership positions in industry, academia and public service, and/or contribute positively to their growth and sustainability.

These PEOs are available at department's website: https://uqu.edu.sa/en/cis_ce/19504.

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The first and second PEOs are in line with the last part of UQU mission, i.e., "local and global community service". The third PEO is in conformance with the second part of the mission, i.e., "leadership in scientific research". "Leadership in education" is mapped to the fourth PEO where our graduates are assumed to have the ability of assuming leadership positions in industry, academia and public service.

The program educational objectives 1 and 2 are consistent with the College mission as well since the computer engineering program prepares students to be leaders in their profession. The third PEO is in conformance with the second part of the College mission, i.e., "conduct innovative research". The third and the fourth PEOs together are mapped to the College mission as stated in "disseminating knowledge by means of scholarly and creative achievements" and "leadership in scientific research" respectively.

The following statements summarize the University, College and Department missions:

Mission 1. Leadership in education /high quality education/graduates are competent and conscientious. (university/college/department)

Mission 2. Conduct innovative research/Leadership in scientific research/having applied and innovative research (university/college/department)

Mission 3. Local and global community service/offer professional services to the Saudi community/providing professional services to the Saudi community (university/college/department)

Mission 4. Educate students who have the ability to become intellectual leaders in Industry, government, and academia (department)

Table 2-4 shows a mapping between the Institution's missions and the PEOs indicating the consistency of the PEOs with the mission of the institution.

Table 2-4 Mapping of PEOs to the missions of Institution

	Mission 1 University & College	Mission 2 University, College & Department	Mission 3 University, College & Department	Mission 4 Department
PEO I	✓			
PEO II	✓		✓	
PEO III	✓	✓		
PEO IV		✓	✓	✓

D. Program Constituencies

The program constituencies are the following:

- *Program students:* They are the primary input to the program. It is expected that students become technically qualified, marketable, and productive scientists upon graduation.
- *Program alumni:* This group includes students who have earned B.Sc. degrees from the Computer Engineering program and are currently working in various professions.
- *Department faculty:* Faculty consists of members of the departmental teaching staff who are responsible for meeting the program outcomes and objectives during the teaching process.
- *National and regional employers of computing professionals:* The employers range from public to private sectors and from small to large organizations.

The Computer Engineering program objectives align with the needs of different constituencies:

- PEO I and II align with the needs of the national and regional employers to have qualified graduates being competent in their field, being effective team members, applying professionalism, and being ethically responsible
- PEO III and IV align with faculty members' aim to see part of their graduates continuing through post-graduation studies and taking part in applied and innovative research
- All PEOs are aligned with the needs of the students to be well prepared for the job market and/or for continuing their studies

The role of each of the department constituents consists of establishment and of participation in the continuous assessment of the program program's educational objectives and student outcomes. Initially, the PEOs were established by a process that involved extensive discussions with faculty, students and the College of Computer & Information Systems' (CCIS) ABET Coordinators' Committee. We then held a meeting with the Department faculty and proposed a number of objectives. Detailed discussions resulted in a consensus.

The department also created an External Advisory Board (EAB) which gathers some faculty members, some representatives of the employers of computer engineering graduates along with some program alumni. In addition, the department has created a student council where students of different levels of the B.Sc. program are represented. The EAB takes part in the process of establishing and reviewing the PEOs.

E. Process of Revision of PEOs

The review and revising process of the PEOs is planned to be launched every three years. It involves consultations with the program's constituencies. From these consultations, the Assessment and Evaluation Committee will propose revisions to the PEOs. The process is as follows:

1. A questionnaire similar to the one shown in Figure 2-1 is distributed to get opinions on PEOs. Along with the questionnaire, all the information is provided to ensure that the recommendations

for modifying the PEOs remain consistent with the institutional mission and the program constituents' needs.

2. Students are involved in the process in two ways:
    a. The current PEOs are published on the department web page and students will be encouraged to present proposed revisions through the Student Advisory Board.
    b. Close to the date of each revision, the Student Advisory Board will take student opinion about PEO revisions through the questionnaire.
3. Alumni are involved in the revision process through a survey of randomly selected alumni graduated within a period of 3 to 5 years from the date of survey.
4. Employers are also involved in the revision process through a survey of major employers of the program graduates.
5. Based on the data obtained through student survey, exit interviews, alumni surveys, employer surveys, and the faculty survey data gathered through the CLOSO software during the past three years, the Assessment and Evaluation Committee forms proposals for revisions of the PEOs.
6. The proposals are presented to the faculty in the department council meeting.
7. The revised PEOs approved by the department council will be sent to EAB members.
8. EAB members will present their opinions in the EAB annual meeting. The EAB members are given the questionnaire to fill in as shown in Figure 2-1.
9. Finally, the department council will consider the recommendations of EAB as well as all constituencies and will give final approval to the revisions.

The Computer Engineering Program Educational Objectives (PEOs) are listed below. Please read and circle either OK, NOT OK, or NOT SURE to indicate if the PEOs need to be modified. If you see it is "NOT OK" then write in the space below what you suggest as the modified PEO.

Graduates of the Computer Engineering program are expected within a few years of graduation to have demonstrated their ability to:

PEO 1: Practice as computer engineers in problem solving, designing, implementing and maintaining computing systems.

OK NOT OK NOTSURE

PEO 2: Utilize their professional education/knowledge for the benefits of the society or/and the profession.

OK NOT OK NOTSURE

PEO 3: Keep their professional knowledge updated through further education or exploring available resources and through engineering educational seminars or workshops.

OK NOT OK NOTSURE

PEO 4: Assume leadership positions in industry, academia and public service, and/or contribute positively to their growth and sustainability.

OK NOT OK NOTSURE

Figure 2-1: PEO revision questionnaire

CRITERION 3: STUDENT OUTCOMES

A. Student Outcomes

The Computer Engineering Department has adopted the Student Outcomes a-k as prescribed in ABET Criterion 3. These abilities that students must demonstrate at the time of graduation are attained through various courses taken by all students during the program. Student Outcomes a-k are listed in Table 3-1. These have been published at the following URL: https://uqu.edu.sa/en/cis_ce/19507.

Table 3-1 Student Outcomes (SOs)

SO ID	SO Description
(a)	an ability to apply knowledge of mathematics, science, and engineering
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d)	an ability to function on multidisciplinary teams
(e)	an ability to identify, formulate, and solve engineering problems
(f)	an understanding of professional and ethical responsibility
(g)	an ability to communicate effectively
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i)	a recognition of the need for, and an ability to engage in life-long learning
(j)	a knowledge of contemporary issues
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

B. Relationship of SOs to PEOs

The program outcomes support the program educational objectives. The first objective is that our graduates *"Practice as computer engineers in problem solving, designing, implementing and maintaining computing systems"*. This objective is supported by most of the student outcomes. Indeed, (a), (b), (c), (e), and (k) target the ability to (1) apply fundamental mathematical, science and engineering knowledge, (2) formulate and solve an engineering problem of varying complexity (a small component to a complete system) as individual or a member of a team and (3) utilize their computing knowledge and up to date computing techniques and tools in analyzing, designing, implementing and evaluating computer-based systems of varying degrees of complexity. Outcome (f) targets social responsibilities and is required from computing professionals such as our graduates. Outcome (h) ensures the ability of our graduates to study the impact of their design in a global, economic, environmental, and societal context.

The second objective is that our graduates *"Utilize their professional education/ knowledge for the benefits of the society or/and the profession"*. Outcomes (d), (e) and (f) support this objective in that they provide the ability to design projects in teams under broader ethical, societal, and global point of view.

The third objective is that our graduates "*Keep their professional knowledge updated through further education or exploring available resources and through engineering educational seminars or workshops*". The outcome (i) directly supports this assertion. Outcomes (h) and (j) require having life-long learning as well.

The forth objective is that our graduates "*Assume leadership positions in industry, academia and public service, and/or contribute positively to their growth and sustainability*". Leadership positions usually require effective communication (Outcome "g"), more experience and knowledge beyond the B.Sc. study (Outcome "i"), a knowledge of contemporary issues (Outcome "j") and skills of using modern tools and technology (Outcome "k").

Table 3-2 summarizes the mapping between the student outcomes and the program objectives.

Table 3-2 Relationship of SOs to PEOs

Student Outcomes	Program Educational Objectives (PEOs) (Abbreviated)			
	PEO 1 Practice computer engineering profession	**PEO 2 Utilize professional education**	**PEO 3 Keep professional knowledge updated**	**PEO 4 Attain professional leadership**
(a)	✓			
(b)	✓			
(c)	✓	✓		
(d)	✓	✓		
(e)	✓			
(f)		✓		
(g)				✓
(h)	✓		✓	
(i)			✓	✓
(j)			✓	✓
(k)	✓			✓

CRITERION 4: CONTINUOUS IMPROVEMENT

A. Student Outcomes

The student outcomes (SOs) have already been described in the previous chapter. The computer engineering program has several processes for regularly assessing and evaluating these outcomes. This section of the chapter documents these processes as well as the results that indicate the extent to which the SOs are actually attained. This section has been structured as follows:

1) Data Collection Elements (Section A-1)
2) Assessment processes (Section A-2).
3) Assessments management (Section A-3)
4) SO Evaluation Processes (Section A-4)
5) SO Attainment (Sections A-5 to A-11)

A-1 Data Collection Elements

The data collection processes for the assessment and evaluation of SOs rely on the following elements:

A-1-1 Element 1: Course Learning Outcomes

Each course has a set of outcomes called "Course Learning Outcomes" or CLOs. The CLOs of a course are the abilities targeted to be attained by the students through the various topics taught to them in the course. For Computer Engineering program, the CLOs are part of the syllabus and are published for students and the faculty through the CLOSO software as described later in this chapter. The syllabus for each course with the CLOs are also provided in Appendix A – Course Syllabi of this SSR.

An example of the set of CLOs for the course 1403201-4 Circuit Theory is shown in Table 4-1.

Table 4-1 Typical CLOs (1403201-4 Circuit Theory)

CLO ID	CLOs
CLO 1	An ability to analyse resistive circuits by applying electrical circuit laws
CLO 2	An ability to analyse 1st order and 2nd order circuits by applying electrical circuit laws
CLO 3	An ability to analyse basic two-port circuits by applying electrical circuit laws
CLO 4	An ability to design and conduct experiments in the area of basic electrical circuits

CLOs are important because they are the basis of all direct assessments of SOs. Importance of the assessment of CLOs is very well described in (Imam et al., 2017) and is quoted as follows:

[It is worth noting that the SOs are not always expected to be attained directly but indirectly in an integrative manner through the attainment of various CLOs in one or more courses. In an academic program, students enroll in a set of courses prescribed in the curriculum. The abilities attained by the students are attained mainly through their learning from these courses. The instructor teaching a course may primarily focus on the course subject matter and strive to ensure that at the end of the course the students attain the abilities as required by the set of CLOs pre-specified in the curriculum. Consequently, the curriculum design must include courses with appropriate CLOs that also help in attaining the required SOs in an integrative manner. This imperative is usually accommodated through an appropriate CLO-SO map (Imam & Tasadduq, 2012; Imam, Tasadduq, Ahmad, & Aldosari, 2016; Smart-Accredit, 2016). Once ensured proper CLO-SO mapping is achieved, teaching and assessments can be focused on the attainment of CLOs (Kuh, Jankowski, Ikenberry, & Kinzie, 2014). It is noteworthy that directly assessing the SOs, and not through CLOs, often defeats the purpose of having both an integrated and an encompassing curriculum. For example, in a course of Circuit Theory, CLOs would require the students to attain an ability to analyze circuits. Whereas, in a course of Hydraulics, CLOs would require the students to attain the ability to analyze

the flow in pipes and channels. These abilities are learned through various courses and, in turn, facilitate learners attain the broad higher-level ability "to identify, formulate, and solve engineering problems", which is an ABET specified SO. However, if an instructor just assesses the SO directly and disregards the subject matter then the whole idea of an integrated curriculum is defeated.]

A-1-2 Element 2: CLO-SO Linking

The ability attained by students in a CLO may be linked to an ability represented by one or more SOs. Therefore, CLO-SO map is required to show this linking using the 0-1 logic. A typical CLO-SO map for the course 1403201-4 Circuit Theory is shown in Table 4-2. A value of 1 indicates the CLO is significantly contributing towards the attainment of the relevant SO.

Table 4-2 Typical CLO-SO map (1403201-4 Circuit Theory)

CLO ID	SOs										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1	1				1						
2	1				1						
3	1				1						
4		1									1

Since SOs are linked to the CLOs of various core courses through the CLO-SO mapping, if the CLOs are attained to the required level of satisfaction, the relevant SOs are also assumed to be attained to the required level of satisfaction. Based on this proposition, the most important part of our SO assessment process is to track the attainment and satisfaction of CLOs in various courses. The data obtained for CLO satisfaction are then converted to SO satisfaction data automatically by the CLOSO software being used in the department for the last 6 years. Figure 4-1 shows this central idea of the SO assessment process.

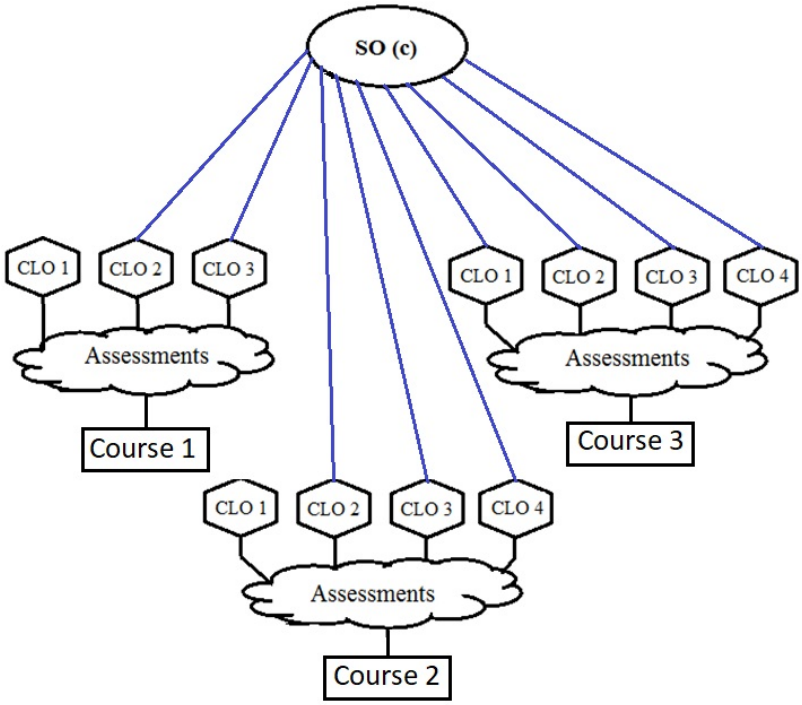


Figure 4-1 The SO assessment linked to CLO assessment

A-1-3 Element 3: Level of Learning (LOL)

"Level of Learning" (LOL) is another essential element of the assessment and evaluation process. It is obvious that just saying that a given SO has been attained by the students is not enough. The question arises: "To what level a SO has been attained?" Therefore, it is important to prescribe proper LOL for each SO. This is necessary to keep track of the level of learning for each SO.

Bloom's Taxonomy is well established way to specify and assess the LOL. It covers the various levels of attainment of educational objectives by dividing them into six levels of cognitive development. They are described here in Table 4-3. Table 4-4 shows the LOLs for each SO. This table may be improved with experience.

Table 4-3 Bloom's Levels of Learning (LOL)

LOL ID	Level	Illustrative Verbs
1	Knowledge	define; describe; enumerate; identify; label; list; match; name; reproduce; select; state
2	Comprehension	classify; cite; convert; describe; discuss; estimate; explain; generalize; give examples; paraphrase; restate (in own words); summarize
3	Application	Administer; apply; calculate; chart; compute; determine; demonstrate; implement; prepare; provide; relate; report; solve; use
4	Analysis	analyze; break down; correlate; differentiate; discriminate; distinguish; formulate; illustrate; infer; organize; outline; prioritize; separate; subdivide
5	Synthesis	Adapt; combine; compile; compose; create; design; develop; devise; facilitate; generate; integrate; modify; plan; reconstruct; revise; justify
6	Evaluation	Appraise; compare and contrast; conclude; criticize; defend; evaluate; judge; justify

Table 4-4 LOLs for SOs

SO	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
LOL	4,5	3	4,5	3	4,5	4,5	4,5	3,4	3	4,5	3

A-1-4 Element 4: Courses Used for Evaluation

The list of all courses used for assessment data collection and evaluation of attainment of SOs is given in Table 4-5. This list does not include all the courses of the program. Students of the Computer Engineering program acquire abilities as prescribed by the required SOs through various courses during the five-year degree program. These courses are from various departments from different colleges and span over a wide range of subject areas. *Despite the fact that all such courses contribute a little or more towards attaining the required SOs, assessment and evaluation presented here to demonstrate the attainments of SOs are limited to the core courses of the program administered by the Computer Engineering Department including the Graduation Project*. These courses are taken by all students enrolled in the program and the department has full control on them for devising the assessment and evaluation processes as well as implementing the improvement plans.

The courses that are *not* considered in the SO evaluation processes are the following:

- General courses to satisfy the university requirement
- Engineering courses administered by other departments
- Elective courses of the Computer Engineering program
- The two summer trainings administered by the College

It must be re-emphasized that all the above courses that are not considered in the evaluation of attainment of SOs definitely contribute to the abilities related to SOs. The reasons for excluding them are as follows:

a) Since it will be demonstrated that all the SOs are attained to the required satisfaction level through the Computer Engineering core courses, as mentioned above, the abilities gained through the excluded courses "a plus" and are not required to be evaluated.

b) These courses are not administered by the department and therefore we don't have full control on them for data collection and evaluation.

c) Excluding *elective courses* from data collection and evaluation is due to the fact that all students do not take the same elective courses. The SOs attained in various elective course are different and therefore the attainment of SOs in these elective courses are not representative of the abilities of all students in the program.

A-1-5 Element 5: Satisfaction Criterion

Another essential element of the SO assessment and evaluation process is the "Program Satisfaction Criterion" or PSC. It specifies the percentage of students that must attain a certain level of ability for the students learning to be called satisfactory. The abilities attained are represented by the students' percentage scores in each CLO and SO. The PSC is specified by the department based on faculty opinion. If the satisfaction level for a CLO or SO in a course is lower than the specified PSC it will trigger the alarm for the instructor and a "Course Improvement Plan" (CIP) must be written and implemented by the instructor.

Computer Engineering program has specified a satisfaction criterion of 60% students attaining the ability represented by 70% marks (i.e., C grade), stated as follows:

Target PSC: "60% students attain the ability represented by 70% marks"

It must be emphasized here that it is **a target to be achieved**. With this target, for any course that cannot attain this PSC then a CIP must be provided by the instructor and then implemented to obtain the required "Target PSC". The purpose of this "Target PSC" is to encourage the faculty to suggest a CIP whenever the CLO or SO attainments fall below this Target PSC. Considering the fact that some faculty members are always too hard graders and some are too soft, the "Target PSC" provides a guideline to the instructors and the chairman to evaluate the level of learning of the students.

Table 4-5 Courses used for evaluation of SO attainment

Course No.	Course Name	Credit Hours
1403201	Circuit Theory	4
1403271	Switching Theory	4
1403311	Electronics	4
1403312	Digital Elect. Syst. & Circuits	4
1403322	Computer Comm. System	4
1403364	Basics of IC Design	3
1403371	Advanced Logic Design	4
1403372	Computer Organization	4
1403381	Numerical Analysis	3
1403401	Seminar	2
1403422	Computer Networks	4
1403450	Microcomputers Syst. Design	4
1403472	Computer Architecture	3
1403489	Microprocessors	4
1403499	Project	4

A-1-6 Element 6: Accreditation Software

The department is using a software package called CLOSO [http://www.smart-accredit.com]. It was used to achieve the following goals:

a) To cut down the instructor's time and effort in assessment data collection.

b) To automate the course folder preparation.

c) To make the course folder of each instructor in a unified format.

d) To increase the reliability of the collected data.

e) To allow error-free processing of large amount of data.

f) To enable the department to analyze and evaluate all courses.

g) To obtain faculty's opinions on issues to help improve the CLO and SO attainments.

h) To identify the courses having issues and to take corrective measures.

i) To review the SO attainments and "Loop-closing" in each semester.

j) To maintain a unified database for syllabi of all courses.

k) To make the assessment and evaluation system highly sustainable to continue without any additional resources.

The software CLOSO was licensed because it satisfied all the above requirements. The software has been extensively used by the instructors in preparing the course files and by the ABET coordinator in getting data for this SSR.

A-2 Assessment Processes

The attainment of SOs are continually assessed and evaluated through a number of processes. Other than the direct Formative and Summative Assessments, five other indirect assessment processes constitute a system of assessment and evaluation. A summary of these processes is given in Table 4-6.

Table 4-6 Assessment Processes at a Glance

	SO Assessment Process	Assessment Type	Frequency	Data Responsibility	Data Collection & Processing	Evaluated by
1	Formative Assessment	Direct	Each Semester	Instructors	CLOSO	Assessment Committee
2	Summative Assessment	Direct	Each Semester	Project Advisor	CLOSO	Assessment Committee
3	Course-wise Student Survey	Indirect	Each Semester	Instructors	CLOSO	Assessment Committee
4	Course-wise Faculty Survey	Indirect	Each Semester	Instructors	CLOSO	Assessment Committee
5	Exit Survey	Indirect	Each Semester	Surveys Committee	Surveys Committee	Assessment Committee
6	Alumni Survey	Indirect	Triennial	Surveys Committee	Surveys Committee	Assessment Committee
7	Employers Survey	Indirect	Triennial	Surveys Committee	Surveys Committee	Assessment Committee

Data collection and evaluation is automated through CLOSO software package mentioned above. The software maintains a unified database containing the syllabus, CLO-SO maps for all courses, Program Satisfaction Criterion and various other data. The software has several features and the effective use of software is improved continually. The department was quite successful in drastically cutting down the instructors' time in preparing the course files and the evaluation of data. To understand the assessment processes, the following two points are to be noted:

a. In the direct assessment process, reliance on some "SO-based" questions in a *subset* of courses cannot be fruitful. Complete data for all core courses are required to make decisions that bring improvement. Since the instructor teaching the course is more oriented towards the CLOs and naturally plans to assess the CLOs of the course and considers students' attainment of the CLOs

of the course as the major responsibility, we let the instructor focus on the CLOs. The CLOSO software converts the CLO based data to the SO based data through the CLO-SO map of the course as described in Section A-4-1.

b. Since CLOSO software automates the process of analysis and evaluation of data our "Formative Assessment" now includes all core courses. The philosophy in the Formative Assessment is based on the fact that SOs are in fact the abilities at the time of graduation and not the abilities demonstrated in individual courses. All core courses taken before the graduation are actually just preparing the students to attain the SOs. Therefore, the Formative Assessments represent the quality of learning and teaching and the data from these assessments are indicators of students' progress towards the attainment of SOs. The SOs are demonstrated by the students in their graduation projects completed in the senior year. The graduation projects cover all the SOs. For this reason, we call the assessment of the Graduation Project as "Summative Assessment".

A-2-1 Formative Assessment

For each course, course assessment data are collected by the instructor in a prescribed format. The data for each core course are input to the CLOSO software by the instructor. CLOSO software produces all the required analyses and evaluation data. It also produces a print out of the complete course file for accreditation purpose. The results are finally reviewed and evaluated by the CLOSO Admin part of the software. The compiled results are reviewed and evaluated by the Assessment and Evaluation Committee. Since all data processing is done by CLOSO software, the key to success in achieving the reliability of the direct course assessment and evaluation system is the data collection and data entry. The data to be collected by the instructor over the whole semester are described in the following sections.

A-2-2 Summative Assessment

Three to five students work as a team on the Graduation Project over a period of one semester under the supervision of a faculty member with good design back ground. CLOSO data templates are available for the instructors to report the assessment of the project. The data are processed and all the required analysis of data and the evaluation are produced by the CLOSO software. The details are given in Section A-6.

A-2-3 Course-wise Student Survey Assessment

For each course, CLOSO software produces a CLO satisfaction survey form. The instructor distributes the survey form to the students at the end of the semester before the final examination. The students fill in the survey form to tell their opinion about how well they think they have learned based on their perception. The data is entered in the CLOSO software by the instructor. The software does the rest of the processing as explained in Section A-7.

A-2-4 Course-wise Faculty Survey Assessment

For each course, the instructor enters his own opinion about students learning based on his perception at the end of the course. The data are entered in the CLOSO software by the instructor. The software does the rest of the processing as will be explained in Section A-8.

A-2-5 Exit Survey Assessment

Exit survey is conducted at the end of each semester. All graduating students fill a survey form. In this survey, graduating students give their assessments of how well they have attained the SOs. The data is compiled by the Surveys Committee and is reviewed by the Assessment and Evaluation Committee. It is discussed in Section A-9.

A-2-6 Alumni Survey Assessment

The Alumni survey is performed at an interval of three years. One of the main objectives of this survey is to obtain the opinion of the alumni about how they found themselves in the abilities relevant to the SOs at the time of graduation. Details of this process are described in Section A-10.

A-2-7 Employer Surveys

Employer survey is performed every three years. There are several items on the questionnaire. One major purpose of the survey is to determine the opinions of the employers about the abilities of the graduates of the Computer Engineering Program related to each SO at the time they were hired after graduation. This is described in Section A-11.

A-3 Assessments Management

A-3-1 SO Assessment Plan

The first piece of information that is required by all instructors is an SO assessment plan for the courses they are teaching and share it with the students in the first week of classes. The purpose of this plan is to increase the awareness of the course relevant SOs among the students and to re-emphasize the faculty of the importance of SO assessment though done implicitly through the assessment of the CLOs. This helps the instructor in keeping in view the relevant SOs whenever designing an assessment for CLOs. At the same time, it helps the students in paying attention to their abilities that are required at the time of graduation. Table 4-7, Table 4-8 and Table 4-9 show the choices available to the instructor for three different aspects of the SO assessment plan.

Table 4-7 SO Introduction to Students - Choices for Instructors

Choice No.	When will the SO be introduced to the students?
1	In the first week of classes
2	In the second week of classes
3	Any time before mid-term
4	After the mid-term
5	Last week of classes
6	Never

Table 4-8 SO Students Awareness Check - Choices for Instructors

Choice No.	How will it be ascertained that students are aware of the SO?
1	Through verbal cross-questioning
2	Through a questionnaire
3	Through questions in assessments
4	No. Nothing will be done.

Table 4-9 SO Assessment Method - Choices for Instructors

Choice No.	How will the SO be assessed?
1	Implicitly through CLO based questions
2	Explicitly through SO based questions
3	Through a presentation, student will make
4	Through an assessment for this purpose
5	Through oral questions
6	Not applicable (because no plan to assess)

Figure 4-2 shows a typical instructors' input in CLOSO software. Here the instructor enters the plan of SO evaluation. The SOs in the first column are only those that are relevant to the course. This information is gathered from all instructors for increased awareness of the faculty teaching the course and the students and may be used by the Assessment and Evaluation Committee to resolve any issues concerning the satisfaction of SO attainment.

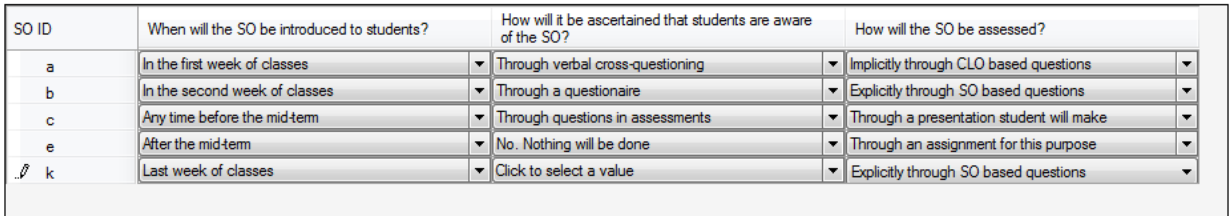


Figure 4-2 An example of SO Assessment Plan Input

A-3-2 Assessment Design

CLOSO helps the instructor in organized design of assessments. The assessments are organized by identifying the four attributes:

a) An assessment ID (usually the serial order of occurrence of assessment)

b) A name given to the assessment by the instructor

c) Raw marks used for grading the assessment

d) Contribution of the assessment to the final grade out of 100

An example is shown in Table 4-10. It is worth noting that data shown in Table 4-10 is typically maintained by all instructors universally and therefore it is no additional burden on the instructor.

Table 4-10 Typical Assessment Marks Contribution Data

Assessment ID	Assessment Name	Raw Marks (Used for grading the assessment)	Marks Contribution to Final Grade (%)
1	Quiz 1	20	5
2	Homework 1	100	5
3	Quiz 2	20	5
4	Mid-Term	20	20
5	Term Project	50	15
6	Final Exam	100	50
Total marks contribution: (must add up to 100) >>			**100**

A-3-2-1 Organizing the Question Sets

The question set works as the main entity in assessment design. It has the following 6 elements:

1. QS ID
2. From/To Question Numbers for the QS
3. Raw Marks of the QS
4. CLO addressed in the QS
5. SO addressed in the QS
6. Bloom's Level of the QS

The instructor inputs the above attributes for each question set through CLOSO as shown in Figure 4-3.

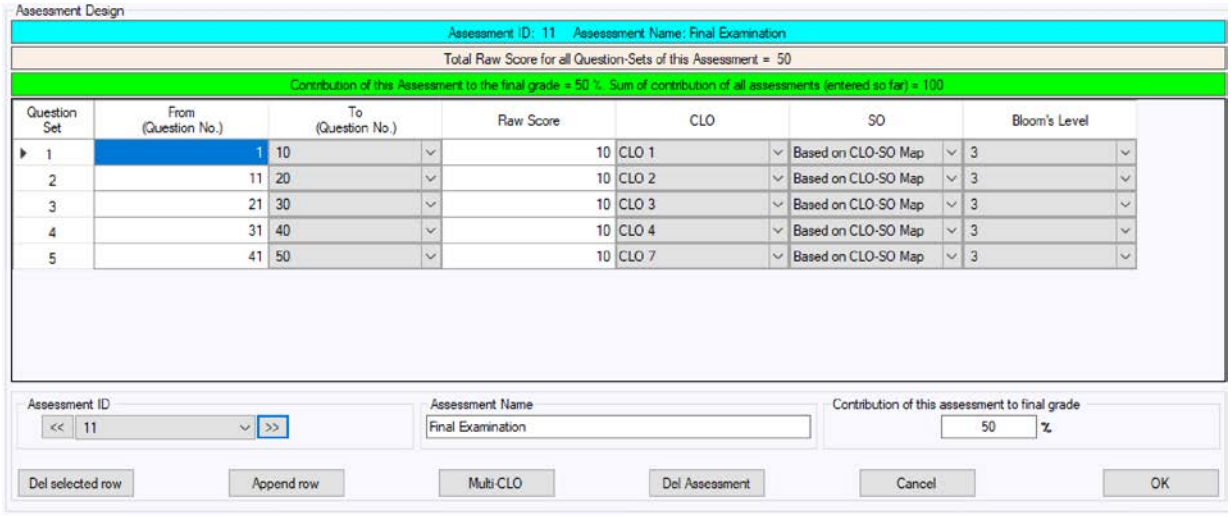


Figure 4-3 An example of assessment design data input

A-3-2-2 Assessment Data

Assessment marks for the students are among the data that an instructor always maintains. Computer Engineering Program Assessment and Evaluation system requires that the assessment marks be recorded QS-wise in a natural way as is done conventionally. The instructor may maintain such data for all students in an Excel sheet and then copy-paste to the CLOSO data input window. Alternatively, the instructor may input the data directly to CLOSO and there is no need to store data in Excel sheets. Table 4-11 is an example showing the required data for each assessment to be recorded by the instructor. The last column indicates the Non-CLO marks i.e. marks for questions in an assessment that don't belong to any of the course CLOs. This option is only used by instructors who assess the students in areas not covered by the prescribed CLOs. Later they may recommend improvements in the curriculum based on their observations of the Non-CLO performance.

Table 4-11 Example of Required Assessment Data

Student S/N	QS 1 (Marks Out of 20)	QS 2 (Marks Out of 30)	QS 3 (Marks Out of 50)
1	17	20	45
2	16	22	43
3	10	25	30
4	17	26	39
5	15	23	38
6	14	19	37
….	….	….	….

Figure 4-4 shows the data input window for assessment data. It is interesting to note that graphs of analyses are shown instantly as the instructor inputs the data. These analyses keep the instructor informed of the students' performance so that the instructor may take measures to improve the learning outcomes.

A-4 SO Evaluation Processes

Evaluation is defined as one or more processes for interpreting the data acquired though the assessment processes in order to determine how well the student outcomes are being attained. This section describes the evaluation processes.

A-4-1 Evaluation through Core Courses

For each course, CLOSO software performs analysis of the collected assessment data. Two types of data are produced: a) CLO satisfaction data, b) SO satisfaction data. They are described below:

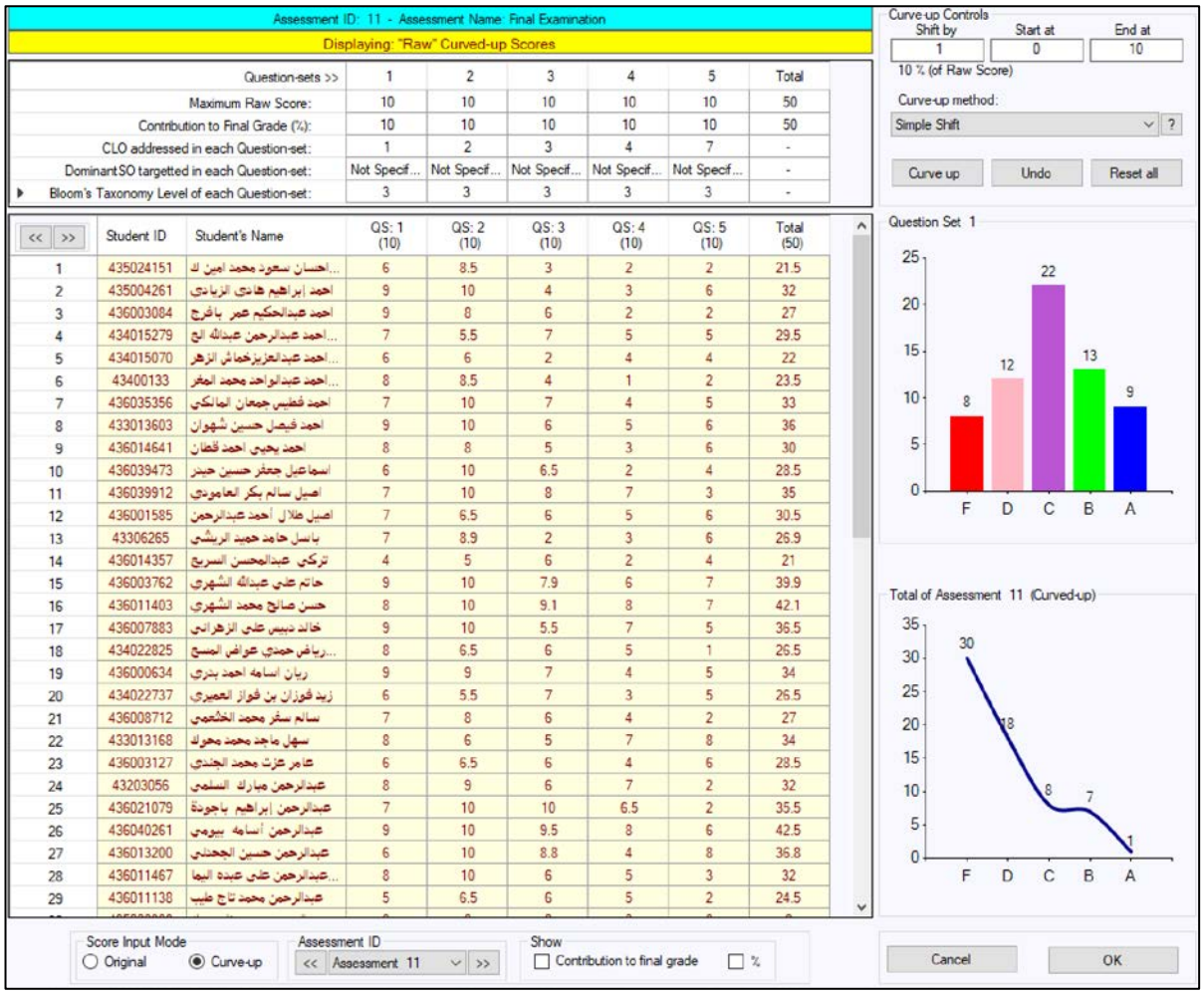


Figure 4-4 Assessment data input and analysis of CLOSO

a) **CLO Satisfaction Data:** CLOSO software analyses and determines the percentage of students satisfying the PSC for each assessment. Then a weighted average is calculated for each CLO. An example of CLOSO display of CLO Satisfaction data is shown in Figure 4-5. For each CLO, there are two columns of data. The first column displays the marks allocated for the assessment for the particular CLO. The second column displays the percentage of students getting marks greater than 70% (Program satisfaction Criterion). The last row in this table of data gives the weighted average of all assessments done for the course.

b) **SO Satisfaction Data:** CLOSO performs SO satisfaction analysis of each course using a conversion formula based on CLO-SO map for the course and produces the percentage of students satisfying the program satisfaction criterion for each SO that is relevant to the course as shown in Figure 4-6. For each SO, there are two columns of data. The first column displays the marks allocated for the assessment for the particular SO. The second column displays the percentage of students getting marks greater than 70% (Program satisfaction Criterion). The last row in this table of data gives the weighted average of all assessments done for the course.

CLO Satisfaction Data

Assessment Name	CLO1 M	CLO1 P	CLO2 M	CLO2 P	CLO3 M	CLO3 P	CLO4 M	CLO4 P	CLO5 M	CLO5 P	Non-CLO M	Non-CLO P
major exam 1	3.5	100	4	38	0	0	0	0	0	0	0	N/A
major exam 2	1.5	38	2	75	4	69	0	0	0	0	0	N/A
Laborartory work	0	0	0	0	0	0	0	0	25	94	0	N/A
term project	0	0	0	0	0	0	15	88	0	0	5	N/A
final exam	5	88	20	69	15	88	0	0	0	0	0	N/A
Weighted Average	**10**	**84**	**26**	**64**	**19**	**84**	**15**	**88**	**25**	**94**	**5**	**N/A**
Simple Average	**10**	**94**	**26**	**69**	**19**	**88**	**15**	**88**	**25**	**94**	**5**	**N/A**

Figure 4-5: Typical CLO satisfaction data

SO Satisfaction Data

Student Outcomes >>	a		b		c		d		e		f		g		h		i		j		k	
Assessment Name	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P	M	P
major exam 1	3.5	100							4	38												
major exam 2	7.5	69																				
Laborartory work			15	100																	10	62
term project							5	100							10	100	5	88				
final exam	10	69			15	88			15	75												
Weighted Average	**21**	**74**	**15**	**100**	**15**	**88**	**5**	**100**	**19**	**67**					**10**	**100**	**5**	**88**			**10**	**62**

Figure 4-6: Typical SO satisfaction data

A-4-2 Evaluation through Graduation Project (GP)

The Graduation Project (GP) is to be completed in one semester. However, if the students are unable to complete the project in one semester, they are given an incomplete grade and they continue the work in the following semester. Its complete procedure with specified tasks to be done is described in a document prepared by the department. This document is available at https://uqu.edu.sa/en/cis_ce/44326. It describes the assessment process of the GP, its administration and evaluation. GP assessment is even more important and has much more weight than direct course assessment because the students doing the GP are close to graduation. Their abilities in all SOs are assessed in GP. We describe the process of data collection and evaluation in the following sections.

A-4-2-1 Graduation Project CLOs & CLO-SO Map

Assessment data for the graduation project submitted by the GP advisers are based on a set of CLOs that are pre-specified and are strongly linked to the SOs. The CLO-SO map for the graduation project is also pre-specified. The CLOs and the CLO-SO maps of the graduation project are approved by the Curriculum Committee. They are also reviewed by the assessment committee to make sure all SOs are properly represented. The prescribed CLOs are shown in Table 4-12. The CLO-SO map is shown in Table 4-13. It can be seen from the CLO-SO map that all the 11 SOs from (a) to (k) are significant in the project. Therefore, over the two semesters, the students demonstrate their abilities in all the required SOs through the tasks required by the GP. Since graduation project is taken by the students when they are close to the graduation, the data obtained from the GP is the most reliable data indicating the attainment of the SOs.

Table 4-14 shows the list of tasks for the GP with relative weight of each task and the required CLO to be attained from these tasks. The weights shown in the third column of Table 4-14 are used by the software CLOSO to process the assessment data. The instructor does not have to worry about calculating the assessment marks based on the weights. The instructor reports the assessment of each task out of 100.

The Graduation Project data collected from the instructors in the form of CLOSO data files are automatically evaluated by CLOSO software for CLO and SO satisfaction. The analysis and the output are exactly similar to what has been described in Section A-4-1 and therefore are not repeated here.

Table 4-12: Graduation project CLOs

S/N	Course Learning Outcomes (CLOs)
1	Ability to identify and formulate engineering problems in the area of Computer Engineering
2	Ability to function in multidisciplinary teams
3	Ability to conduct enough literature review in the project domain
4	Ability to design a system, component or process with defined constraints
5	Ability to solve engineering problems and implement designed solutions
6	Ability to collect and analyze data, and draw conclusions through experiments while testing a project
7	Ability to communicate effectively in written engineering report and in oral presentation

Table 4-13: Graduation project CLO-SO map

CLO ID	Student Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CLO 1	1	0	0	0	1	0	0	0	1	0	0
CLO 2	0	0	0	1	0	0	0	0	0	0	0
CLO 3	1	0	1	0	1	1	0	0	1	1	1
CLO 4	1	1	1	0	0	0	0	1	0	1	1
CLO 5	1	1	1	0	1	0	0	1	0	1	1
CLO 6	0	1	0	0	0	0	0	0	0	1	1
CLO 7	0	0	0	0	0	1	1	0	0	0	0

Table 4-14: Graduation project assessment items

Task No.	Task Description	Weight (Out of 100)	CLO ID
1	Proposal	5	CLO 1
2	Process & Team Work	15	CLO 2
3	Literature Review And Analysis	5	CLO 3
4	Problem Formulation	5	CLO 1
5	Design	20	CLO 4
6	Implementation	15	CLO 5
7	Testing	10	CLO 6
8	Technical Report	10	CLO 7
9	Oral Presentation	5	CLO 7
10	Poster Presentation	10	CLO 7
	Total Marks	**100**	

A-4-3 Course-wise Student Survey

Indirect assessment of SO attainment through course-wise student survey is the most important indirect assessment. Students get a chance to tell about their perception concerning the attainment of the CLOs. The form for getting each student's opinion is generated and printed by CLOSO. Since the CLOs are different for each course, the forms are printed differently for each course. On the form, the CLOs are listed and a student scores the learning outcome attained as perceived by him. A typical form is shown in Figure 4-7.

The filled in forms are collected from all students just before the final examination. The data are entered in CLOSO. CLOSO processes the data and evaluates the CLO satisfaction. A typical CLOSO screen

snapshot of Student Survey Analysis is shown in Figure 4-8. In the analysis produced by CLOSO, the percentages in the columns, labelled 3:C, 4:B and 5:A, are summed up to determine what percentage of students perceive that the CLOs have been attained to 70% or higher marks. The SO satisfaction is also calculated and displayed as shown in the bottom part of Figure 4-8. It may be noted that the required satisfaction is obtained when 60% students believe that they have attained the CLOs to the level of 70% or higher marks (i.e., C or above).

A-4-4 Course-wise Faculty Survey

Indirect assessment of SOs through Faculty Survey is important because it is the judgment of the instructor teaching the course. Obviously, the instructor knows from the direct assessment how well the students have attained the CLOs and SOs. The judgment of the instructor will be usually about the same as reflected by the direct assessments. However, the instructor observes the performance of students over the semester and there may be reasons to believe that the students' ability as reflected by the direct assessments are not true. Thus, the indirect assessment through Faculty Survey is necessary. It shows the perception the instructor has about the students' abilities attained in the course. In this survey, the instructor indicates, for each CLO, his opinion about the real abilities attained by the students. Therefore, the input is very simple. CLOSO takes the input from the instructor and then converts it to SO satisfaction using the same CLO-SO mapping as discussed earlier. Figure 4-9 shows a CLOSO screen snapshot of the faculty survey of CLO satisfaction for a typical course. The snapshot also shows the rubrics used for the faculty survey. CLOSO displays the rubrics to help the instructor input his perception of students' abilities. The rubrics are as follows:

- 1: Unsatisfactory
- 2: Progressing (towards satisfaction)
- 3: Satisfactory (i.e. 60% students are attaining the abilities to a level of C grade)
- 4: Excellent
- 5: Exemplary

A score less than three is unsatisfactory and therefore an improvement plan will be required to rectify the low attainment of the CLO and the relevant SOs.

College of Computer & Information Systems
Computer Engineering Department

Instructor: Omar Sonbul
Microcomputers System Design
Course Number: 1403450 - Class Section: 1
Semester:Spring; Academic Year: 2017-18

Indirect Assessment of CLOs

(Student Survey)

Scale of ability/understanding

1	2	3	4	5
Not well	Well	Very well	Excellent	Superb

Tell us about your ability in each outcome of this course by giving a "Score" (1,2,3,4 or 5) as descibed above.

	Course Learning Outcome (CLO)	Score
1	An ability to comprehend the knowledge of microcomputer/microcontroller based systems [BL 2, Topics 1, 2]	
2	An ability to use PIC18 instruction set architecture for assembly language programming [BL 3, Topic 3]	
3	An ability to apply the knowledge of PIC 18 hardware and interfacing peripherals to design a microcomputer based system [BL 3, Topics 4,5,6,]	
4	An ability to design a system or component through a hardware project in the area of microcomputer/microcontroller based system [Instructor will evaluate the project on the basis of self-learning of students (SO i), cost (SO h) and its impact on the society (SO h)]	
5	An ability to design and conduct experiments in the area of microcomputer/microcontroller based systems [BL 3]	

Student Name(Optional)	Student Signature(Optional)

Figure 4-7 Typical student survey form

CLOSO converts the CLO Satisfaction data to the SO satisfaction data. Figure 4-10 shows the converted data for several courses. This is presented here as an example. Faculty survey analysis is not done only for the CLO and SO attainment but actually is done for numerous factors affecting the quality of learning and proposed improvements. The data shown in Figure 4-10 is for SO attainment that is displayed when the user clicks the “SO Satisfaction” item from the left menu and then selects “Faculty Survey” from the bottom of the window.

Figure 4-10 shows faculty survey data for each course. It shows the marks allocated to the relevant SO and the percentage of students getting 70% or more marks. For example, SO (a) has two columns namely M(a) and P(a). M(a) are the marks that were allocated to questions used in the assessments of SO (a). P(a) is based on the faculty survey data about the perception of the instructor about the percentage of students satisfying the criterion. One can see that except for three, all the courses displayed have a satisfaction of 99 i.e., 100%. It means that the instructor believes that all of the students have attained the learning outcome to the level of 70%. In addition to this information, the first few columns of the table give the Course ID, Sections, the credit hours (CH) and the number of students (NS).

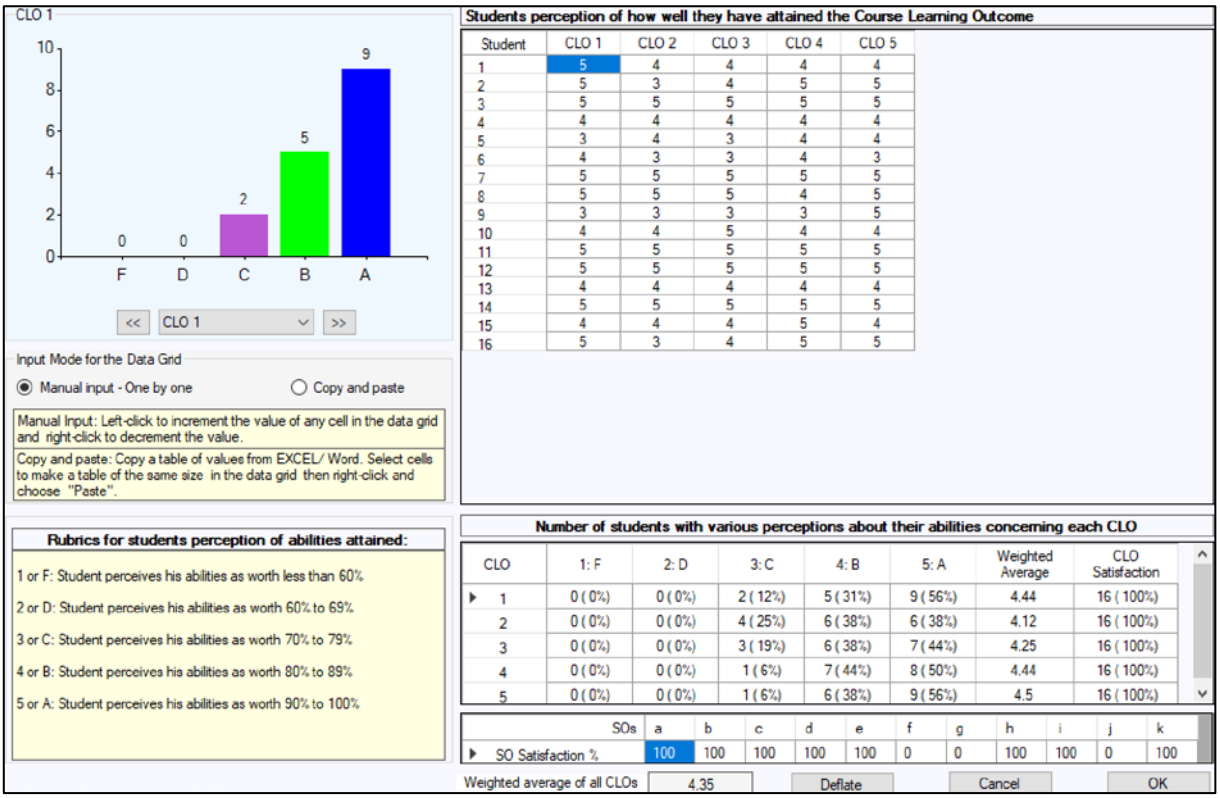


Figure 4-8 Typical student survey data and analysis

CLO ID	CLO Statement	Achievement Score*
1.	An ability to comprehend the knowledge of microcomputer/microcontroller based systems [BL 2, Topics 1, 2]	4
2.	An ability to use PIC18 instruction set architecture for assembly language programming [BL 3, Topic 3]	3
3.	An ability to apply the knowledge of PIC 18 hardware and interfacing peripherals to design a microcomputer based system [BL 3, Topics 4,5,6,]	4
4.	An ability to design a system or component through a hardware project in the area of microcomputer/microcontroller based system [Instructor will evaluate the project on the basis of self-learning of students (SO i), cost (SO h) and its impact on the society (SO h)]	3
5.	An ability to design and conduct experiments in the area of microcomputer/microcontroller based systems [BL 3]	5

Figure 4-9 An example of faculty survey data input

% Students with abilities worth 70% or better					(a)		(b)		(c)		(d)		(e)		(f)		(g)		(h)		(i)		(j)		(k)	
	Course Number	Sections	CH	NS	M(a)	P(a)	M(b)	P(b)	M(c)	P(c)	M(d)	P(d)	M(e)	P(e)	M(f)	P(f)	M(g)	P(g)	M(h)	P(h)	M(i)	P(i)	M(j)	P(j)	M(k)	P(k)
1	1403201	1	4	28	7	67	15	0	0	0	0	0	68	67	0	0	0	0	0	0	0	0	0	0	10	0
2	1403201	1	4	16	12.5	33	15	0	0	0	0	0	57.5	33	0	0	0	0	0	0	0	0	0	0	10	0
3	1403201	2	4	28	17	99	50	99	0	0	0	0	5	99	0	0	0	0	0	0	0	0	0	0	23	99
4	1403271	1	4	5	25.5	99	15	99	20.9	99	0	0	16.6	99	0	0	0	0	0	0	0	0	0	0	10	99
5	1403311	1,2	4	44	27	99	8.3	99	0	0	8.3	99	43	99	0	0	0	0	0	0	0	0	0	0	8.3	99
6	1403312	2	4	34	18	0	12.5	0	0	0	0	0	52	0	0	0	0	0	0	0	0	0	0	0	12.5	0
7	1403322	1	4	30	26.9	99	15	99	15.5	99	0	0	22.6	99	2	99	4	99	0	0	0	0	4	99	10	99
8	1403322	1	4	28	38.2	99	15	99	4.5	99	0	0	32.3	99	0	99	0	99	0	0	0	0	0	99	10	99
9	1403364	1	3	21	14	99	0	0	26	99	0	0	12	99	0	0	18	99	20	99	8	99	2	99	0	0
10	1403371	1	4	20	19.6	0	10	0	9.5	0	0	0	4.5	0	0	0	0	0	0	0	0	0	0	0	56.4	0
11	1403371	1	4	25	13	99	8.3	99	57	99	8.3	99	0	0	0	0	0	0	0	0	0	0	0	0	8.3	99
12	1403372	1	4	28	15	99	25	99	30	99	0	0	25	99	0	0	0	0	0	0	0	0	0	0	0	99
13	1403372	1	4	38	36.7	99	20	99	7.5	99	0	0	25.8	99	0	0	0	0	0	0	0	0	0	0	12.5	99
14	1403381	1,2	3	31	80	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	99
15	1403401	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	75	99	0	0	0	0	25	99	0	0
16	1403401	1	2	14	0	0	0	0	0	0	0	0	0	0	13	99	40	99	0	0	20	99	7	99	0	99
17	1403422	1	4	16	37.5	83	12.5	99	12.5	99	0	0	12.5	99	0	0	0	0	0	99	0	0	0	0	25	99
18	1403450	1	4	23	21	99	15	99	15	99	5	99	19	99	0	0	0	0	10	99	5	99	0	0	10	99
19	1403450	1	4	9	21	99	15	99	15	99	5	99	19	99	0	0	0	0	10	99	5	99	0	0	10	99
20	1403489	1	4	4	40.9	99	15	99	10.6	99	0	0	13.6	99	0	0	0	0	2	99	3	99	0	0	5	99
21	1403489	1	4	27	41	67	12.5	99	6	0	0	0	20	99	0	0	0	0	4	0	4	0	0	0	12.5	99

Figure 4-10: Example of SO satisfaction based on faculty survey data

A-4-5 Exit Survey

In each semester, all graduating students are required to fill in a survey form available online at department's website. Table 4-15 shows part of the survey form that relates to SOs.

Table 4-15 Exit Survey SO Attainment Form

CE Student Outcomes **My education at UQU has given me the ability to:**		**To what degree the education you received at CE meet the Student Outcome**				
		Excellent	*Very Good*	*Good*	*Poor*	*Very Poor*
a	Apply knowledge of mathematics, science, and engineering					
b	Design and conduct experiments, and collect, analyze and interpret data.					
c	Design a system, process, or component to meet desired needs subject to given constraints					
d	Function on multi-disciplinary and/or diverse teams. Take responsibility, share work, and value other viewpoints.					
e	Identify, formulate, and solve engineering problems					
f	Understand professional and ethical responsibilities					
g	Communicate effectively – oral and written					
h	Understand the impact of engineering solutions in a global, economic, environmental, and societal context					
i	Recognize the need for and demonstrate ability to engage in lifelong learning					
j	Know about contemporary (state-of-the-art) issues relevant to computer engineering					
k	Use techniques, skills and modern engineering tools necessary for engineering practice					

A-4-6 Alumni Survey

Alumni survey is done at an interval of 3 years. The questionnaire is available online and a set of randomly selected alumni are requested to fill it. Among the questions in the questionnaire Table 4-16 is provided. In this table, the alumni indicate the perception of their abilities in each SO at the time of graduation.

A-4-7 Employer Survey

Employer survey is also done at an interval of 3 years. A set of randomly selected employers are requested to fill a questionnaire available online. Among the questions, a table similar to Table 4-16 used for the Alumni survey is provided so that the employers may indicate how well they found our graduates that they employed in abilities concerning each SO.

Table 4-16 Alumni survey form for SO attainment

CE Student Outcomes My education at UQU has given me the ability to:		To what degree the education you received at CE meet the Student Outcome				
		Excellent	*Very Good*	*Good*	*Poor*	*Very Poor*
a	Apply knowledge of mathematics, science, and engineering					
b	Design and conduct experiments, and collect, analyze and interpret data.					
c	Design a system, process, or component to meet desired needs subject to given constraints					
d	Function on multi-disciplinary and/or diverse teams. Take responsibility, share work, and value other viewpoints.					
e	Identify, formulate, and solve engineering problems					
f	Understand professional and ethical responsibilities					
g	Communicate effectively – oral and written					
h	Understand the impact of engineering solutions in a global, economic, environmental, and societal context					
i	Recognize the need for and demonstrate ability to engage in lifelong learning					
j	Know about contemporary (state-of-the-art) issues relevant to computer engineering					
k	Use techniques, skills and modern engineering tools necessary for engineering practice					

A-5 SO Attainment Data Extraction from CLOSO

SO Attainment data for two academic years (2016-17 and 2017-18) are presented in this section. These data are based on the formative assessment data collected from the course files submitted by the instructors. The data represent about 90% of the courses taught in the academic years covering all SOs from (a) to (k). Roughly 10% of the courses go without any course file submission or course files with issues that don't allow their inclusion in the automated analysis performed by CLOSO software. This does not have any significant effect on the average SO attainment data. The department chairman takes measures to pursue all instructors for the submission of course files and we are hoping to have 100% course files submission in the future.

A-5-1 SO Attainment Data for 2016-17 (Formative)

Formative SO Attainment Data for the academic year 2016-17 produced by CLOSO software are shown in Figure 4-11 to Figure 4-21 for SO (a) to SO (k).

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403201	Circuit Theory	Term 1/ 2016-17 (1)	4	28	7	57
2	1403201	Circuit Theory	Term 2/ 2016-17 (1)	4	16	12.5	58
3	1403201	Circuit Theory	Term 2/ 2016-17 (2)	4	28	17	24
4	1403271	Switching Theory	Term 1/ 2016-17 (1)	4	5	25.5	60
5	1403311	Electronics	Term 1/ 2016-17 (1,2)	4	44	27	40
6	1403312	Digital Electronic Systems and Circuits	Term 2/ 2016-17 (2)	4	34	18	5
7	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	26.9	70
8	1403322	Computer Communication System	Term 2/ 2016-17 (1)	4	28	38.2	12
9	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	14	81
10	1403371	Advanced Logic Design	Term 1/ 2016-17 (1)	4	20	19.6	64
11	1403371	Advanced Logic Design	Term 2/ 2016-17 (1)	4	25	13	45
12	1403372	Computer Organization	Term 1/ 2016-17 (1)	4	28	15	51
13	1403372	Computer Organization	Term 2/ 2016-17 (1)	4	38	36.7	63
14	1403381	Numerical Analysis	Term 2/ 2016-17 (1,2)	3	31	80	77
15	1403422	Computer Networks	Term 1/ 2016-17 (1)	4	16	37.5	71
16	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	21	65
17	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	21	63
18	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	40.9	87
19	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	41	78
	-	**Average**	-	-	-	-	**56**
	-	**Weighted Average**	-	-	-	-	**57**
	-	**Maximum**	-	-	-	-	**87**

Figure 4-11 SO Attainment Data for SO (a) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403201	Circuit Theory	Term 1/ 2016-17 (1)	4	28	15	25
2	1403201	Circuit Theory	Term 2/ 2016-17 (1)	4	16	15	56
3	1403201	Circuit Theory	Term 2/ 2016-17 (2)	4	28	50	73
4	1403271	Switching Theory	Term 1/ 2016-17 (1)	4	5	15	60
5	1403311	Electronics	Term 1/ 2016-17 (1,2)	4	44	8.3	59
6	1403312	Digital Electronic Systems and Circuits	Term 2/ 2016-17 (2)	4	34	12.5	85
7	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	15	80
8	1403322	Computer Communication System	Term 2/ 2016-17 (1)	4	28	15	86
9	1403371	Advanced Logic Design	Term 1/ 2016-17 (1)	4	20	10	95
10	1403371	Advanced Logic Design	Term 2/ 2016-17 (1)	4	25	8.3	80
11	1403372	Computer Organization	Term 1/ 2016-17 (1)	4	28	25	96
12	1403372	Computer Organization	Term 2/ 2016-17 (1)	4	38	20	72
13	1403422	Computer Networks	Term 1/ 2016-17 (1)	4	16	12.5	56
14	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	15	87
15	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	15	67
16	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	15	50
17	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	12.5	96
	-	**Average**	-	-	-	-	**72**
	-	**Weighted Average**	-	-	-	-	**75**
	-	**Maximum**	-	-	-	-	**96**

Figure 4-12 SO Attainment Data for SO (b) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403271	Switching Theory	Term 1/ 2016-17 (1)	4	5	20.9	50
2	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	15.5	70
3	1403322	Computer Communication System	Term 2/ 2016-17 (1)	4	28	4.5	71
4	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	26	54
5	1403371	Advanced Logic Design	Term 1/ 2016-17 (1)	4	20	9.5	57
6	1403371	Advanced Logic Design	Term 2/ 2016-17 (1)	4	25	57	49
7	1403372	Computer Organization	Term 1/ 2016-17 (1)	4	28	30	29
8	1403372	Computer Organization	Term 2/ 2016-17 (1)	4	38	7.5	74
9	1403422	Computer Networks	Term 1/ 2016-17 (1)	4	16	12.5	38
10	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	15	96
11	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	15	78
12	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	10.6	82
13	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	6	63
	-	**Average**	-	-	-	-	**62**
	-	**Weighted Average**	-	-	-	-	**55**
	-	**Maximum**	-	-	-	-	**96**

Figure 4-13 SO Attainment Data for SO (c) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403311	Electronics	Term 1/ 2016-17 (1,2)	4	44	8.3	59
2	1403371	Advanced Logic Design	Term 2/ 2016-17 (1)	4	25	8.3	80
3	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	5	100
4	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	5	100
	-	**Average**	-	-	-	-	**85**
	-	**Weighted Average**	-	-	-	-	**74**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-14 SO Attainment Data for SO (d) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403201	Circuit Theory	Term 1/ 2016-17 (1)	4	28	68	47
2	1403201	Circuit Theory	Term 2/ 2016-17 (1)	4	16	57.5	48
3	1403201	Circuit Theory	Term 2/ 2016-17 (2)	4	28	5	21
4	1403271	Switching Theory	Term 1/ 2016-17 (1)	4	5	16.6	62
5	1403311	Electronics	Term 1/ 2016-17 (1,2)	4	44	43	37
6	1403312	Digital Electronic Systems and Circuits	Term 2/ 2016-17 (2)	4	34	52	21
7	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	22.6	57
8	1403322	Computer Communication System	Term 2/ 2016-17 (1)	4	28	32.3	75
9	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	12	79
10	1403371	Advanced Logic Design	Term 1/ 2016-17 (1)	4	20	4.5	25
11	1403372	Computer Organization	Term 1/ 2016-17 (1)	4	28	25	56
12	1403372	Computer Organization	Term 2/ 2016-17 (1)	4	38	25.8	39
13	1403422	Computer Networks	Term 1/ 2016-17 (1)	4	16	12.5	56
14	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	19	40
15	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	19	51
16	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	13.6	60
17	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	20	87
	-	**Average**	-	-	-	-	**51**
	-	**Weighted Average**	-	-	-	-	**46**
	-	**Maximum**	-	-	-	-	**87**

Figure 4-15 SO Attainment Data for SO (e) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	2	53
2	1403401	Seminar	Term 2/ 2016-17 (1)	2	14	13	92
	-	**Average**	-	-	-	-	**72**
	-	**Weighted Average**	-	-	-	-	**82**
	-	**Maximum**	-	-	-	-	**92**

Figure 4-16 SO Attainment Data for SO (f) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	4	73
2	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	18	47
3	1403401	Seminar	Term 2/ 2016-17 (2)	2	2	75	100
4	1403401	Seminar	Term 2/ 2016-17 (1)	2	14	40	43
	-	**Average**	-	-	-	-	**66**
	-	**Weighted Average**	-	-	-	-	**54**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-17 SO Attainment Data for SO (g) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	20	36
2	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	10	100
3	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	10	100
4	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	2	100
5	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	4	33
	-	**Average**	-	-	-	-	**74**
	-	**Weighted Average**	-	-	-	-	**60**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-18 SO Attainment Data for SO(h) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	8	42
2	1403401	Seminar	Term 2/ 2016-17 (1)	2	14	20	100
3	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	5	100
4	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	5	100
5	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	3	100
6	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	4	33
	-	**Average**	-	-	-	-	**79**
	-	**Weighted Average**	-	-	-	-	**77**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-19 SO Attainment Data for SO (i) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	4	57
2	1403364	Basics of Integrated Circuits Design	Term 1/ 2016-17 (1)	3	21	2	93
3	1403401	Seminar	Term 2/ 2016-17 (2)	2	2	25	50
4	1403401	Seminar	Term 2/ 2016-17 (1)	2	14	7	70
	-	**Average**	-	-	-	-	**68**
	-	**Weighted Average**	-	-	-	-	**65**
	-	**Maximum**	-	-	-	-	**93**

Figure 4-20 SO Attainment Data for SO(j) – Fall & Spring 2016-17 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403201	Circuit Theory	Term 1/ 2016-17 (1)	4	28	10	96
2	1403201	Circuit Theory	Term 2/ 2016-17 (1)	4	16	10	94
3	1403201	Circuit Theory	Term 2/ 2016-17 (2)	4	28	23	57
4	1403271	Switching Theory	Term 1/ 2016-17 (1)	4	5	10	100
5	1403311	Electronics	Term 1/ 2016-17 (1,2)	4	44	8.3	59
6	1403312	Digital Electronic Systems and Circuits	Term 2/ 2016-17 (2)	4	34	12.5	85
7	1403322	Computer Communication System	Term 1/ 2016-17 (1)	4	30	10	97
8	1403322	Computer Communication System	Term 2/ 2016-17 (1)	4	28	10	96
9	1403371	Advanced Logic Design	Term 1/ 2016-17 (1)	4	20	56.4	52
10	1403371	Advanced Logic Design	Term 2/ 2016-17 (1)	4	25	8.3	80
11	1403372	Computer Organization	Term 2/ 2016-17 (1)	4	38	12.5	95
12	1403381	Numerical Analysis	Term 2/ 2016-17 (1,2)	3	31	20	33
13	1403422	Computer Networks	Term 1/ 2016-17 (1)	4	16	25	100
14	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	23	10	100
15	1403450	Microcomputers System Design	Term 1/ 2016-17 (1)	4	9	10	100
16	1403489	Microprocessors	Term 1/ 2016-17 (1)	4	4	5	100
17	1403489	Microprocessors	Term 2/ 2016-17 (1)	4	27	12.5	96
	-	**Average**	-	-	-	-	**85**
	-	**Weighted Average**	-	-	-	-	**74**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-21 SO Attainment Data for SO (k) – Fall & Spring 2016-17 (Produced by CLOSO)

A-5-2 SO Attainment Data for 2017-18 (Formative Assessments)

SO Attainment Data for the academic year 2017-18 are shown for SO (a) to SO (k) in Figure 4-22 to Figure 4-32.

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	14031202	Circuit Theory	Term 1/ 2017-18 (1,3)	4	45	29	51
2	1403201	Circuit Theory	Term 2/ 2017-18 (2)	4	25	30	17
3	1403201	Circuit Theory	Term 1/ 2017-18 (1-2,2)	4	51	17.5	27
4	1403271	Switching Theory	Term 1/ 2017-18 (1)	4	18	14.7	66
5	1403271	Switching Theory	Term 2/ 2017-18 (1)	4	22	27.5	72
6	1403271	Switching Theory	Term 2/ 2017-18 (2)	4	22	15	15
7	1403271	Switching Theory	Term 1/ 2017-18 (3)	4	8	10	56
8	1403311	Electronics	Term 1/ 2017-18 (1)	4	9	21	14
9	1403311	Electronics	Term 1/ 2017-18 (1,2)	4	48	22	20
10	1403312	Digital Electronic Systems and Circuits	Term 2/ 2017-18 (1)	4	38	10	89
11	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	26.2	57
12	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	14.7	20
13	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	28.3	39
14	1403371	Advanced Logic Design	Term 1/ 2017-18 (1)	4	28	15.3	47
15	1403371	Advanced Logic Design	Term 2/ 2017-18 (1)	4	19	41.2	56
16	1403372	Computer Organization	Term 1/ 2017-18 (1)	4	16	45.6	48
17	1403372	Computer Organization	Term 2/ 2017-18 (1)	4	30	35	52
18	1403372	Computer Organization	Term 2/ 2017-18 (2)	4	13	37.5	33
19	1403381	Numerical Analysis	Term 2/ 2017-18 (3)	3	47	91.7	17
20	1403381	Numerical Analysis	Term 1/ 2017-18 (1,2)	3	49	80	57
21	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	52.6	51
22	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	68.6	74
23	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	21	70
24	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	21	74
25	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	55.5	76
26	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	61	56
27	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	30	74
	-	**Average**	-	-	-	-	**49**
	-	**Weighted Average**	-	-	-	-	**47**
	-	**Maximum**	-	-	-	-	**89**

Figure 4-22 SO Attainment Data for SO (a) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	14031202	Circuit Theory	Term 1/ 2017-18 (1,3)	4	45	17.5	93
2	1403201	Circuit Theory	Term 2/ 2017-18 (2)	4	25	15	48
3	1403201	Circuit Theory	Term 1/ 2017-18 (1-2,2)	4	51	10	90
4	1403271	Switching Theory	Term 1/ 2017-18 (1)	4	18	3.3	39
5	1403271	Switching Theory	Term 2/ 2017-18 (1)	4	22	15	0
6	1403271	Switching Theory	Term 2/ 2017-18 (2)	4	22	20	58
7	1403271	Switching Theory	Term 1/ 2017-18 (3)	4	8	5	100
8	1403311	Electronics	Term 1/ 2017-18 (1)	4	9	10	78
9	1403311	Electronics	Term 1/ 2017-18 (1,2)	4	48	10	94
10	1403312	Digital Electronic Systems and Circuits	Term 2/ 2017-18 (1)	4	38	12.5	100
11	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	15	77
12	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	15	27
13	1403371	Advanced Logic Design	Term 1/ 2017-18 (1)	4	28	31.8	70
14	1403371	Advanced Logic Design	Term 2/ 2017-18 (1)	4	19	10	58
15	1403372	Computer Organization	Term 1/ 2017-18 (1)	4	16	12.5	100
16	1403372	Computer Organization	Term 2/ 2017-18 (1)	4	30	12.5	100
17	1403372	Computer Organization	Term 2/ 2017-18 (2)	4	13	15	92
18	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	12.5	93
19	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	12.5	78
20	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	15	73
21	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	15	100
22	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	3	94
23	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	12.5	83
	-	**Average**	-	-	-	-	**76**
	-	**Weighted Average**	-	-	-	-	**76**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-23 SO Attainment Data for SO (b) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403271	Switching Theory	Term 1/ 2017-18 (1)	4	18	20.3	9
2	1403271	Switching Theory	Term 2/ 2017-18 (1)	4	22	21.7	18
3	1403271	Switching Theory	Term 2/ 2017-18 (2)	4	22	25	15
4	1403271	Switching Theory	Term 1/ 2017-18 (3)	4	8	60	27
5	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	22.4	64
6	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	16.8	31
7	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	18.3	39
8	1403371	Advanced Logic Design	Term 1/ 2017-18 (1)	4	28	37.8	65
9	1403371	Advanced Logic Design	Term 2/ 2017-18 (1)	4	19	29.3	20
10	1403372	Computer Organization	Term 1/ 2017-18 (1)	4	16	16.2	44
11	1403372	Computer Organization	Term 2/ 2017-18 (1)	4	30	21.2	51
12	1403372	Computer Organization	Term 2/ 2017-18 (2)	4	13	17	56
13	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	3.4	60
14	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	5	51
15	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	15	96
16	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	15	88
17	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	4	77
18	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	25	69
19	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	10	79
	-	**Average**	-	-	-	-	**50**
	-	**Weighted Average**	-	-	-	-	**48**
	-	**Maximum**	-	-	-	-	**96**

Figure 4-24 SO Attainment Data for SO (c) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403311	Electronics	Term 1/ 2017-18 (1)	4	9	5	100
2	1403311	Electronics	Term 1/ 2017-18 (1,2)	4	48	5	90
3	1403371	Advanced Logic Design	Term 1/ 2017-18 (1)	4	28	2	82
4	1403371	Advanced Logic Design	Term 2/ 2017-18 (1)	4	19	4.5	9
5	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	5	100
6	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	5	100
	-	**Average**	-	-	-	-	**80**
	-	**Weighted Average**	-	-	-	-	**84**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-25 SO Attainment Data for SO (d) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	14031202	Circuit Theory	Term 1/ 2017-18 (1,3)	4	45	28	61
2	1403201	Circuit Theory	Term 2/ 2017-18 (2)	4	25	45	9
3	1403201	Circuit Theory	Term 1/ 2017-18 (1-2,2)	4	51	52.5	34
4	1403271	Switching Theory	Term 1/ 2017-18 (1)	4	18	18.3	19
5	1403271	Switching Theory	Term 2/ 2017-18 (1)	4	22	23.8	52
6	1403271	Switching Theory	Term 2/ 2017-18 (2)	4	22	14	9
7	1403271	Switching Theory	Term 1/ 2017-18 (3)	4	8	20	78
8	1403311	Electronics	Term 1/ 2017-18 (1)	4	9	50	6
9	1403311	Electronics	Term 1/ 2017-18 (1,2)	4	48	53	19
10	1403312	Digital Electronic Systems and Circuits	Term 2/ 2017-18 (1)	4	38	60	69
11	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	16.4	66
12	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	28.5	20
13	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	13.3	39
14	1403372	Computer Organization	Term 1/ 2017-18 (1)	4	16	8.1	62
15	1403372	Computer Organization	Term 2/ 2017-18 (1)	4	30	13.8	55
16	1403372	Computer Organization	Term 2/ 2017-18 (2)	4	13	20.5	29
17	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	8.9	63
18	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	8.9	65
19	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	19	81
20	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	19	67
21	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	25.5	70
22	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	4	94
23	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	10	60
	-	**Average**	-	-	-	-	**49**
	-	**Weighted Average**	-	-	-	-	**42**
	-	**Maximum**	-	-	-	-	**94**

Figure 4-26 SO Attainment Data for SO (e) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	1.9	68
2	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	4.5	62
3	1403401	Seminar	Term 2/ 2017-18 (1)	2	7	25	76
4	1403401	Seminar	Term 1/ 2017-18 (1)	2	27	13	79
5	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	6	80
	-	**Average**	-	-	-	-	**73**
	-	**Weighted Average**	-	-	-	-	**75**
	-	**Maximum**	-	-	-	-	**80**

Figure 4-27 SO Attainment Data for SO (f) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	6.2	59
2	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	6	77
3	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	10	39
4	1403401	Seminar	Term 2/ 2017-18 (1)	2	7	30	81
5	1403401	Seminar	Term 1/ 2017-18 (1)	2	27	40	100
6	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	3	73
	-	**Average**	-	-	-	-	**72**
	-	**Weighted Average**	-	-	-	-	**85**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-28 SO Attainment Data for SO (g) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	5	39
2	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	5.2	25
3	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	2.5	74
4	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	10	65
5	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	10	100
6	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	1	97
7	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	12.5	71
	-	**Average**	-	-	-	-	**67**
	-	**Weighted Average**	-	-	-	-	**65**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-29 SO Attainment Data for SO (h) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	10	39
2	1403401	Seminar	Term 2/ 2017-18 (1)	2	7	10	90
3	1403401	Seminar	Term 1/ 2017-18 (1)	2	27	20	70
4	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	5	100
5	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	5	88
6	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	5	61
7	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	12.5	71
	-	**Average**	-	-	-	-	**74**
	-	**Weighted Average**	-	-	-	-	**69**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-30 SO Attainment Data for SO (i) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	1.9	73
2	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	4.5	85
3	1403364	Basics of Integrated Circuits Design	Term 2/ 2017-18 (1)	3	23	15	39
4	1403401	Seminar	Term 2/ 2017-18 (1)	2	7	15	81
5	1403401	Seminar	Term 1/ 2017-18 (1)	2	27	7	88
6	1403472	Computer Architecture	Term 2/ 2017-18 (1)	3	15	6	40
	-	**Average**	-	-	-	-	**68**
	-	**Weighted Average**	-	-	-	-	**62**
	-	**Maximum**	-	-	-	-	**88**

Figure 4-31 SO Attainment Data for SO (j) – Fall & Spring 2017-18 (Produced by CLOSO)

	Course ID	Course Name	Term (Sections)	CH	NS	SO Score	P: 70%
1	14031202	Circuit Theory	Term 1/ 2017-18 (1,3)	4	45	28.5	51
2	1403201	Circuit Theory	Term 2/ 2017-18 (2)	4	25	10	32
3	1403201	Circuit Theory	Term 1/ 2017-18 (1-2,2)	4	51	15	92
4	1403271	Switching Theory	Term 1/ 2017-18 (1)	4	18	3.3	39
5	1403271	Switching Theory	Term 2/ 2017-18 (1)	4	22	10	0
6	1403271	Switching Theory	Term 2/ 2017-18 (2)	4	22	26	39
7	1403271	Switching Theory	Term 1/ 2017-18 (3)	4	8	5	88
8	1403311	Electronics	Term 1/ 2017-18 (1)	4	9	10	89
9	1403311	Electronics	Term 1/ 2017-18 (1,2)	4	48	10	85
10	1403312	Digital Electronic Systems and Circuits	Term 2/ 2017-18 (1)	4	38	12.5	100
11	1403322	Computer Communication System	Term 1/ 2017-18 (1)	4	22	10	100
12	1403322	Computer Communication System	Term 2/ 2017-18 (1)	4	26	10	85
13	1403371	Advanced Logic Design	Term 1/ 2017-18 (1)	4	28	18	45
14	1403371	Advanced Logic Design	Term 2/ 2017-18 (1)	4	19	15	68
15	1403372	Computer Organization	Term 1/ 2017-18 (1)	4	16	12.5	100
16	1403372	Computer Organization	Term 2/ 2017-18 (1)	4	30	12.5	100
17	1403372	Computer Organization	Term 2/ 2017-18 (2)	4	13	10	100
18	1403381	Numerical Analysis	Term 2/ 2017-18 (3)	3	47	8.3	36
19	1403381	Numerical Analysis	Term 1/ 2017-18 (1,2)	3	49	20	61
20	1403401	Seminar	Term 2/ 2017-18 (1)	2	7	10	90
21	1403422	Computer Networks	Term 1/ 2017-18 (1)	4	29	12.5	93
22	1403422	Computer Networks	Term 2/ 2017-18 (1)	4	23	12.5	78
23	1403450	Microcomputers System Design	Term 1/ 2017-18 (1)	4	26	10	100
24	1403450	Microcomputers System Design	Term 2/ 2017-18 (1)	4	16	10	62
25	1403489	Microprocessors	Term 1/ 2017-18 (1)	4	36	1	94
26	1403489	Microprocessors	Term 2/ 2017-18 (1)	4	24	12.5	83
	-	**Average**	-	-	-	-	**73**
	-	**Weighted Average**	-	-	-	-	**69**
	-	**Maximum**	-	-	-	-	**100**

Figure 4-32 SO Attainment Data for SO (k) – Fall & Spring 2017-18 (Produced by CLOSO)

A-5-3 SO Attainment Summary and Comparison for Formative Assessments

A summary of SO attainment for academic year 2016-17 is shown in Table 4-17. It is obvious that SOs (a), (c), (e) and (g) are the weakest and below the PSC. However, at least in one course, 87% students earned 70% or more marks in both these SOs as can be seen in the last row of the table. Moreover, students attained these marks in one of the advanced courses that they took. Also, SO attainment is much better in advanced courses as compared to that in earlier courses. Therefore, it can be concluded that although, students were weak in these SOs in earlier courses but they earned good scores in advanced courses showing that their understanding became better later in the program.

A summary of SO attainment for academic year 2017-18 is shown in Table 4-18. Looking at simple averages, It can be seen that SO (g) has improved but SOs (a), (c) and (e) have degraded even further. However, as shown in the last row of the table, at least in one course, 89% students earned 70% or more marks in SO (a), 96% in SO (c) and 94% in SO (e). Similar to what we concluded for the academic year 2016-17, these maximum attainments were achieved in one of the advanced courses. Also, SO attainment is much better in advanced courses as compared to that in earlier courses. Therefore, for the academic year 2017-18 also, it can be concluded that although, students were weak in these SOs in earlier courses but they earned good scores in advanced courses showing that their understanding became better later in the program.

Table 4-17 SO attainment for P: 70% (2016-17)

Student Outcomes (SO)	a	b	c	d	e	f	g	h	i	j	k
Weighted Averages (%)	56	75	55	74	46	77	55	63	73	64	75
Maximum (%)	87	96	96	99	87	92	99	99	99	93	99

Table 4-18 SO attainment for P: 70% (2017-18)

Student Outcomes (SO)	a	b	c	d	e	f	g	h	i	j	k
Weighted Averages (%)	48	76	48	82	42	74	80	66	69	61	69
Maximum (%)	89	99	96	99	94	80	99	99	99	88	99

A comparison of averages for the two academic years is shown in Figure 4-33. There is improvement in SOs (b), (f), (g) and (j) while student performance has degraded in other SOs. This issue will be investigated in the Assessment and Evaluation Committee in the early part of Fall 2018-19 and faculty opinion will be sought to suggest measures for improvements. Moreover, instructors have been proposing and implementing improvement plans for courses in which they find SO attainment less than PSC.

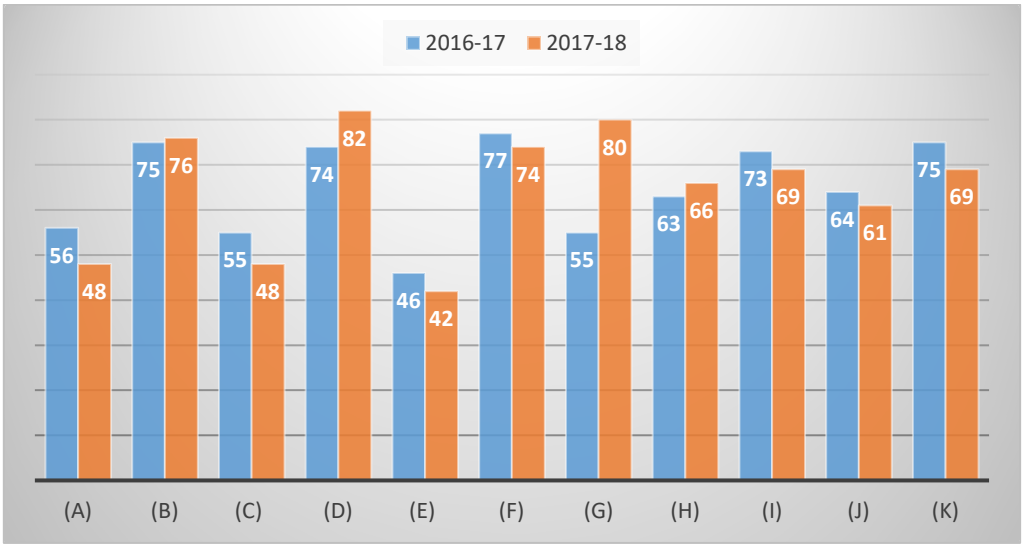


Figure 4-33 SO attainment averages' comparison 2016-17 vs 2017-18

A-6 SO Attainment indicated by Summative Assessment

As described earlier in Section A-4-2, while discussing the assessment process of the graduation project, the Graduation Project addresses all the SOs from (a) to (k). Also, the Graduation Project is completed just before graduation and therefore it represents the abilities at the time of graduations. No other course or set of courses have such strong summative property for the purpose of assessment of the SOs. Therefore, we consider the Graduation Project assessment as the most important direct Summative Assessment of the Computer Engineering Program. The department has established a system to regulate, monitor and assess the Graduation Projects. All assessment data are collected by the instructors and are input to CLOSO software. CLOSO performs all the required data processing and generates tables just like the tables described earlier for formative assessments. Table 4-19 gives a summary of SO attainment as indicated by the summative assessments. The numbers in the table are weighted averages for all graduation projects completed in the academic years 2016-17 and 2017-18. Except for SO (d), all the attainment percentages being higher than 90% indicate that almost all the students scored 70% or higher for the respective SOs.

Table 4-19: Summative SO Attainment (%) Weighted Averages

	a	b	c	d	e	f	g	h	i	j	k
2016-17	99	99	99	84	99	99	99	99	99	99	99
2017-18	99	99	99	94	99	99	99	99	99	99	99

A-7 SO Attainment indicated by Course-wise Student Survey

As described earlier, CLOSO analyses the student survey data. Students' opinions are based on their perception of learning concerning each CLO of the course. CLOSO converts the data to SO based satisfaction. The attainment indicated by the course-wise student survey has been showing very satisfactory results. The data shown in Table 4-20 are student survey results for academic years 2016-17 and 2017-18. The weighted averages have been shown. Similar data has been observed in the past years.

For both the academic years, for all SOs in various courses, more than 80% students believe that they have the abilities to score 70% marks. Although, the direct assessment results indicate much lower satisfaction, this expression of students' belief of their learning is a good indicator. Its reliability however must be determined.

Student survey becomes useful when the students strongly disagree with the notion that they have the achieved the abilities and the satisfaction goes below 60%. In such special cases, the department council is required to look into the matter on the recommendation of the Assessment and Evaluation Committee.

Table 4-20 Student Survey SO Attainment

	a	b	c	d	e	f	g	h	i	j	k
2016-17	95	91	95	93	93	96	97	92	92	98	87
2017-18	88	84	92	89	88	96	98	94	95	97	82

A-8 SO Attainment through indicated by Course-wise Faculty Survey

The process of faculty survey has been described earlier. Each instructor gives his perception of the level of learning of the students in each CLO of the course. This way the instructor expresses his opinion about whether the direct assessment data is an accordance with his perception of students' learning or otherwise. CLOSO software processes the faculty input and converts them into SO based satisfaction data. The data obtained from CLOSO for the two academic years are shown in Table 4-21. These are weighted averages for all the core courses used for formative assessments not including the Graduation Projects. It is obvious from the data that in faculty's opinion the abilities are being achieved by the students in the courses at satisfactory level. Again, the direct assessment results don't coincide with this and indicate lower level of actual abilities for the SOs. The matter will be investigated and discussed in the beginning of Fall 2018-19 and the faculty council will make decisions to modify the process of faculty survey to make it more realistic.

Table 4-21 Faculty Survey SO Attainment

	a	b	c	d	e	f	g	h	i	j	k
2016-17	85	80	92	99	73	99	99	85	79	99	65
2017-18	86	85	83	99	79	85	96	99	99	88	78

A-9 SO Attainment indicated by Exit Surveys

Exit surveys are performed to obtain data of the graduating students' perception of their abilities at the time of graduation. The data collected for the two academic years was processed so as to obtain weighted averages for each SO by giving 5 points to Excellent, 4 to Very Good, 3 to Good, 2 to Poor and 1 to Very Poor. The weighted averages for the two academic years are shown graphically in Figure 4-34. The ordinate in this graph is the weighted average of student responses. The graph shows attainments of SOs (a) to (k) as indicated by the surveys. Since the satisfaction criterion is 60%, we consider the attainment satisfactory if the weighted average is greater than or equal to 60%. It can be observed that the SO attainment for both the academic years is well above the satisfaction target. However, except for SOs (f) and (k), SO attainment in 2017-18 has degraded to some extent as compared to the year 2016-17. This issue will be investigated in the Assessment and Evaluation Committee in the early part of Fall 2018-19 and faculty opinion will be sought to suggest measures for improvements.

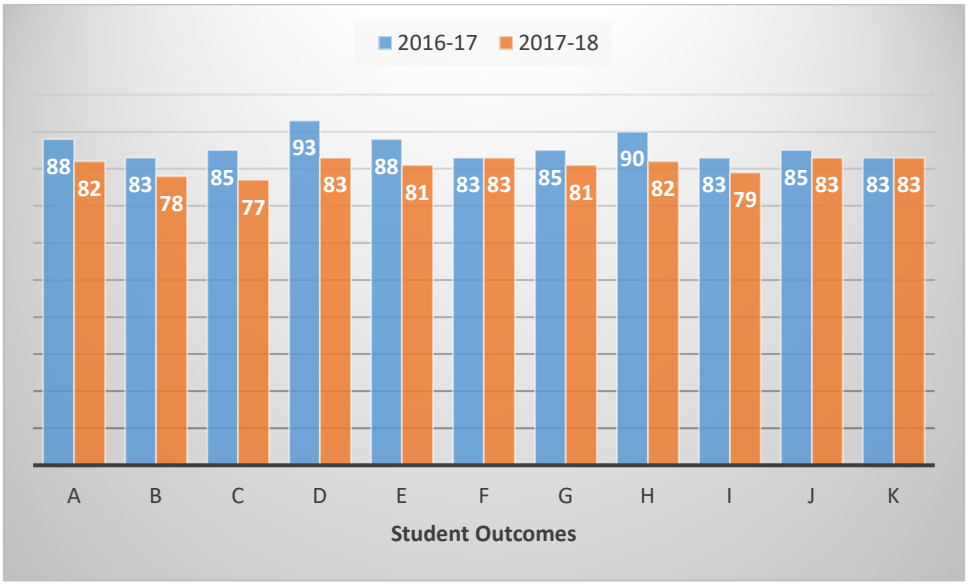


Figure 4-34 Exit survey results for attainment of SOs

A-10 SO Attainment indicated through Alumni Survey

The process of Alumni Survey has been described earlier in Section A-4-6. Here the data is presented based on a random sample of 21 alumni. Since the satisfaction criterion is 60%, we consider the attainment satisfactory if the weighted average is greater than or equal to 60%. The results are shown in Table 4-22 and it can be observed that all SOs indicate satisfaction. Whenever this weighted average will be less than 60% for one or more SO(s), it would be discussed in the Assessment & Evaluation Committee to analyze the reason(s) behind it. The matter might also be escalated to the Department Council for remedial measures to be taken.

Table 4-22: Alumni survey results for attainment of SOs

	Student Outcomes My education at UQU has given me the ability to:	5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Weighted Average (%)
a	Apply knowledge of mathematics, science, and engineering	2	5	13	1	0	67.6
b	Design and conduct experiments, and collect, analyze and interpret data.	2	6	11	2	0	67.6
c	Design a system, process, or component to meet desired needs subject to given constraints	1	9	6	5	0	65.7
d	Function on multi-disciplinary and/or diverse teams. Take responsibility, share work, and value other viewpoints.	6	5	5	3	2	69.5
e	Identify, formulate, and solve engineering problems	5	3	8	4	1	66.7
f	Understand professional and ethical responsibilities	6	3	6	6	0	68.6
g	Communicate effectively – oral and written	4	7	6	3	1	69.5
h	Understand the impact of engineering solutions in a global, economic, environmental, and societal context	4	7	6	2	2	68.6
i	Recognize the need for and demonstrate ability to engage in lifelong learning	3	5	9	3	1	65.7
j	Know about contemporary issues relevant to computer engineering	3	5	7	2	4	61.0
k	Use techniques, skills and modern engineering tools necessary for engineering practice	6	5	5	1	4	67.6

A-11 SO Attainment indicated through Employer Survey

The process of Employer Survey has been described earlier in Section A-2-7. Here the data is presented based on a random sample of 15 employers. This survey was done some years ago. New survey is being conducted and hopefully, the results will be available at the time of the visit. Since the satisfaction criterion is 60%, we consider the attainment satisfactory if the weighted average is greater than or equal to 60%. As a result, an improvement plan must be devised to tackle the issue of low satisfaction. In this case, the issue will be discussed in Assessment & Evaluation Committee, Departmental Council, and the EAB meetings. Employers and alumni will be contacted and ways to resolve the issue will be determined. The data shown in Table 4-23 indicates that only the software skills are in the state of "progressing towards satisfaction". Faculty is aware of this issue and it has been discussed in the Department Council. Computer Science department that teaches software courses to Computer Engineering students is also aware of this issue and has been taking measures to improve software skills of the students.

Table 4-23: Employer survey data for SO attainment

	Skills/Abilities	5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Weighted Average (%)
1	Communication skills	2	5	6	2	0	69.3
2	Problem solving	3	3	6	3	0	68.0
3	Software skills	0	4	8	1	2	58.7
4	Ability to work in teams	4	4	5	2	0	73.3
5	Structured thinking	3	6	3	2	1	70.7
6	Creative thinking	2	5	5	2	1	66.7
7	Hardware skills	1	6	7	1	0	69.3
8	Ability to apply appropriate engineering skills in the job	2	5	6	1	1	68.0
9	Ability to apply appropriate mathematical skills in the job	1	4	7	2	1	62.7
10	Ability to analyze a problem and identify and define the engineering requirements appropriate to its solution	2	5	4	4	0	66.7
11	Ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs	1	6	5	2	1	65.3
12	Be ethically, socially and professionally responsible	4	7	1	3	0	76.0
13	Be lifelong learners and strive to continuous improvement	3	8	3	0	1	76.0

B. Continuous Improvement

Computer Engineering program has very significant and effective continuous improvement processes. For the past several years, there have been continuous improvements on numerous fronts including the curriculum, assessment processes, facilities, graduation project quality and assessment, etc. The whole process of improvement itself is being improved to obtain a highly sustainable system of assessment, evaluation and improvement based on CLOSO software. The processes used for evaluating the Student Outcomes were described in Section A-2. In this section, we discuss the continuous improvement processes keeping the following in consideration:

a) How the results of SO evaluations are used in continuous improvement processes
b) Changes made to the program due to the results of assessments and evaluations
c) Results of changes made to the program
d) Future program improvement plans based on recent evaluations

B-1 Course Improvement Plan (CIP)

The most important part of our continuous improvement plan is a "*microscopic*" continuous improvement process that deals with an instructor's teaching and assessment plan. We believe that improvements at

microscopic level contribute the most to the continuous improvement of the program through improvements in the course outcomes. This improvement process directly and specifically uses the results of evaluation processes for SOs as well as for CLOs with information about the instruction and assessment plan used to teach the course.

In this process, the instructor identifies the weak CLO or SO and then comes up with changes in the teaching plan and/or the assessment plan. The changes suggested here are those that the instructor alone can accomplish to improve the learning outcome. The instructor treats the weakness in a particular CLO or a related SO by suggesting changes in the teaching/assessment plan to be implemented next time the course is taught. Some examples of the measures that are suggested in a CCIP are as follows:

a) Timing of teaching particular topics

b) Timing of assessments for particular topics

c) Re-assessment of students with weak CLOs/SOs after giving them an opportunity to learn

d) Holding extra classes/tutorials to remove the weakness in relevant CLOs or SOs

e) Increasing the number of quizzes or assignments in relevant CLOs or SOs

f) Providing students with solutions to problems related to topics in which students face difficulty

g) Suggesting ways to increase students' interest in topics related to weak CLOs or SOs

h) Arranging group discussions among the students

i) Ensuring that students know in-advance the nature of questions in assessments

j) Re-designing teaching plan to have more lectures or lab sessions for weak CLOs and/or SOs

It will be again emphasized that in this type of CIP, the focus is only on what an instructor can do without asking for things that the department can do such as modifications in the curriculum. Such a *microscopic* improvement plan is possible because, as described earlier, CLOSO produces CLO and SO satisfaction data for the instructors. From this data, the instructors can easily identify the CLOs and the SOs for the course with satisfaction level(s) lower than the PSC. If in a course, all CLOs and the relevant SOs are satisfied (i.e., 60% or more of the students obtain 70% or more marks), then no CIP is required, though an instructor may due to his own interest try to improve the learning outcomes even further and suggest a CIP.

B-1-1 CIP Procedure

The instructor will do the following to create a CIP report:

1) Review the course information: Copy it from CLOSO to the CIP report. This shows the CLO-SO map and other information about the course.
2) Analyze the CLO satisfaction data: Identify the weak CLOs and the assessments that indicate the weakness.
3) Analyze the SO satisfaction data: Identify the weak SOs and relate them to the CLOs using the CLO-SO map.
4) Ask himself/herself questions: The questions that an instructor needs to ask himself/herself arise because the instructor thinks: "I taught the students the topic, explained to them the methods and concepts involved then why 60% students did not get to level C?" Pondering into this may raise the questions of following types:
    a. Was my explanation of the topics not enough or not clear?
    b. Was the topic covered beyond the student's background?
    c. Can I lower the level of complication of the assessment on this topic while keeping the same level of Bloom's Taxonomy as required for the related SO?
    d. Were the questions not so much focused on the CLO or the related SO?

e. Will a forehand explanation of the nature of an assessment, prior to giving it to the students, help them achieve attain better abilities and consequently better score?
f. Will more quizzes on the weak CLO help?
g. Will an explanation of the type of answer for 100% score help?

The above are just examples of the questions that the instructor can pose to himself/herself and should be considered as thought provoking. The instructor will know better about how to find the right direction to go for improvement.

5) Suggest improvements: Based on the answers to the above questions, the following improvements may be considered:
   a. Homework problems may be explained (at the time of assigning them) in more detail so students know clearly what is required by them.
   b. A quiz on this CLO with may be introduced before the final examination so students prepare the topics related to the CLO better
   c. If students show poor learning in the quiz on this CLO, another quiz after the quiz with poor performance be given to help them be more prepared.
   d. Students be given solved example of a question demonstrating effective communication at the time of assigning the homework questions on weak CLO.
   e. Students be provided with an ideal answer (that will result in 100% marks) to an example problem related to weak CLO.

   It may be noted that the above are only examples of the improvement measures that the instructor teaching the course next time can implement. The instructor himself/herself will be able to analyze the situation and come up with a suitable improvement plan.

Suggested improvements must have the following qualities to make the improvement plan successful:

A. They must be specific to the CLO or SO being considered.
B. Time must be specified for implementation like before mid-term, before final exam, etc.
C. Bad and vague suggestions must be avoided. Some example of vague and bad suggestions are as follows:
   a) Give *enough practice* in solving *different types* of problems numerically.
      i) "*enough*" is vague and non-measurable.
      ii) "*practice*" is also vague and undefined and non-specific
      iii) "*different types*" is also not clear. The CLO is not mentioned
      iv) Time is missing. When it will be done?
   b) *Enable* students to write computer programs for *different* problems
      i) "*Enable*" is vague and non-measurable. It should be clearly specified what will exactly be done.
      ii) "*different*" is also not clear. The CLO is not mentioned.
      iii) CLO not specified
      iv) Time of implementation missing.
   c) Read *certain* books containing *some* applications of the *numerical methods*.
      i) "*certain*" is vague. Clearly specify which books.
      ii) "*some*" is vague. Clearly specify what type of application
      iii) "*numerical methods*" is non-specific. Specify the topic
      iv) CLO not specified
      v) Time of implementation missing
D. Discuss the suggestions with fellow instructors: All cases of low satisfaction of CLO with the improvement plan need to be discussed with fellow instructors preferably teaching the same course.
E. Loop Closing: The loop closing will take place when the suggested improvements are implemented and as a result the CLO and SO satisfaction (number of students getting 70% or more marks) rises to 60% or greater.

B-1-2 CIP Example

Following is a typical CIP prepared by one of the instructors:

Continuous Improvement Plan: Switching Theory (1403271-4)

Dr. Khalid Khayyat
Spring Semester 2017-18
Date: Tuesday, June 5, 2018

Switching Theory contains 5 Course Learning Objectives (CLOs) listed below:

CLO 1. An ability to understand number systems and codes.
CLO 2. An ability to apply Boolean algebra for optimizing logic circuits.
CLO 3. An ability to design combinational logic circuits.
CLO 4. An ability to design sequential circuits.
CLO 5. An ability to design and conduct experiments in the aria of basic digital circuits.

CLO Satisfaction Data

For Spring Semester of the 2017-18 academic year, only CLO_3 failed to meet the target satisfaction criterion (60% of students getting 70% or higher). These are highlighted in the table below.

	CLO1		CLO2		CLO3		CLO4		CLO5	
	M	P	M	P	M	P	M	P	M	P
Weighted Average	13.4	77	14.1	64	21.7	26	23.8	66	25	100

SO Satisfaction Data

The corresponding student outcomes (SOs) for the aforementioned CLOs are listed below. The SOs for this course are:

a. An ability to apply knowledge of mathematics, science and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. N/A
e. An ability to identify, formulate and solve engineering problems.
f. N/A
g. N/A
h. N/A
i. N/A
j. N/A
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

As for the SO Satisfaction data for the Spring 2017-18 semester for Switching Theory, only SO c failed to meet the target satisfaction criterion (60% of students getting 70% or higher). These are highlighted in the table below.

	a		b		C		e		k	
	M	P	M	P	M	P	M	P	M	P
Cumulative Sum (Out of 100)	27.5	74	15	100	21.7	26	23.8	65	10	95

Analysis

The data presented earlier shows that CLO_3 received 36% satisfaction. The SO satisfaction data reveals that SO "c" received 26% satisfaction level. SOs "c" is based on CLOs 3.

Improvement Plan

CLO3: "An ability to design combinational logic circuits."

CLO_3 had a satisfaction of 26%. It was assessed by online quizzes, pop quizzes, quiz 3, test 2 , and the final exam. In general, Boolean algebra and combinational logic circuits tend to be hard topics. Typically, a student who is well-versed in traditional algebra should be able to adjust. However, it seemed that many flaws still exist within student understandings of basic algebra. Since this is beyond the scope of this course it cannot be addressed in an improvement plan, but rather having more rigorous acceptance of students on the basis of mathematics and other engineering-related courses is a must. Furthermore, some students are not willing to improve their understanding of the material by learning from their mistakes. On several occasions throughout the assessments, the same errors were being committed despite the fact that the instructor drew the students' attention to those issues. An improvement plan for this CLO would include:

1. Providing more examples for the students to work on and gain practice.
2. A help session can be given to actively identifying their misunderstandings and practicing on various problems.

SO "c": An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Since this SO is related to CLOs 3, applying the improvement plans for it should raise the performance of students on this SO.

B-1-3 Meaning of Loop-closing in CIP

It is important to understand what is meant by "Loop-closing" in the data presented here. We consider the loop closed in the following two cases:

1. An improvement plan was available from the beginning of the semester and its implementation caused the satisfaction attained in a particular SO to improve to a level of 60% or better.
2. The satisfaction obtained for a particular SO is greater than 60% although no improvement plan was available because the satisfaction in the previous semester was already greater than 60%.

The Loop-closing for a particular SO will remain false if the satisfaction for that particular SO remained below 60% whether an improvement plan was available or not or, whether the satisfaction was ok in the previous semesters.

B-1-4 CIP Loop-closing Monitoring

CLOSO software provides the instructors with an option to specify whether an improvement plan for their course was available at the beginning of the semester and did it improve the outcome. The purpose of this option is to collect data from all instructors and then analyze them for making decisions. Table 4-24 shows the choices available to the instructors for the questions asked by CLOSO.

Table 4-24: Improvement plan existence for relevant SOs

Question	Possible answers
At the start of the semester, was an improvement plan available that addressed this SO?	Yes
	No
	Not Applicable
Who was responsible for implementing the improvement plan?	Instructor
	Department
	Instructor and Department
	Not Applicable
Was the improvement plan implemented while teaching this course?	Yes, all parts implemented
	Only instructor's part implemented
	Only department's part implemented
	Nothing was implemented
	Not applicable
How good was the improvement in SO satisfaction?	Very good. Satisfaction criterion was met
	Significant improvement but not enough
	Insignificant improvement
	No improvement
	Satisfaction went down

Figure 4-35 shows a typical instructor's input in CLOSO software. The Loop-closing data collected as described, is analyzed by CLOSO. The statistics obtained by the software CLOSO are discussed by the Assessment and Evaluation Committee for resolving any issues and recommending future actions to be taken.

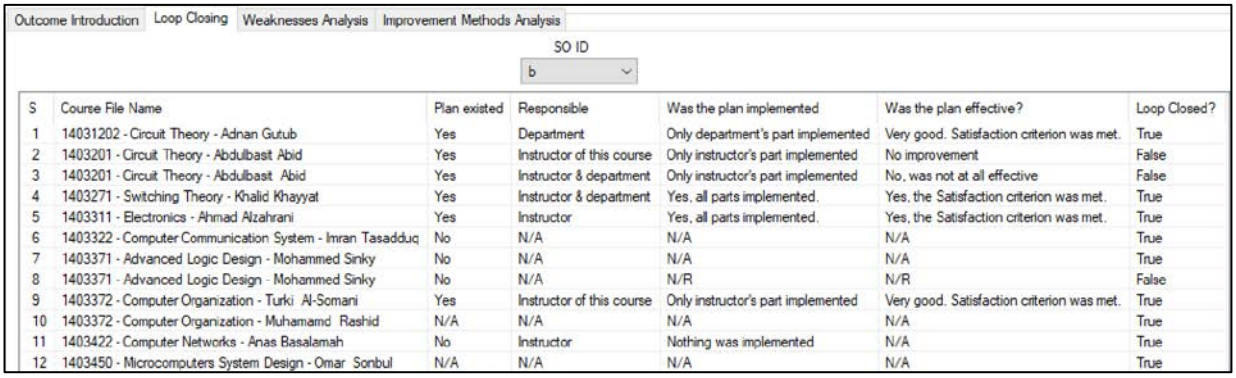
Learning Readiness | Syllabus Coverage | CLO Satisfaction | Weaknesses | Improvement Methods | SO Loop Closing

SO ID	M	P	At the start of the course, was an improvement plan avialable that addressed this SO ?	Who was responsible for implementing the improvement plan?	Was the improvement plan implemented while teaching this course?	How good was the improvement in SO satisfaction?	Loop Closed?
k	10	100	No	Not Applicable	Not Applicable	Not applicable	☑
a	26	57	No	Not Applicable	Not Applicable	Not applicable	☐
g	6	59	Yes	Instructor of this co...	Yes, all parts implemented.	Significant improvement but not enough.	☐
c	22	64	Yes	Instructor of this co...	Yes, all parts implemented.	Very good. Satisfaction criterion was met.	☑
e	16	66	Yes	Instructor of this co...	Yes, all parts implemented.	Very good. Satisfaction criterion was met.	☑
f	2	68	Yes	Instructor of this co...	Yes, all parts implemented.	Very good. Satisfaction criterion was met.	☑
j	2	73	No	Not Applicable	Not Applicable	Not applicable	☑
▸ b	15	77	Yes	Instructor of this co...	Yes, all parts implemented.	Very good. Satisfaction criterion was met.	☑

Figure 4-35 CIP loop-closing monitoring in CLOSO

B-1-5 SO Loop Closing Statistics

The loop-closing statistics can be displayed using CLOSO software for any of the SOs for any specific semester, academic year or a set of courses. Figure 4-36 shows a typical CLOSO screen snapshot for SO (b). CLOSO administrator puts all the CLOSO files in a folder and then from the Admin Panel of CLOSO, chooses "SO-wise Analysis" and then the "Loop Closing" tab. Selecting the SO (b) (just as an example), CLOSO displays all the courses in the folder. The "Plan existed" column shows "Yes" for courses that had a CIP available. It can be seen that the faculty is reporting the effectiveness of the CIP. In some cases, significant improvement did occur but the satisfaction criterion was not achieved so the loop was not closed. Since the data comes from the faculty input, many times there are errors in the faculty input. Assessment and Evaluation committee will review all the data and then will request the faculty members to re-submit the CLOSO course files with the corrected data. The complete and corrected data for all SOs will be available at the time of the visit.



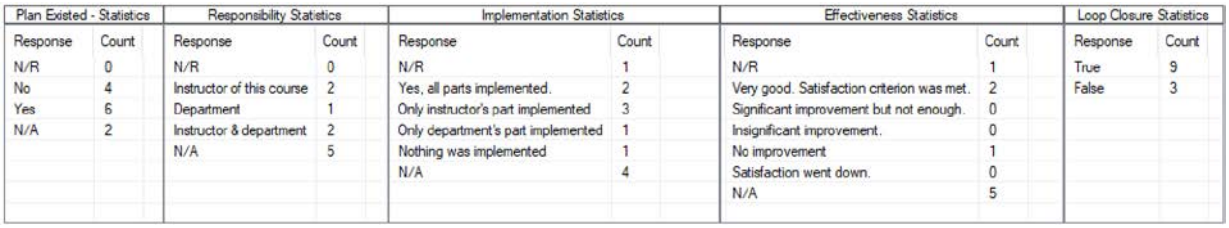
Outcome Introduction | Loop Closing | Weaknesses Analysis | Improvement Methods Analysis

SO ID: b

S	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	14031202 - Circuit Theory - Adnan Gutub	Yes	Department	Only department's part implemented	Very good. Satisfaction criterion was met.	True
2	1403201 - Circuit Theory - Abdulbasit Abid	Yes	Instructor of this course	Only instructor's part implemented	No improvement	False
3	1403201 - Circuit Theory - Abdulbasit Abid	Yes	Instructor & department	Only instructor's part implemented	No, was not at all effective	False
4	1403271 - Switching Theory - Khalid Khayyat	Yes	Instructor & department	Yes, all parts implemented.	Yes, the Satisfaction criterion was met.	True
5	1403311 - Electronics - Ahmad Alzahrani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was met.	True
6	1403322 - Computer Communication System - Imran Tasadduq	No	N/A	N/A	N/A	True
7	1403371 - Advanced Logic Design - Mohammed Sinky	No	N/A	N/A	N/A	True
8	1403371 - Advanced Logic Design - Mohammed Sinky	No	N/A	N/R	N/R	False
9	1403372 - Computer Organization - Turki Al-Somani	Yes	Instructor of this course	Only instructor's part implemented	Very good. Satisfaction criterion was met.	True
10	1403372 - Computer Organization - Muhamamd Rashid	N/A	N/A	N/A	N/A	True
11	1403422 - Computer Networks - Anas Basalamah	No	Instructor	Nothing was implemented	N/A	True
12	1403450 - Microcomputers System Design - Omar Sonbul	N/A	N/A	N/A	N/A	True

Figure 4-36 An example of loop-closing data

CLOSO also provides a summary of the statistics as shown in Figure 4-37. This is just an example for SO (b). Complete data for all SOs will be available at the time of the visit.



Plan Existed - Statistics		Responsibility Statistics		Implementation Statistics		Effectiveness Statistics		Loop Closure Statistics	
Response	Count	Response	Count	Response	Count	Response	Count	Response	Count
N/R	0	N/R	0	N/R	1	N/R	1	True	9
No	4	Instructor of this course	2	Yes, all parts implemented.	2	Very good. Satisfaction criterion was met.	2	False	3
Yes	6	Department	1	Only instructor's part implemented	3	Significant improvement but not enough.	0		
N/A	2	Instructor & department	2	Only department's part implemented	1	Insignificant improvement.	0		
		N/A	5	Nothing was implemented	1	No improvement	1		
				N/A	4	Satisfaction went down.	0		
						N/A	5		

Figure 4-37 An example of loop-closing statistics

B-1-6 Results of changes made through CIP

All the CIPs are first submitted to the ABET coordinator who ensures that all the required information has been provided and the plans are implementable. Any issues in the plans are discussed with course instructors and then the improvement plans are finalized. The instructors then implement the improvement plans. Once the CIPs are implemented and new results are compiled, the assessment and evaluation committee discusses and evaluates the new results to ascertain if student learning has improved. Table 4-25 summarizes some of the results of the changes made through CIPs. In this table, the SOs that were below satisfaction are shown in the fourth column. The table shows "Weak SOs" for each subject, their satisfaction percentage before improvement and their satisfaction after implementing the CIP the next time the course was taught. The data does not include the CIPs that did not result in any improvements.

B-2 Improvement Planning based on Student Weaknesses

Instructors identify student weaknesses and suggest possible improvements in their courses. They do it two ways. First, by pointing out weaknesses and then by identifying the ways to improve. CLOSO displays a list of 16 weaknesses. The instructor may choose from the list the weaknesses he thinks exist

in the students. The 17th in the list is for the instructor to specify any weakness not among the 16. This list is shown in Table 4-26.

Table 4-25 SO Improvement Loop-closing

Course	Semester	Weak SOs	Satisfaction (%)	
			Before Improvement	After Improvement
1403312 Digital Elect. Syst. & Circuits	Spring 2016-17	(e)	21	69
1403371 Advanced Logic Design	Spring 2016-17	(c)	49	65
1403372 Computer Organization	Fall 2016-17	(a)	51	63
		(c)	29	74
1403381 Numerical Analysis	Spring 2016-17	(k)	33	61
1403422 Computer Networks	Fall 2017-18	(a)	51	74
		(h)	25	74
1403450 Microcomputer based Syst. Design	Fall 2016-17	(e)	40	51

In addition to the identification of weaknesses, the instructors also identify ways to improve the SO attainments. The list of possible improvements to be chosen from is shown in Table 4-27.

CLOSO performs SO-wise analysis of the data gathered by the instructors for their courses. SO-wise analysis gives a good idea of the weaknesses and improvement methods for a specific SO. Figure 4-38 and Figure 4-39 show such data displayed by CLOSO for SO (a). All such data are evaluated by the Assessment and Evaluation committee for future improvements.

B-3 Improvement Planning based on Course Readiness

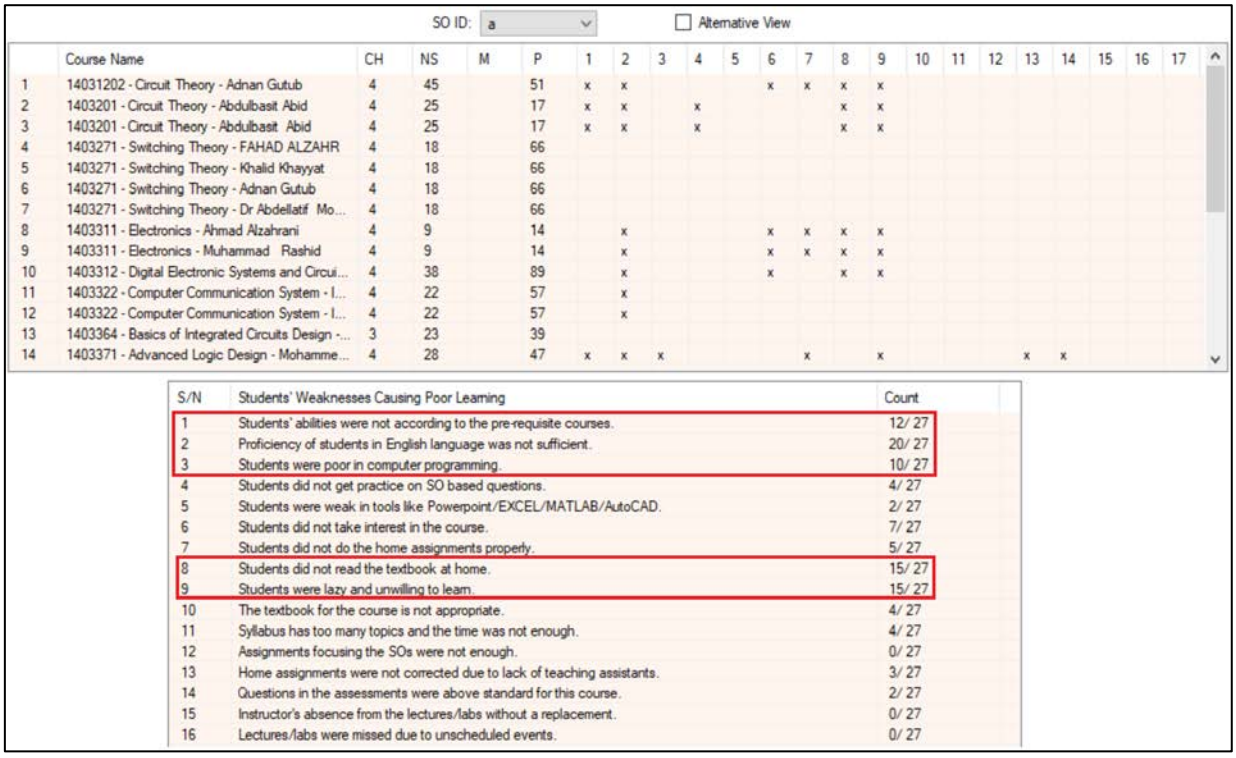
CLOSO software provides the opportunity to instructors to voice their concerns about “Course Readiness”. It involves the readiness aspects required at the beginning of the semester. Following CLOSO snapshots obtained from the analysis of such survey for the academic year 2017-18 are given in Figure 4-40 to Figure 4-57.

Table 4-26 Student Weaknesses

S/N	Weakness
1	Students' abilities were not according to the pre-requisite courses.
2	Proficiency of students in English language was not sufficient.
3	Students were poor in computer programming.
4	Students did not get practice on SO based questions.
5	Students were weak in tools like PowerPoint/EXCEL/MATLAB/AutoCAD.
6	Students did not take interest in the course.
7	Students did not do the home assignments properly.
8	Students did not read the textbook at home.
9	Students were lazy and unwilling to learn.
10	The textbook for the course is not appropriate.
11	Syllabus has too many topics and the time was not enough.
12	Assignments focusing the SOs were not enough.
13	Home assignments were not corrected due to lack of teaching assistants.
14	Questions in the assessments were above standard for this course.
15	Instructor's absence from the lectures/labs without a replacement.
16	Lectures/labs were missed due to unscheduled events.
17	Other than the above? Please write in the space provided.

Table 4-27 Ways to improve SO attainments

S/N	Improvement Method
1	Students were weak in tools like PowerPoint/EXCEL/MATLAB/AutoCAD.
2	Students did not take interest in the course.
3	Students' English proficiency be improved.
4	The CLO with weak performance be addressed earlier in the semester.
5	More assignments related to the CLOs be given.
6	More Quizzes related to the weak CLO be given.
7	Assessment marks for questions related to the weak CLO be increased.
8	Students' admission policy be made stricter.
9	Students' interest be improved through lectures/site-visits.
10	A different textbook be specified.
11	Syllabus of the course be revised.
12	Tutorial classes be arranged.
13	Contact hours for the course be increased.
14	Lab facilities be improved.
15	Complexity of questions in assessments be reduced
16	Errors in exams be explained with elaboration to the students.
17	Other than the above? Please write in the following space:



	Course Name	CH	NS	M	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	14031202 - Circuit Theory - Adnan Gutub	4	45		51	x	x				x	x	x	x								
2	1403201 - Circuit Theory - Abdulbasit Abid	4	25		17	x	x		x				x	x								
3	1403201 - Circuit Theory - Abdulbasit Abid	4	25		17	x	x		x				x	x								
4	1403271 - Switching Theory - FAHAD ALZAHR	4	18		66																	
5	1403271 - Switching Theory - Khalid Khayyat	4	18		66																	
6	1403271 - Switching Theory - Adnan Gutub	4	18		66																	
7	1403271 - Switching Theory - Dr Abdellatif Mo...	4	18		66																	
8	1403311 - Electronics - Ahmad Alzahrani	4	9		14		x				x	x	x	x								
9	1403311 - Electronics - Muhammad Rashid	4	9		14		x				x	x	x	x								
10	1403312 - Digital Electronic Systems and Circui...	4	38		89		x				x		x	x								
11	1403322 - Computer Communication System - I...	4	22		57		x															
12	1403322 - Computer Communication System - I...	4	22		57		x															
13	1403364 - Basics of Integrated Circuits Design -...	3	23		39																	
14	1403371 - Advanced Logic Design - Mohamme...	4	28		47	x	x	x				x		x				x	x			

S/N	Students' Weaknesses Causing Poor Learning	Count
1	Students' abilities were not according to the pre-requisite courses.	12/ 27
2	Proficiency of students in English language was not sufficient.	20/ 27
3	Students were poor in computer programming.	10/ 27
4	Students did not get practice on SO based questions.	4/ 27
5	Students were weak in tools like Powerpoint/EXCEL/MATLAB/AutoCAD.	2/ 27
6	Students did not take interest in the course.	7/ 27
7	Students did not do the home assignments properly.	5/ 27
8	Students did not read the textbook at home.	15/ 27
9	Students were lazy and unwilling to learn.	15/ 27
10	The textbook for the course is not appropriate.	4/ 27
11	Syllabus has too many topics and the time was not enough.	4/ 27
12	Assignments focusing the SOs were not enough.	0/ 27
13	Home assignments were not corrected due to lack of teaching assistants.	3/ 27
14	Questions in the assessments were above standard for this course.	2/ 27
15	Instructor's absence from the lectures/labs without a replacement.	0/ 27
16	Lectures/labs were missed due to unscheduled events.	0/ 27

Figure 4-38 Example of SO-wise weakness analysis for SO (a)

SO ID: a Alternative View

	Course Name	CH	NS	M	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	14031202 - Circuit Theory - Adnan Gutub	4	45		51			x						x		x	x			x	x	
2	1403201 - Circuit Theory - Abdulbasit Abid	4	25		17			x	x	x			x	x			x					
3	1403201 - Circuit Theory - Abdulbasit Abid	4	25		17			x	x	x			x	x			x					
4	1403271 - Switching Theory - FAHAD ALZAHR	4	18		66																	
5	1403271 - Switching Theory - Khalid Khayyat	4	18		66																	
6	1403271 - Switching Theory - Adnan Gutub	4	18		66																	
7	1403271 - Switching Theory - Dr Abdellatif Mo...	4	18		66																	
8	1403311 - Electronics - Ahmad Alzahrani	4	9		14	x	x	x			x		x									x
9	1403311 - Electronics - Muhammad Rashid	4	9		14	x	x	x			x		x									x
10	1403312 - Digital Electronic Systems and Circui...	4	38		89			x		x			x									
11	1403322 - Computer Communication System - I...	4	22		57			x														
12	1403322 - Computer Communication System - I...	4	22		57			x														
13	1403364 - Basics of Integrated Circuits Design -...	3	23		39																	
14	1403371 - Advanced Logic Design - Mohamme...	4	28		47		x	x					x	x								

S/N	Proposed Actions for Continuous Improvement	Count
1	Pre-requisites be modified.	4/ 27
2	Grading in pre-requisites with more weight on fundamentals.	10/ 27
3	Students English proficiency be improved.	20/ 27
4	The CLO with weak performance be addressed earlier in the semester.	6/ 27
5	More assignments related to the CLOs be given.	8/ 27
6	More Quizzes related to the weak CLO be given.	8/ 27
7	Assessment marks for questions related to the weak CLO be increased.	4/ 27
8	Students admission policy be made more strict.	14/ 27
9	Students' interest be improved through lectures/site visits.	10/ 27
10	A different textbook be specified.	2/ 27
11	Syllabus of the course be revised.	3/ 27
12	Tutorial classes be arranged.	10/ 27
13	Contact hours for the course be increased.	2/ 27
14	Lab facilities be improved.	4/ 27
15	Complexity of questions in assessments be reduced	1/ 27
16	Errors in exams be explained with elaboration to the students.	3/ 27

Figure 4-39 Example of SO-wise improvement methods analysis for SO (a)

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	26
2	Inappropriate	0
3	No response from the instructor	3

Figure 4-40 Pre-requisite courses

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	17
2	Inappropriate	6
3	Very Poor	4
4	No response from the instructor	2

Figure 4-41 Pre-requisite abilities in the students

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	27
2	Inappropriate	0
3	No response from the instructor	2

Figure 4-42 Instructor's class schedule

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	25
2	Too big	2
3	No response from the instructor	2

Figure 4-43 Instructor's class size

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	26
2	Inappropriate	1
3	No response from the instructor	2

Figure 4-44 Instructor's classroom space

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	19
2	Inappropriate	8
3	No response from the instructor	2

Figure 4-45 Instructor's classroom facilities

S/N	Possible responses (Instructors' Input)	Count
1	Comfortable	11
2	Noisy	0
3	Disturbing	0
4	Improper Temperature	14
5	Improper Lighting	1
6	No response from the instructor	3

Figure 4-46 Instructor's classroom environment

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	16
2	Inappropriate	4
3	Non-existent	2
4	Not applicable	5
5	No response from the instructor	2

Figure 4-47 Lab equipment

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	15
2	Inappropriate	4
3	Non-existent	2
4	Not applicable	6
5	No response from the instructor	2

Figure 4-48 Lab utilities

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	17
2	Inappropriate	1
3	Non-existent	5
4	Not applicable	3
5	No response from the instructor	3

Figure 4-49 Lab assistants/technicians

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	20
2	Too big	0
3	Not applicable	6
4	No response from the instructor	3

Figure 4-50 Lab class size

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	12
2	Inappropriate	1
3	Non-existent	4
4	Not applicable	10
5	No response from the instructor	2

Figure 4-51 Required software

S/N	Possible responses (Instructors' Input)	Count
1	From the institution	2
2	From local bookstore	10
3	From overseas bookstore	3
4	From Internet	6
5	Difficult to find	5
6	Not available	1
7	Not applicable	0
8	No response from the instructor	2

Figure 4-52 Textbook availability

S/N	Possible responses (Instructors' Input)	Count
1	From the institution	3
2	From local bookstore	3
3	From overseas bookstore	1
4	From Internet	15
5	Difficult to find	0
6	Not available	0
7	Not applicable	5
8	No response from the instructor	2

Figure 4-53 Reference material availability

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	3
2	Inappropriate	4
3	Not provided	14
4	Not needed	6
5	No response from the instructor	2

Figure 4-54 Teaching assistants

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	5
2	Inappropriate	3
3	Non-existent	9
4	Not needed	9
5	No response from the instructor	3

Figure 4-55 Classroom Wifi

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	9
2	Inappropriate	0
3	Non-existent	7
4	Not needed	8
5	Custom Possible Answers	0
6	Custom Possible Answers	0
7	No response from the instructor	5

Figure 4-56 Lab Wifi

S/N	Possible responses (Instructors' Input)	Count
1	Appropriate	18
2	Inappropriate	4
3	Non-existent	4
4	Not needed	0
5	Custom Possible Answers	0
6	Custom Possible Answers	0
7	No response from the instructor	3

Figure 4-57 Instructor's office Wifi

B-4 Improvement Planning based on Exit Surveys

The results of exit surveys as shown in Section A-9 clearly indicate that the SO attainments as perceived by the students are well above the PSC for both the academic years.

In addition to SO attainments, the graduating students in their exit surveys, are also asked about some key parameters related to the continuous improvement that indicate the satisfaction of overall learning and assessment processes. Students are asked if they agree with the quality of the following key parameters that affect the learning assessment processes:

1) Quality of Instruction
2) Quality of Laboratories
3) Quality of Supervision or Advice
4) Quality of Academic Services

Student responses for the period of 2016 to 2018 are shown in Table 4-28. It is obvious that most of the students believe that the quality of the key parameters is satisfactory. However, improvement measures are still necessary because of relatively large number of students selecting "Good" about the quality. Such issues are usually discussed in the annual meetings of the External Advisory Board. And continuous improvement measures are always taken at various levels from the instructor level to the department, college and university administration levels to improve the quality.

Table 4-28: Response of graduating students regarding the quality of key parameters

Learning Environment		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Weighted Average (%)
a. Quality of Instruction in:							
1	Mathematics, Physics, and Chemistry	20	22	15	1	0	81.0
2	Computer Engineering courses	27	21	9	1	0	85.5
3	Computer Science courses	21	13	20	3	1	77.2
4	English courses	20	9	22	5	2	73.8
5	Islamic studies and humanities	30	15	12	1	0	85.5
6	Elective courses	25	19	13	1	0	83.4
b. Quality of Laboratories:							
1	Instruction provided by lab instructors	20	17	19	2	0	79.0
2	Experiments and lab manuals	20	13	17	8	0	75.5
3	Computing facilities and equipments	20	11	21	3	3	74.5
c. Quality of Supervision or Advice:							
1	Summer training	24	14	10	8	2	77.2
2	Senior Project	30	14	11	2	1	84.1
3	Academic advising	22	13	14	6	3	75.5
d. Quality of Academic Services:							
1	Admission process	25	16	16	0	1	82.1
2	Orientation program	20	14	21	1	2	76.9
3	Registration process	22	18	13	3	2	79.0
4	Email, Internet, and Networking infrastructure	23	11	18	3	3	76.6
5	Library	22	14	19	1	2	78.3
6	Classrooms	19	14	18	4	3	74.5
7	Bookstore	20	11	18	3	6	72.4

B-5 Improvement Planning based on Alumni and Employer Surveys

Results of the last Alumni survey shown in Section A-10 are yet to be analyzed by the Assessment and Evaluation Committee. However, it is clear from these results that SO "j" (knowledge of contemporary issues) has scored the lowest. This issue has already been taken care of by modifying CLOs of certain courses as will be explained in the next section. Based on these results and analysis, the Assessment and Evaluation committee will present recommendations.

Results of a relatively older employer survey were presented in Section A-11. It was noted that the employers gave low score to software skills of computer engineering students. The computer science department that offers software courses to computer engineering students is taking measures to improve software skills of students. As soon as the results of a recent employer survey become available, the Assessment and Evaluation Committee will analyze them and will present recommendations.

B-6 Improvement through Curriculum

Program improvement plans are based on the evaluations as described in this chapter. Some of the improvement plans are short ranged as described in Section B-1. Some improvement plans will be made at the beginning of the semester when the Assessment and Evaluation Committee will present any issues that need attention. There are other long-term improvement plans that are based on evaluation results of last several years. Among them, the most important is the curriculum improvement. A summary of this improvement is given in the following:

During the last 12 years one major and one minor improvement were made to the curriculum. The curricula at Umm Al-Qura University are identified as "Plan xx". For example, Plan 27 was introduced 12 years ago in 2006. For getting ABET accreditation, minor changes were made and the modified curriculum was given the name Plan 30. The numbers 27 and 30 refer to the Arabic calendar years 1427 and 1430. The students being admitted to the program since Fall 2009 are following the curriculum of Plan 30 (the current plan) and the students admitted before Fall 2009 were following the curriculum of Plan 27. Starting from Fall 2017-18, the admitted students started following Plan 37 which is a major improvement of Plan 30 based on many factors including the outcome evaluations described in this chapter. Figure 4-58 shows that basically, the curricula known as Plan 30 and Plan 37 represent the same academic program with about the same number of credit hours allocated to the four areas of General Education, Engineering, Math & Basic Sciences and Others. The improvements that are yet to be implemented, will bring minor changes in this allocation.

Table 4-29 shows a comparison of Plan 30 and Plan 37 mentioning the courses that have been removed, modified or added. The course content and CLOs have also been improved in the new Plan.

In addition to above, several other improvements have been made in the curriculum as detailed below:

1. Wordings of CLOs for all courses have been standardized to comply with the standard definition of learning outcomes. Wherever possible, same action verbs are used for abilities that are similar in nature but are being addressed in different courses. Moreover, CLO statements have been revised and made simple so that the abilities addressed by these CLOs are easily understood.
2. Topics to which CLOs relate have been identified and documented within the syllabus to make it easier for the instructor to design assessments addressing a specific CLO.
3. Expected Bloom's level has also been made part of the CLO statement.
4. Mapping of CLOs to the SOs has also been revised to ensure that a CLO indeed maps to the right SO. Also, to the extent possible, each CLO has been mapped to minimum number of SOs.
5. Teamwork has been introduced in some of the labs and an assessment form has been developed for this purpose.
6. On the recommendations of EAB, new electives are being introduced in the curriculum to keep up pace with the rapidly growing technological world.

7. It is now mandatory for the Graduation Projects to have a chapter in the final report that demonstrates students' understanding in SOs "h" and "j".

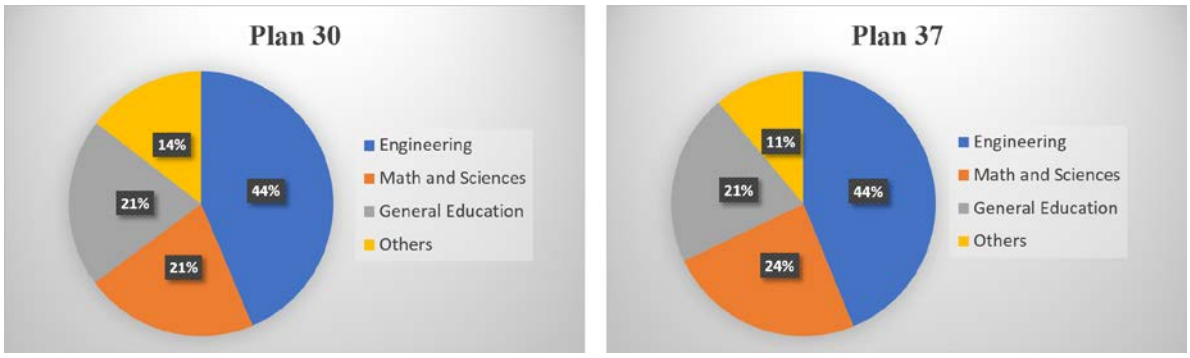


Figure 4-58: Credit hours' comparison of the current and improved curriculum

Table 4-29: Summary of improvements in the curriculum

	Current Curriculum		Improved Curriculum		Changes
	Course	**CH**	**Course**	**CH**	
1	4800150 Computer Skills-I	2/0/2			Removed
2	1401102 Computer Prog.	2/1/3	14011101 Computer Prog.	3/1/4	Modified
3	1401104 Structured Prog.	2/1/3	14011102 Object Oriented Prog.	3/1/4	Modified
4	802321 Signal Analysis	3/0/3	14032101 Signals & Systems	3/1/4	Replaced
5	804343 Eng. Prob. & Stat.	3/0/3	14033410 Prob. & Stat. for Eng.	3/1/4	Replaced
6	1401105 Advanced Prog.	2/1/3			Removed
7	1403381 Numerical Analysis	3/0/3	14032401 Numerical Methods for Computing	3/1/4	Modified
8	1403372 Computer Org.	3/1/4	14032205 Computer Org. & Architecture	3/1/4	Merged
	1403472 Computer Arch.	3/0/3			
9	1403300 Summer Training-I	0/2/2	14033500 Summer Training	0/3/3	Merged
	1403400 Summer Training-II	0/2/2			
10	804344 Eng. Economics	2/0/2			Removed
11	1403401 Seminar	2/0/2	14033403 Professional Skills for Eng. Design	2/0/2	Replaced
12	1403422 Computer Networks	3/1/4	14033103 Computer Networks	3/1/4	Modified
13	1403364 Basics of IC Design	3/0/3			Core to Elective
14	804345 Eng. Management	2/0/2	8034620 Eng. Projects Mgt.	2/0/2	Replaced
15	1403499 Project	0/4/4	14034903 Graduation Project-I	0/2/2	Split
			14034904 Graduation Project-II	0/3/3	
16	1401313 Software Engineering	3/0/3			Removed
17			14033402 Eng. Design Process & Tools	3/0/3	Added

C. Additional Information

PDF copies of the course folders will be made available in the ABET resource room. Each instructor submits a course folder. It contains the copies of the assessment instruments, assessment data, improvement plans, samples of students' work, faculty and student survey data, syllabus, instructor's time table, office hours, CLOs of the course, related SOs, CLO-SO map, course topics teaching plan,

instruction methods used, assessment methods used, SO assessment plan, student survey analysis, faculty surveys, Loop-closing data, and samples of all assessments.

Minutes of the meetings of committees involved in the evaluation of the assessment results, minutes of department council where recommendations for action were made will be available for reviewer at the time of visit.

References

Imam, M. H., & Tasadduq, I. A. (2012). Evaluating the satisfaction of ABET student outcomes from course learning outcomes through a software implementation. *International Journal of Quality Assurance in Engineering and Technology Education (IJQAETE), 2*(3), 21-33.

Imam, M. H., Tasadduq, I. A., Ahmad, A.-R., & Aldosari, F. (2016). *An Expert System for Assessment of Learning Outcomes for ABET Accreditation*. Paper presented at the International Conference on Engineering Education, Singapore.

Imam, M. H., Tasadduq, I. A., Khan, M. H., Ahmad, A.-R., Aldosari, F., & Shaikh, S. V. (2017). eCOOL: An Expert System based Approach to Designing Effective Assessments for Course Outcomes and Learning. *Transylvanian Review, 1*(4).

Kuh, G. D., Jankowski, N., Ikenberry, S. O., & Kinzie, J. (2014). Knowing what students know and can do: The current state of student learning outcomes assessment in US colleges and universities. *Urbana, IL: University of Illinois and Indiana University, National Institute for Learning Outcomes Assessment (NILOA)*.

Smart-Accredit. (2016). *CLOSO User's Manual (smart-accredit.com)*. Retrieved from http://www.smart-accredit.com/adminpanel/upload/CLOSO_2015_Users_Manual.pdf

CRITERION 5: CURRICULUM

A. Program Curriculum

The computer engineering program prepares students for engineering practice via course content throughout the curriculum, culminating in a major design experience, 1403499-4: Project. The Program includes over one-year combination of college level mathematics and basic sciences (35 credits, 32 minimum), 72 credit hours of engineering topics (48 minimum), 24 credit hours of Computer Science courses, and general education consistent with Umm Al-Qura University requirements.

A-1 Plan of Study

Table 5-1 describes the plan of study for students in the computer engineering program. This includes information on course offerings in the form of a recommended schedule by year and term along with maximum section enrollments for all courses in the program. Table 5-1 also indicates whether the credit hours of the courses belong to Math & Basic Sciences or Engineering Topics or General Education or other.

According to the information given in Table 5-1, courses belonging to Math & Basic Sciences collect 35 hours that fits with minimum required credit hours. Also, engineering topics collect 72 hours which is more than the minimum required.

Undergraduate lecture courses usually have a class size ranging from 20 to 40. The laboratory courses usually have 20 – 25 students per section. Detailed information regarding actual course offerings and section enrollment is provided in Table 5-1. The departmental policy is to offer basic required computer engineering courses each semester. In each academic semester, a selection of technical electives is also offered to facilitate exposure to current technologies and specialization. In consultation with their faculty advisers, students choose 9 credit hours of technical electives.

A-2 Curriculum Alignment to Program Educational Objectives

Table 5-2 lists all course of the computer engineering program and its support with the Computer Engineering program objectives.

A-3 Curriculum Alignment to Student Outcomes

Each of the Computer Engineering courses in the curriculum has a set of Course Learning Outcomes (CLOs). The CLOs are related to the student outcomes considering that each CLO will help the students in attaining the abilities required at the time of graduation. This relationship of the CLOs of a course with the SOs is expressed as a CLO-SO map as shown in the syllabi given in Appendix A. The support of each SO from various courses based on the CLO-SO maps of Computer Engineering core courses are shown in Table 5-3.

A-4 Prerequisites Flowchart

Figure 5-1 shows the prerequisite flowchart for the core courses of the program.

A-5 Curricular Areas

Five main curricular areas are included in the Computer Engineering program which consists of 165 credit hours. These areas are mathematics, basic science, computer engineering, others (consisting of courses from computer science) and general education. Table 5-4 shows distribution of credit hours among these curricular areas.

Table 5-1: Program Curriculum

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Preparation Year Deanship, 4800130-4, General Physics-I	R	4	*0*	*0*	*0*	Spring 2015-16 Spring 2016-17	Lecture 60 Lab 60
Preparation Year Deanship, 4800140-4, Introduction to Mathematics-I	R	4	*0*	*0*	*0*	Fall 2015-16 Fall 2016-17	Lecture 60
Preparation Year Deanship, 4800170-6, English Language	R	0	*0*	*6*	*0*	Fall 2015-16 Fall 2016-17	Lecture 60
Preparation Year Deanship, 4800150-2, Computer Skills-I	R	0	*0*	*0*	*2*	Fall 2013-14 Fall 2014-15	Lecture 60 Lab 60
Preparation Year Deanship, 4800141-4, Introduction to Mathematics-II	R	4	*0*	*0*	*0*	Spring 2015-16 Spring 2016-17	Lecture 60
Preparation Year Deanship, 4800171-4, Technical English	R	0	*0*	*4*	*0*	Spring 2015-16 Spring 2016-17	Lecture 60 Lab 60
Preparation Year Deanship, 4800104-3, Learning and Study Skills	R	0	*0*	*3*	*0*	Fall 2015-16 Fall 2016-17	Lecture 60 Lab 60
Preparation Year Deanship, 4800153-3, Computer Programming Skills	R	0	*0*	*0*	*3*	Spring 2015-16 Spring 2016-17	Lecture 60 Lab 60
Computer Science, 1401102-3, Computer Programming	R	0	*0*	*0*	*3*	Spring 2016-17 Fall 2017-18	Lecture 106 Lab 106
College of Engineering, 800201-3, Engineering Mathematics-I	R	3	*0*	*0*	*0*	Fall 2017-18 Fall 2016-17	Lecture 40

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Dawah and Islamic Culture, 601101-2, Islamic Culture I	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 79
Dawah and Islamic Culture, 605101-2, The Holy Qur`aan I	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 110
Kitab and Sunna, 102101-2, The Biography of Prophet Muhammad (pbuh)	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 95
Chemistry, 402101-4, General Chemistry	R	4	*0*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 50 Lab 50
Computer Engineering, 1403201-4, Circuit Theory	R	0	*4*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 113 Lab 113
College of Engineering, 800202-3, Engineering Mathematics-II	R	3	*0*	*0*	*0*	Spring 2017-18 Spring 2016-17	Lecture 40
Computer Science, 1401104-3, Structured Programming	R	0	*0*	*0*	*3*	Spring 2016-17 Fall 2017-18	Lecture 69 Lab 69
Physics, 403102-4, General Physics II	R	4	*0*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 50 Lab 50
Dawah and Islamic Culture, 601201-2, Islamic Culture II	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 114
Dawah and Islamic Culture, 605201-2, The Holy Qur`an II	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 159
Computer Engineering, 1403271-4, Switching Theory	R	0	*4* ✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 122 Lab 122

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Electrical Engineering, 802321-3, Signal Analysis	R	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 45
Computer Engineering, 1403311-4, Electronics	R	0	*4*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 63 Lab 63
Dawah and Islamic Culture, 605301-2, The Holy Qur`an III	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 79
Dawah and Islamic Culture, 601301-3, Islamic Culture III	R	0	*0*	*3*	*0*	Fall 2017-18 Spring 2017-18	Lecture 87
Mechanical Engineering, 804343-3, Eng. Statistics & Probability Theory	R	3	*0*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 55
Computer Science, 1401105-3, Advanced Programming	R	0	*0*	*0*	*3*	Fall 2017-18 Spring 2017-18	Lecture 56 Lab 56
Computer Engineering, 1403381-3, Numerical Analysis	R	3	*0*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 49
Computer Engineering, 1403372-4, Computer Organization	R	0	*4*✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 44 Lab 44
Dawah and Islamic Culture, 601401-2, Islamic Culture IV	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 94
Computer Engineering, 1403312-4, Digital Electronic Sys. & Circuits	R	0	*4*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 62 Lab 62
Computer Engineering, 1403300-2, Summer Training I	R	0	*2*	*0*	*0*	Summer 2016 Summer 2017	Training 44

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Dawah and Islamic Culture, 605401-2, The Holy Qur`an IV	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 109
Computer Engineering, 14003322-4, Computer Communication System	R	0	*4*✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 27 Lab 27
Computer Science, 1401218-4, Data Structures & Algorithms	R	0	*0*	*0*	*4*	Fall 2017-18 Spring 2017-18	Lecture 24 Lab 24
Mechanical Engineering, 804344-2, Engineering Economics	R	0	*2*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 32
Computer Science, 1401210-3, Discrete Structures	R	3	*0*	*0*	*0*	Spring 2016-17 Fall 2017-18	Lecture 19
Computer Engineering, 1403371-4, Advanced Logic Design	R	0	*4* ✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 34 Lab 34
Computer Engineering, 1403401-2, Seminar	R	0	*2*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 27
Computer Engineering, 1403422-4, Computer Networks	R	0	*4*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 29 Lab 29
Arabic Language and Grammar, 501101-2, Arabic Language	R	0	*0*	*2*	*0*	Fall 2017-18 Spring 2017-18	Lecture 144
Computer Science, 1401311-3, Operating Systems	R	0	*0*	*0*	*3*	Fall 2017-18 Spring 2017-18	Lecture 11
Computer Engineering, 1403472-3, Computer Architecture	R	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 96

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Computer Engineering, 1403489-4, Microprocessors	R	0	*4* ✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 36
Computer Engineering, 1403400-2, Summer Training II	R	0	*2*	*0*	*0*	Summer 2016 Summer 2017	Training 36
Computer Engineering, 1403450-4, Microcomputer System Design	R	0	*4* ✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 26 Lab 26
Computer Engineering, 1403364-3, Basics of IC Design	R	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 27
Mechanical Engineering, 804345-2, Engineering Management	R	0	*2*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 27
Computer Engineering, 1403499-4, Project	R	0	*4* ✓	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 26
Computer Science, 1401313-3, Software Engineering	R	0	*0*	*0*	*3*	Fall 2017-18 Spring 2017-18	Lecture 29
Computer Engineering, 1403xxx, Elective I	E	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 17
Computer Engineering, 1403xxx, Elective II	E	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 33
Computer Engineering, 1403xxx, Elective III	E	0	*3*	*0*	*0*	Fall 2017-18 Spring 2017-18	Lecture 32

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	*Subject Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Add rows as needed to show all courses in the curriculum.							
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		35	*72*	*34*	*24*		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	165						
PERCENT OF TOTAL		21.21 %	*43.6%*	*20.6 %*	*14.54 %*		
Total must satisfy either credit hours or percentage — Minimum Semester Credit Hours		32 Hours	48 Hours				
Total must satisfy either credit hours or percentage — Minimum Percentage		25%	37.5 %				

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

Table 5-2 Relationship between CE curriculum and the PEOs

Course Number	Course Title	Program Educational Objectives			
		PEO 1	PEO 2	PEO 3	PEO 4
Required Courses					
1403201-4	Circuit Theory	✓			
1403311-4	Electronics	✓	✓		
1403271-4	Switching Theory	✓	✓		
1403381-3	Numerical Analysis	✓			
1403372-4	Computer Organization	✓	✓		
1403312-4	Digital Electronic Systems & Circuits	✓	✓		
1403322-4	Computer Communication System	✓		✓	✓
1403371-4	Advanced Logic Design	✓	✓		
1403401-2	Seminar	✓	✓	✓	✓
1403422-4	Computer Networks	✓		✓	✓
1403489-4	Microprocessors	✓	✓	✓	✓
1403472-3	Computer Architecture	✓	✓	✓	
1403364-3	Basics of IC Design	✓	✓	✓	✓
1403450-4	Microcomputer System Design	✓	✓		
1403300-2	Summer Training I	✓	✓	✓	✓
1403400-2	Summer Training II	✓	✓	✓	✓
1403499-4	Project	✓	✓	✓	✓
Electives					
1403464-3	Design of Integrated Circuit	✓	✓	✓	
1403446-3	Mobile Computing	✓	✓	✓	✓
1403478-3	Computer Vision	✓	✓		✓
1403481-3	Neural Networks	✓	✓		
1403476-3	Simulation & Modeling	✓	✓		
1403421-3	Digital Signal Analysis	✓			
1403480-3	Artificial Intelligence	✓	✓	✓	
1403484-3	Databases	✓	✓	✓	✓
1403487-3	Process Control	✓	✓	✓	
1403490-3	Special Topics	-	-	-	-
Other Courses					
	Physics and Chemistry	✓			
	Mathematics	✓			
	General Education including English		✓		✓

A-5-1 Mathematics and Basic Sciences

One year of mathematics and basic sciences is taken primarily during the freshman and sophomore years. The combined mathematics and basic science credits are a minimum of 35 (more than the required minimum of 32 credits).

Mathematics

Computer engineering students take Calculus I & II in their freshman year. In their second year, students take Engineering Math I & II. Students also take Engineering Statistics and Probability Theory, and Numerical Analysis during their third year. Finally, they take Discrete Structures in their fourth year.

Table 5-3: Relationship between CE curriculum and SOs

Course		Cr Hr	Student Outcomes										
ID	Name		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1403201	Circuit Theory	4	1	1	0	0	1	0	0	0	0	0	1
1403271	Switching Theory	4	1	1	1	0	1	0	0	0	0	0	1
1403311	Electronics	4	1	1	0	1	1	0	0	0	0	0	1
1403312	Digital Elect. Syst. & Circuits	4	1	1	0	0	1	0	0	0	0	0	1
1403322	Computer Comm. System	4	1	1	1	0	1	1	1	0	0	1	1
1403364	Basics of IC Design	3	1	0	1	0	1	0	1	1	1	1	0
1403371	Advanced Logic Design	4	1	1	1	1	0	0	0	0	0	0	1
1403372	Computer Organization	4	1	1	1	0	1	0	0	0	0	0	1
1403381	Numerical Analysis	3	1	0	0	0	0	0	0	0	0	0	1
1403401	Seminar	2	0	0	0	0	0	1	1	0	1	1	1
1403422	Computer Networks	4	1	1	1	0	1	0	0	1	0	0	1
1403450	Microcomputers Syst. Design	4	1	1	1	1	1	0	0	1	1	0	1
1403472	Computer Architecture	3	1	0	1	0	1	1	1	0	0	1	0
1403489	Microprocessors	4	1	1	1	0	1	0	0	1	1	0	1
1403499	Project	4	1	1	1	1	1	1	1	1	1	1	1
T O T A L S (for each column)		55	14	11	10	4	12	4	5	5	5	5	13
Bloom's Taxonomy LOL for each SO			4,5	3	4,5	3	4,5	4,5	4,5	3,4	3	4,5	3

Basic Sciences

In their freshman year, Computer Engineering majors take General Physics I & II. Each is 4 credits including laboratory. In their second year, students take General Chemistry I (4 credits including laboratory). These courses total 12 credits.

A-5-2 Engineering Topics

Computer Engineering majors are required to take a minimum of 72 engineering credits including 63 required credits and 9 elective credits.

Required Courses

The required course set totaling 72 credits is tabulated in Table 5-5 by the year typically taken.

Professional Electives

Computer Engineering majors are also required to take a minimum of three courses from the courses listed in Table 5-6.

A-6 Major Design Experience for Engineering Practice

Several courses in Computer Engineering curriculum give design experience to students. For example, students gain elementary design experience in course 1403271-4 Switching Theory, 1403322-4 Computer Communications and 1403372-4 Computer Organization. Students gain relatively advanced design experience in courses such as 1403371-4 Advanced Logic Design, 1403489-4 Microprocessors and 1403450-4 Microcomputer Based System Design.

Seniors in their final year take their major design experience, 1403499-4 Graduation Project. Students work in teams of anywhere from three to five students. Students are allowed to form their own teams and choose projects that must be approved by the faculty member teaching the course. Only those students who complete at least 132 credit hours' worth course work are allowed to take the project. The Capstone Projects Committee and the faculty member supervising the project ensure that the project is indeed capstone and incorporates engineering standards and realistic constraints such as economic,

environmental, sustainability, ethical, security and social considerations. Chapter 4 of this SSR has discussed in detail the coverage of all student comes through the Graduation Project. A document highlighting the complete process is available at: https://uqu.edu.sa/en/cis_ce/Graduation-Project-Regulations.

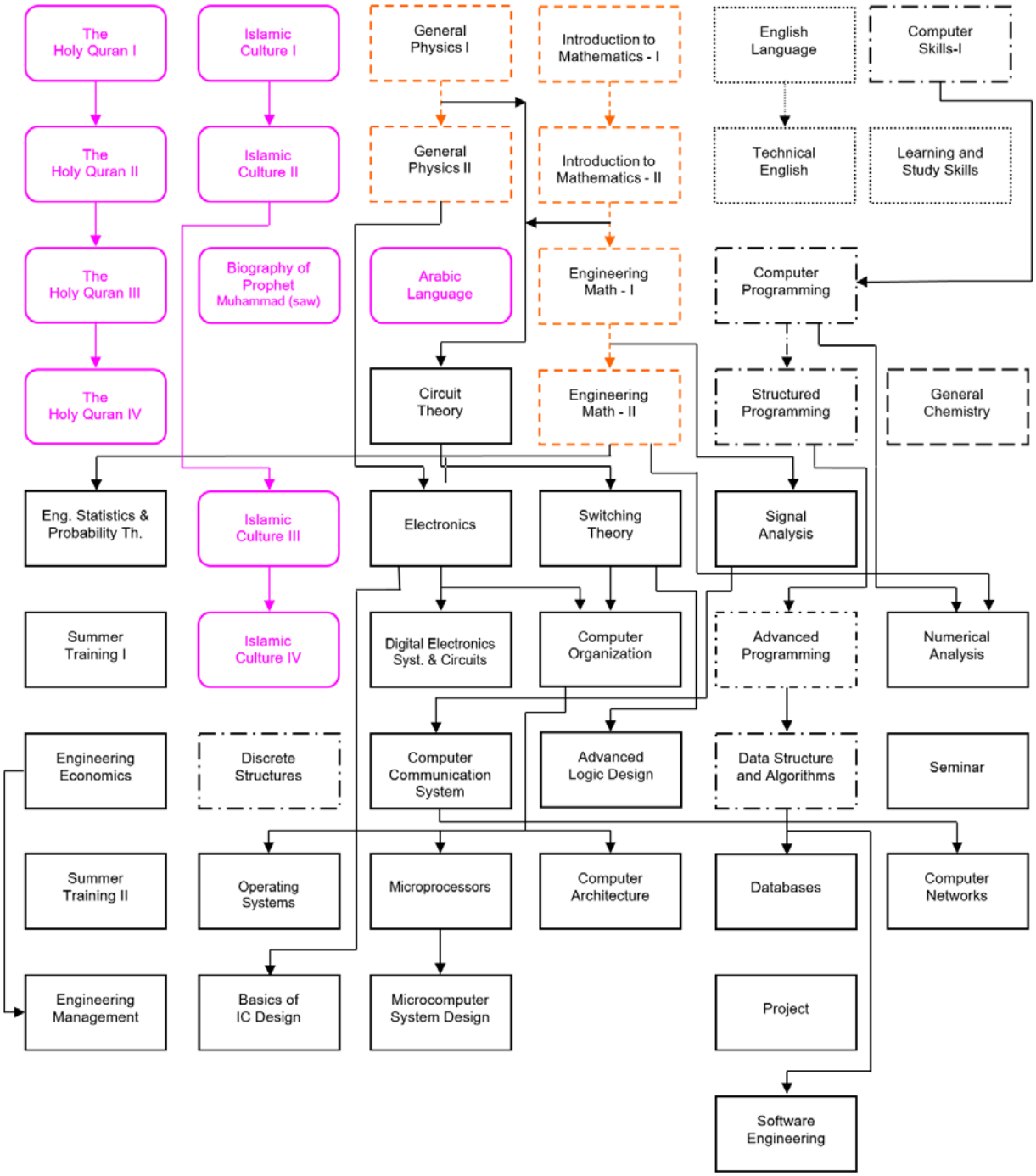


Figure 5-1: Prerequisites flowchart

A-7 Cooperative Education

Currently the Computer Engineering program curriculum does not allow cooperative education.

A-8 Materials Available for Review during Visit

The materials available during the ABET evaluator's visit has been described in Section C of Criterion 4. In addition, the following will be available concerning the curriculum:

1. Course syllabi.
2. Teaching Materials.
3. Course textbooks.

Table 5-4: Number of credit hours for each curriculum area

Area	Credit hours	% of Credit hours
Mathematics	23	13.93%
Basic Sciences	12	7.27%
Engineering Topics	72	43.6%
Others	24	14.54%
General Education	34	20.60%

Table 5-5: Year-wise distribution of credit hours of required engineering courses

Year	Course Code	Course Title	Credit Hours
2nd Year	1403201-4	Circuit Theory	4
3rd Year	802321-3	Signal Analysis	3
	1403311-4	Electronics	4
	1403271-4	Switching Theory	4
	1403372-4	Computer Organization	4
	1403312-4	Digital Electronic Systems & Circuits	4
	1403300-2	Summer Training 1	2
4th Year	1403322-4	Computer Communication System	4
	1403371-4	Advanced Logic Design	4
	1403401-2	Seminar	2
	1403422-4	Computer Networks	4
	1403489-4	Microprocessors	4
	1403472-3	Computer Architecture	3
	1403400-2	Summer Training 2	2
	804344-2	Engineering Economics	2
5th Year	1403364-3	Basics of Integrated Circuits Design	3
	1403450-4	Microcomputers System Design	4
	1403499-4	Project	4
	804345-2	Engineering Management	2
	1403xxx-3	Elective I	3
	1403xxx-3	Elective II	3
	1403xxx-3	Elective III	3

Table 5-6: Elective courses

Course Code	Course Title	Credit Hrs.
1403464-3	Design of Integrated Circuits	3
1403446-3	Mobile Computing	3
1403478-3	Computer Vision	3
1403481-3	Neural Networks	3
1403476-3	Simulation & Modeling	3
1403421-3	Digital Signal Analysis	3
1403480-3	Artificial Intelligence	3
1403490-3	Special Topics	3
1403484-3	Databases	3
1403487-3	Process Control	3

B. Course Syllabi

Course syllabi are attached in Appendix A.

CRITERION 6. FACULTY

A. Faculty Qualifications

The Computer Engineering faculty is committed to program development and course coverage in addition to maintaining continuity and improvement of academic standards. The interest and qualifications of department faculty members are sufficient to plan, teach, modify and update all offered courses and curriculum. The faculty collectively presents an impressive level of competence in their respective areas of specialty through their academic, research and industrial experiences.

The Department has currently thirty-one full time faculty members of which twenty-six have doctorate degrees, four have master's degrees while one has a bachelor's degree. The distribution of the full-time faculty ranks is as follows: three professors, seven associate professors, sixteen assistant professors and five lecturers. They have earned their degrees from recognized universities of the USA, UK, Canada, Australia, Pakistan and Middle East.

There is versatility in specializations of faculty members and they cover all the curricular areas of the program such as, Computer Architecture and Organization, Computer Networks and Communications, Digital Systems Design, and Circuits and Electronics.

Some of the Computer Engineering faculty members have been assigned various administrative positions. Three faculty members of Computer Engineering hold the position of the Dean while five others hold the positions of the Vice Dean in various departments of the University.

Qualifications, experiences, and level of professional activities of the Computer Engineering faculty members have been listed in Appendix B and Table 6-1.

B. Faculty Workload

The maximum teaching load according to the official University policy is as follows:

- 10 credit hours for professors.
- 12 credit hours for associate professors.
- 14 credit hours for assistant professors.
- 16 credit hours for lecturers.

The above teaching load allows the faculty to spend time on research and educational quality improvement activities. Department chairman and faculty members who are assigned the administrative positions get only 50% of the teaching loads.

The expected working hours for the Saudi faculty members is 35 hours/week (Article #41 of the University Policy) and for the faculty on the yearly contract the working hours are 40 hours/week (Article #15 of the Policy and Regulation of Non-Saudi faculty). The working hours are to be spent on teaching, research, academic advising, laboratory supervision, and any other tasks assigned to them. The teaching load of faculty for Fall and Spring of the academic year 2017-18 can be found in Table 6-2.

C. Faculty Size

The faculty size of thirty-one is more than sufficient to cater the needs of around 285 students registered in the program as the student to faculty ratio is 9.19:1. Table 6-2 summarizes the teaching load of each faculty member for the past academic year.

Faculty members have a wide range of responsibilities in addition to teaching that includes student-faculty interaction, student advising, research activities and administrative responsibilities. Several

faculty members hold administrative positions within and outside the College of Computer and Information Systems.

The faculty members actively pursue research in their areas of specialization. In addition to personal research efforts, they utilize funding opportunities through the Deanship of Scientific Research as well as external funding by other agencies such as King Abdulaziz City for Science and Technology (KACST).

D. Professional Development

The faculty members of Computer Engineering Department have several opportunities of professional development through one or more of the following:

- Attending workshops on teaching techniques offered by the University
- Attending administration and leadership workshops through the Institute of Public Administration.
- Attending national and international conferences and workshops in the areas of various computer and IT disciplines.
- Attending e-learning workshops supervised by the National Center for E-learning.

For tenured faculty members, UQU covers all the expenses for attending wide range of conferences and workshops based on the approval of the Computer Engineering Department Council and the College Council subject to UQU rules and regulations. In addition to that, UQU allows tenured faculty members to have a one-year sabbatical leave if the faculty member has served UQU for at least five years.

E. Authority and Responsibility of Faculty

Department Chairman is the chief administrator of all resources provided to the Department. The role of Department Chairman has two primary over-arching dimensions. First, the Department Chairman has the responsibility to oversee and manage the wide range of operations in their academic unit. Second, the Department Chairman participates in the executive management of the college and, as such, has a responsibility to contribute to the overall success of the college.

The department council consist of all faculty members. It makes decisions on all academic matters related to the Computer Engineering program including the study plan, curriculum, textbooks, and appointment of faculty members and teaching assistants.

Several committees consisting of faculty members have been made to carry out the tasks of development and implementation of the processes for the assessment, evaluation, and continuing improvement of the program.

Most of the faculty members are assigned the task of Academic Advisement. The Academic Advisement duties require the faculty member to assist students in all academic matters to help them fulfill all the requirements of graduation.

Table 6-1: Faculty Qualifications

Faculty Name	Highest Degree Earned- Field and Year	Rank [1]	Type of Academic Appointment [2] T, TT, NTT	FT or PT [4]	Years of Experience			Professional Registration/ Certification	Level of Activity H, M, or L [3]		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Abdellatif Semeia	PhD – CE – 2002	AST	NTT	FT	0	28	12	--	M	M	H
Abduaziz Miyajan	PhD – CE – 2016	AST	T	FT	0	5	3	Hardware security	M	L	M
Abdulbasit Abid	PhD – CE – 2008	AST	T	FT	0	10	10	--	L	L	L
Abdulghani Sayegh	MS – CE – 2012	TA	T	FT	0	13	13	--	L	L	L
Abdullah Baz	PhD – CE – 2014	AST	T	FT	0	12	12	IEEE senior member	M	L	H
Adnan Abdul-Aziz Gutub	PhD – CE – 2002	P	T	FT	2	17	7	--	M	M	M
Ahmed Zahrani	PhD – CE – 2015	AST	T	FT	2	6	4	--	L	L	L
Ahmad Muaz Qamar	MS – CS – 1998	L	NTT	FT	2	15	15	--	L	L	L
Anas Basalamah	PhD – CE – 2009	ASC	T	FT	9	7	7	--	L	M	M
Ayman A Alharbi	PhD – CE – 2015	AST	T	FT	0	3	2	--	L	M	L
Emad Felemban	PhD – CE – 2009	ASC	T	FT	0	18	18	IEEE, ACM, Saudi Eng.	M	M	L
Fahad Al-Zahrani	PhD – CE – 2005	ASC	T	FT	0	13	13	--	L	L	L
Fahd Aldosari	PhD – CE– 2011	AST	T	FT	2	6	6	--	L	M	L
Faisal Al-Osaimi	PhD – CE – 2010	AST	T	FT	0	6	6	--	L	L	L
Hussam Aleem Mohammed	MS – CE – 2009	L	NTT	FT	2	6	6	CCNA, MCSE, MCP, MCSA	L	M	L
Imran Tasadduq	PhD – ECE – 2002	P	NTT	FT	0	16	9	--	L	L	L
Khalid Al-Hindi	PhD – EE – 2002	ASC	NTT	FT	2	24	17	--	L	L	L
Khaled H. Almotairi	PhD – ECE – 2012	AST	T	FT	0	5	5	--	L	L	L

Khalid Khayyat	PhD – CE – 2011	AST	T	FT	0	7	7	--	L	L	L
Lo'ai A. Tawalbeh	PhD – ECE – 2004	ASC	T	FT	14	14	5	IEEE Senior Member	M	M	M
Maher Rajab	PhD – CE – 2004	ASC	T	FT	0	15	15	--	L	M	L
Mohammad Al-Turkistany	PhD – CE – 2006	AST	T	FT	0	12	12	--	L	L	L
Majid Al-Gethami	PhD – CE – 2011	AST	T	FT	1	7	7	--	L	L	L
Mohammed Hussein Sinky	PhD – CE – 2015	AST	T	FT	0	2	2	--	L	L	L
Mohsin Murad	MSc – CE – 2012	L	NTT	FT	0	6	6	--	L	L	L
Muhammad Rashid	PhD – CE – 2009	AST	NTT	FT	2	7	7	--	L	L	M
Muhammad Yousuf I. Zia	MS – CE – 2002	L	NTT	FT	0	15	7	--	M	M	L
Omar Sonbul	PhD – CE – 2012	AST	T	FT	1	6	6	--	L	L	L
Saleh Basalamah	PhD–BioEng–2005	ASC	T	FT	0	12	12	--	L	L	L
Turki Al-Somani	PhD – CSE – 2006	P	T	FT	12	12	12	MCSE, CCNA, CCDA	H	H	H
Waleed Alasmary	PhD – ECE – 2015	AST	T	FT	0	2	2	--	L	M	M

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

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

2. Code: TT = Tenure Track T = Tenured NTT = Non Tenure Track

3. The level of activity, high, medium or low, should reflect an average over the year prior to the visit plus the two previous years.

4. FT means full time, PT means part time

Table 6-2: Faculty workload summary

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Abdellatif Semeia	FT	(1403271/4) Fall 2017-18 (1403312/4) Spring 2017-18	80	20	-	100%
Abdulaziz Miyajan	FT	(1403472/3) Fall 2017-18 (14032205/4) (2 Sections), (14032205/4) (1 Lab) Spring 2017-18	80	20	-	100%
Abdulbasit Abid	FT	(14031202/4), (1403201/4) (2 Sections) Fall 2017-18 (1403201/4) (2 Sections), (14032205/4) (3 Sections) Spring 2017-18	80	20	-	100%
Abdulghani Sayegh	FT	(14031201/4) (3 Labs), (1403271/4) Fall 2017-18	90	10	-	100%
Abdullah Baz	FT	(1403271/4), (1403364/3) Fall 2017-18 (14031201/4) (2 Sections), (1403364/3) Spring 2017-18	80	20	-	100%
Adnan Gutub	FT	(14031202/4) (2 Sections) Fall 2017-18 (1403271/4), (1400519/3) Spring 2017-18	60	40	-	100%
Ahmad Zahrani	FT	(1403311/4) Fall 2017-18 (1403311/4) (2 Sections), (48021503/3) Spring 2017-18	80	20	-	100%
Ahmad Qamar	FT	(14031202/4) (4 Labs), (1403372/4) (1 Lab) Fall 2017-18 (14032205/4) (1 Lab), (1403372/4) (3 Labs), (1401310/3) Spring 2017-18	90	10	-	100%
Anas Basalamah	FT	(1403422/4) Fall 2017-18 (1403422/4) Spring 2017-18	40	60	-	100%
Ayman Harbi	FT	(1403271/4) (2 Labs), (1403311/4) (1 Lab), (1400503/3) (3 Sections) Fall 2017-18 (14031201/4) (1 Lab) (1403271/4) (1 Lab) (1403322/4) (1 Lab), (1403490/3), (1400510/3), (1400522/3) Spring 2017-18	50	50	-	100%
Emad Felemban	FT	(1403446/3), (1400520/3) Fall 2017-18 (1400522/3) Spring 2017-18	80	20	-	100%
Fahad Zahrani	FT	(14031201/4), (1403271/4) Fall 2017-18 (1403381/3) (3 Sections), (1400529/3) Spring 2017-18	80	20	-	100%
Fahd Dosari	FT	(1400508/3) (2 Sections) Fall 2017-18 (1400509/3) (2 Sections), (1403450/4) (1 Lab) Spring 2017-18	60	40	-	100%
Faisal Osaimi	FT	(1400508/3) Fall 2017-18 (1400509/3) (2 Sections) Spring 2017-18	50	50	-	100%
Hussam Aleem	FT	(1403311/4) (3 Labs) Fall 2017-18 (14031201/4) (2 Labs)), (1403271/4) (2 Labs) Spring 2017-18	90	10	-	100%

Imran Tasadduq	FT	(1403322/4), (1403381/3) (2 Sections) Fall 2017-18 (1403322/4) Spring 2017-18	70	30	-	100%
Khalid Hindi	FT	(1403481/3) Fall 2017-18 (1403481/3) Spring 2017-18	80	20	-	100%
Khalid Khayyat	FT	(1403271/4), (405121/4) Fall 2017-18 (1403271/4), (405121/4) (2 Sections), (405123/3) Spring 2017-18	80	20	-	100%
Khalid Motairi	FT	(1400520/3) Fall 2017-18 (1400514/3) Spring 2017-18	80	20	-	100%
Loai Tawalbeh	FT	(1400510/3) Fall 2017-18 (1400513/3) Spring 2017-18	80	20	-	100%
Maher Rejeb	FT	(1403489/4) Fall 2017-18 (1403478/3) Spring 2017-18	70	30	-	100%
Majid Gethami	FT	(1403401/2), (2316539/4) Fall 2017-18 (14031201/4) (1 Lab) (1403312/4) (1 Lab), (1401439/4) Spring 2017-18	80	20	-	100%
Mohsin Khan	FT	(1403311/4) (2 Labs), (1403450/4) (2 Labs) Fall 2017-18 (1403311/4) (3 Labs) Spring 2017-18	90	10	-	100%
Muhammad Rashid	FT	(1403311/4) (2 Sections), (1403499/4) (2 Sections) Fall 2017-18 (1403372/4) Spring 2017-18	80	20	-	100%
Muhammad Sinky	FT	(14031201/4), (1403371/4) (2 Sections), (1403499/4) Fall 2017-18 (1403371/4) (2 Sections), 1403472/3) Spring 2017-18	80	20	-	100%
Muhammad Turkistany	FT	(405121/4), (1401210/3) Fall 2017-18 (1403312/4) (2 Sections), (1403446/3), (1401334/3), (14011801/3) (2 Sections) Spring 2017-18	80	20	-	100%
Omar Sonbul	FT	(1403450/4), (1403499/4) Fall 2017-18 (1403450/4) Spring 2017-18	80	20	-	100%
Saleh Basalamah	FT	-	-	-	100	100%
Turki Somani	FT	(1403372/4) Fall 2017-18 (14031201/4), (1403372/4), (1403401/2) Spring 2017-18	60	40	-	100%
Waleed Asmary	FT	(1403201/4) (1 Lab), (1403371/4) (1 Lab), (1403499/4) Fall 2017-18 (14031201/4) (2 Sections), (1403499/4) (4 Sections), (1400581/3), (1400582/3) Spring 2017-18	60	40	-	100%
Yousuf Zia	FT	(1403271/4) (2 Labs), (1403322/4) (1 Lab) Fall 2017-18 (1403201/4) (2 Labs), (1403322/4) (1 Lab) Spring 2017-18	90	10	-	100%

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.

CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

A-1 Offices

Until about two years' ago, there was limitation of space for faculty offices and labs. Previously, only 18 offices were available, shared between multiple faculty members. Similarly, lecturers had to utilize laboratories for their administrative work. However, the aforementioned problem has been solved by the completion of new building where independent offices have been provided to each faculty member. Faculty offices in the new building are equipped with the following facilities:

- Office size allows the faculty members to conduct meetings with at least two colleagues or students.
- Normal and standard teaching needs
- Each faculty member is assigned a computer with basic software installed such as Windows and Microsoft Office, and he has full access to the Internet and the University Intranet. Furthermore, wireless access to the Internet/intranet is available in the offices.
- Computer replacement occurs on the demand/requirements of faculty and is initiated by the College depending on the available annual purchasing budget allocated to the College.

In addition to faculty offices, there are dedicated offices for administrative and clerical works. Lecturers in the department are utilize the laboratories for their administrative tasks.

A-2 Classrooms

Classrooms in the new building are equipped with the following facilities:

- Adequate number of seats
- An instructor's desk
- A data projector
- A white board

However, classrooms are not covered with a wireless network. Consequently, the instructors cannot connect their laptops to the Internet during lectures.

A-3 Laboratory Facilities

Facilities related to the laboratories can be summarized in the following:

- Total number of labs: There are a total of eight physical laboratories covering ten different subjects including an exclusive lab for Graduation Projects.
- Class size of each lab: Lab class size is 15 – 20 students on average and the lab instructor has the opportunity to comfortably supervise the experiments and help the students in any problems they might face.
- Equipment in the labs: These laboratories are well equipped as is mentioned in the equipment list in Appendix C. Appendix C enlists the major and latest equipment available in computer engineering laboratories.
- Upgradation of equipment: The department upgrades laboratories as and when needed by purchasing state of the art equipment, software and components.

- Upgradation of laboratory manuals: All the lab manuals were thoroughly revised and updated to help students in performing the experiments and enhancing their laboratory experience. These lab manuals are available online at: https://uqu.edu.sa/en/cis_ce/لائحة-تجارب-المعامل

B. Computing Resources

On campus, students have open access to the campus network and the Internet. There are wireless access points that serve campus buildings including staff offices and labs. The practical result is that anyone in the campus community can have access to the campus network and the Internet at any time from any place. Students can either use their own laptops to connect to the Internet or use one of the laboratories having computing facilities to use computers and connect to the Internet. Further, each faculty member has a PC in his office having Internet access.

The Deanship of Admission and Registration provides access to the electronic-gate services system to students and faculty members via the University network. By using the Electronic-Gate system, students can perform online registration, monitor their academic progress, view transcripts/grades, etc. while instructors can monitor their students, see their academic progress and results, insert marks and absences for students, edit their profile, etc.

C. Guidance

The faculty members are responsible to support and guide the use of laboratories and resources, each in his assigned laboratory. Faculty prepares laboratory notes, set procedures for performing the experiments and discusses the safety regulations for each lab. A staff member always attends the laboratory sessions with the students and guides them in the relevant use of equipment and tools as needed and in performing experiments.

Furthermore, there are two types of technical support. The first type of technical support is related to PCs and is provided by IT department to all college students, faculty, teaching staff and administrative staff. Technicians deal with all kinds of technical problems which are sometimes fixed on the spot, and sometimes are handled by the help desk. The requester has to fill up a technical-support request form and submit it at the help desk which keeps track of issue until the request is fulfilled.

The second type of technical support is related to hardware laboratories which are used to teach a number of courses in the computer engineering department. Technical support for those laboratories and their equipment is directly provided by qualified teaching staff from the computer engineering department. The department generally supervises and operates those laboratories.

D. Maintenance and Upgrading of Facilities

For computing related facilities, the IT Deanship is responsible for all university-supplied computers and network connectivity issues on all campuses. The IT Deanship has a telephone service desk that serves as the first point of contact for handling and resolving maintenance problems. If they cannot rectify the problem, they will forward the issue to the relevant part of the IT Deanship. If faculty members experience maintenance problems with their office computer or network connectivity, they can contact the service desk directly.

E. Library Services

The King Abdullah Library is the central library of Umm Al-Qura University. It is the main body that collects and develops information sources (purchasing, donation, and exchange), organizes these sources (classifying, cataloging, indexing, and shelving), and makes them available to the university community through a range of services (loans, reading areas, electronic access). The library contains a large range of information resources such as books, periodicals, digital libraries, documents, manuscripts, audio-visual

material, maps and atlases, and other electronically accessible material. These services are provided by the following departments of the library:

- The Department of Library Users Services.
- The Department of Scripts, Dissertations, and Audio-visual Materials.
- The Department of Technical Procedures.
- The Department of Exchange and Official Publications.
- The Department of Special Collections.
- The Department of Planning, Follow Up, Organization and Research.

Under its authority are:

- King Abdullah University Library at the Abdiyah campus
- King Abdullah University Library at the Zaher campus
- Branch libraries, including:
- College of Da'wa and Usul-ud-Din Library (Abdiyah)
- College of Arabic Language Library (Abdiyah)
- College of Applied Sciences Library (Abdiyah)
- College of Computer & Information Systems Library (Abdiyah)
- College of Engineering and Islamic Architecture Library (Abdiyah)
- College of Medicine Library (Abdiyah)
- Institute of Scientific Research and Revival of Islamic Heritage Library (Abdiyah)
- College of Applied Sciences Library (Zaher)
- Al-Jamum University College Library (Jamum)
- College of Arts and Administrative Sciences Library (Zaher)
- The Custodian of the Two Holy Mosques Institute for Hajj Research Library (Aziziah)
- College of Islamic Law Library (Abdiyah)
- College of Education Library (Abdiyah)
- Al-Qunfudah University College Library (Qunfudah)
- College of Fine Arts and Design Library (Abdiyah)
- Al Leith University College Library (Leith)

The university provides connections to different and varied information sources. These include:

- University Dissertations and Theses
- Arabic Books
- Foreign Books
- Periodicals and Microfilms

- Government Publications
- Automatic Lending Service
- Automatic Book-Return Service
- Reference Service
- Book Purchase Request Service
- Digital Library Service (e.g. IEEE Explore, ACM, Elsevier, and Wiley)
- Umm Al-Qura University Journals
- Original and Photocopied manuscripts
- Records of conferences and symposia held at Umm Al-Qura University
- Photographed meetings held at Umm Al-Qura University

F. Overall Comments on Facilities

Safety procedures for all Computer Engineering Laboratories follow the University's centralized plan and policy. Specific laboratory procedures are documented for each Computer Engineering laboratory. Required safety equipment and the proper operation of laboratory equipment is conveyed to students by the laboratory instructors and are also documented in each laboratory manual. Several policies and measures have been defined and taken in order to ensure that facilities, tools, computers and equipment used are safe for their intended purposes. They are summarized below.

F-1 General Safety Measures

The general safety measures taken are summarized as follows:

- The college building is equipped with surveillance cameras for security purposes.
- A health center is available in the University for all students.
- Smoke detectors are installed everywhere in the college building.
- Fire extinguishers are installed everywhere in the college building.
- Sprinklers are installed everywhere in the college building.
- An emergency evacuation procedure is available in laboratories.
- A laboratory safety procedure is affixed in each laboratory.

F-2 Laboratory Safety Guidelines

Laboratory safety guidelines are included in every lab manual. These have been included in Appendix F.

F-3 Safety of Computer Software

F-3-1 Safety against Viruses/Malware

Antivirus is installed on all the PCs in the college. This is configured for automatic updates and real time scanning.

F-3-2 Software Piracy

All software tools used within the college are legal and licensed. The installation and use of illegal and/or unlicensed software tools is strictly forbidden.

CRITERION 8: INSTITUTIONAL SUPPORT

A. Leadership

The departmental leadership consists of the chairman of the department, and the department council which consists of all faculty members. The chairman heads the department council responsible for making all academic decisions related to the curriculum, faculty and staff appointment, teaching load distribution and faculty research and professional development activities. The department chair and council play a very important role in promoting departmental interests at the college and university levels. The chairman has made several committees to help him in making decisions. If the recommendations of these committees relate to academic matters, the matter is discussed in the department council meeting before a decision is made. Any recommendations that require the support of the college, are referred to the dean of the college of engineering. The dean presents the matter to the college council and a decision is made. If the matter requires the support of the university then the approved decision is sent to the university administration for proper action, support or implementation.

B. Program Budget and Financial Support

B-1 Sources of Financial Support

Umm Al-Qura University is one of the leading universities in Kingdom of Saudi Arabia situated in Holy city of Makkah. Like other state-owned universities in the Kingdom it receives very generous financial support from the Ministry of Education. The Computer Engineering Program budget is supplied by the funds allocated to the university. The financial support and budget are on an annual basis. Initially each department informs the college of the required facilities, faculty appointments and funding. University prepares the budget based on the financial requirements of all colleges and various other entities functioning under the rector of the university and is presented to the Ministry of Education.

The budget for the University and thus of the program is mostly centralized. The first of the University budget preparation steps involves consultation with the organizational units including, but not limited to, the University Vice Rectors, Projects Department, Financial Department, Procurements Department, Deanship of Faculty and Staff Affairs, and Deanship of Admission & Registration to define the University requirements and complete the forms specifically prepared by the Ministry of Finance. This process helps to ensure the adequacy of funds for programs and services to be provided for the next year. During the budget preparation, consultation with the Rector and Vice Rector is maintained to obtain their guidance. The draft budget with a brief memorandum on it is submitted to the University Council for approval. Once the proposal is approved by the Council, it is submitted to the Ministry of Finance with copies of the same to the Ministry of Civil Service and the Ministry of Economics & Planning. A date is set for discussing the draft budget with the Ministry. After the University budget is approved, it is announced and disseminated.

The funds allocated to salaries, benefits and wages, as well as the budget assigned to the security, maintenance, and other amenities are administered and audited centrally at the University campus. The operating expenses for laboratory equipment, office furniture, teaching materials, raw material for maintenance, spare parts projects, repair projects, and building rehabilitation plans are allocated based on the needs and requirements of the various units of the University.

The University budget is 2.7 Billion Saudi Riyals. The college budget is a part of the University. Large orders, such as computer equipment for labs or offices, lab equipment or furniture for labs or offices, are handled centrally. Salaries of all staff are also handled centrally. The College funds are controlled by regulations issued by the College Council and implemented and monitored by the Dean.

The computer engineering department had its share from the college budget according to the requirements of the department. Also, the following funds were used by the department directly from the University:

a) Computer Laboratory equipment
b) Basic computer software
c) Lab equipment (other than computers)
d) Faculty and staff computers

In addition, the University also provides resources to the College to hire non-Saudi MS-holders as lecturers. The University has made outstanding progress not only in increasing the number of faculty and staff but also in enhancing its quality. It provides opportunities to faculty for personal and professional development through workshops, including teaching workshops, offered regularly by the Deanship of University Development and Quality, and by encouraging faculty members to attend international conferences or training workshops abroad.

The long-term needs for the department are stated in the Strategic Plan are considered at the time of preparing the central university budget. Short-term needs for the department are managed through the Dean by requesting finding from the university. The university assigns financial resources based on needs and priorities of all its academic and administrative units.

B-2 Support for Teaching Activities

Each faculty member teaching a course is in charge of the teaching and grading activities assigned to him. The secretarial staff and those graduate students who have not yet gone abroad for their higher education, are utilized by the department chair to help the faculty in their teaching activities.

The University also supports the College with a generous share of the Teaching Assistant positions at the University level for Saudi graduates. Appointed Teaching Assistants are required to pursue their MS and Ph.D. degrees in top-ranked international universities within at most two semesters of their appointment. After earning their Ph.D., they return to their respective departments to serve as full-time faculty. Budgets continue to be adequate to cover program and departmental needs for all operations.

The faculty and staff employment processes are centrally supervised and administered by the Deanship of Faculty and Staff Affairs. Moreover, the Deanship provides all personnel services for Umm Al-Qura University Colleges.

The university provides salaries of all its employees, including Computer Engineering Department faculty and staff. The salary of each faculty member of Computer Engineering department includes a basic salary, a professional allowance between 30 to 100% of the basic salary, transportation housing allowances. Each faculty member enjoys 2 months fully paid summer vacation.

B-3 Support for Facilities

Formal department plans to acquire, maintain, and operate equipment, laboratories, and other facilities are revised and followed every year. Other permanent improvements of the facilities are planned during the budget process. The plans are developed with the input of faculty members assigned as coordinators of various laboratories in the department.

The College relies mainly on the University-allocated governmental budget provided each fiscal year for purchases and upgrade of laboratory equipment, teaching facilities, furniture, etc. The College also utilizes its University-allocated liquidity to acquire any additional facilities and equipment needed by faculty or students of the various College programs.

The college programs have adequate teaching infrastructure, facilities and laboratory equipment for students to attain their student outcomes. Various committees of the department keep track of any issues and upgrade plans through communication with the department faculty and staff. The laboratory equipment is upgraded regularly according to the request of the department.

B-4 Adequacy of Resources

The fund and the budget allocated by the University to the Computer Engineering Department is adequate to enable the Computer Engineering Program achieving its academic goals and objectives. The university provides salaries of all its employees, including Computer Engineering Department faculty and staff. The salary of each faculty member of Computer Engineering department includes a basic salary, a professional allowance between 30 to 100% of the basic salary, transportation housing allowances. Each faculty member enjoys 2 months fully paid summer vacation.

The faculty and staff employment processes are centrally supervised and administered by the Deanship of Faculty and Staff Affairs. Moreover, the Deanship provides all personnel services for Umm Al-Qura University Colleges.

C. Staffing

The computer engineering department has a strong resource team composed of faculty, administrative assistants, engineers, clerical and other support personnel. The college maintains administrative staffs that provide various kinds of support to the department. Currently, the computer engineering department has three technicians, one teaching assistant and four lecturers on duty. In addition, twelve teaching assistants are on leave for PhD studies. Staff retention is not an issue. Their salaries and benefits and the pension plan are quite attractive to keep them in the department.

D. Faculty Hiring and Retention

The majority of faculty and staff employment processes are centrally managed by the Deanship of Faculty and Staff Affairs. Moreover, the Deanship provides all personnel services for Umm Al-Qura University Colleges. To hire new faculty, the department selects a suitable person and then requests the University to make arrangements for hiring him. There is no problem in retaining faculty as the salary here is tax-free and faculty receives free housing and medical benefits plus air tickets to their country of origin.

E. Support of Faculty Professional Development

Faculty professional development is primarily accomplished through workshops, seminars, conferences, professional publications, and committee service in professional societies. The University supports the College with a generous share of the available Teaching Assistant (TA) positions at the University level for top Saudi graduates. Appointed TA's are required to pursue their MS and Ph.D. degrees in top-ranked international universities within at most two semesters of their appointment. After earning their PhD, they return to their respective departments to serve as full-time faculty. In addition, the University also provides resources to the College to hire non-Saudi MS-holders as teaching assistants with the "lecturer" rank, and BS and MS holders as research assistants. The University also allows departments to hire part-time teaching faculty and assistants on a per-semester basis with the approval of the University Permanent Committee for Collaborators. The University has made outstanding progress not only in increasing the number of its faculty members and staff but also in enhancing its quality. It provides opportunities to faculty for personal and professional development through workshops, including teaching workshops, offered regularly by the Deanship of University Development and Quality, and by encouraging faculty members to attend international conferences or training workshops abroad. Faculty members are encouraged to attend regularly training and professional development workshops held either within the University, by the Deanship of University Development and Quality Development, or outside the University.

All tenured faculty members can get a leave to attend national or international conferences twice a year and to attend a workshop every two year. Faculty members are given financial support for transportation, conference registration fees and living allowance for the conference period. They are also allowed to have a one-year sabbatical leave every five years, after providing an acceptable plan for research and scientific contribution to be performed during the expected leave.

PROGRAM CRITERIA

The structure of the computer engineering curriculum (as described in detail in Criterion 5) covers all the applicable ABET Program Criteria. The Criteria are also fully integrated into our outcome assessment process (Criterion 4).

A. Curriculum

Specifically, in terms of the ABET Program Criteria, the Computer Engineering curriculum can be summarized as follows:

- All computer engineering students take laboratory-based basic sciences, which include depth in both General Chemistry and calculus-based physics (General Physics I and General Physics II), and two semesters of differential and integral calculus (Introduction to Math-I and Introduction to Math-II) that include applications to physical sciences and engineering problems.
- Advanced mathematics topics covered through two Engineering Math sequences include complex variables, multivariable calculus and differential equations. Other advanced topics are introduced through required computer engineering courses. For example, discrete mathematics is covered in the third year.
- The required course Engineering Math II introduces computer engineering students to the techniques of linear algebra and its basic applications. These concepts are further reinforced through application in the required course Signal Analysis.
- The required course Engineering Statistics and Probability Theory introduces computer engineering students to random variables, various distribution functions, and computer simulation of probability models.
- As described in detail in Criterion 5, the required computer engineering courses cover the full range of computer engineering topics such as, electrical and electronic devices, software, computers, and systems containing hardware and software components. They include analytical techniques, laboratory skills, and a design sequence. The design sequence begins in the freshman year, is built upon through the curriculum, and culminates in a major design experience in the senior year.
- Computer engineering students also take three electives in which they analyze and design complex software, and systems containing hardware and software components.

Appendix A – Course Syllabi

1403201 (Circuit Theory) Syllabus - Part 1

General Information

Course Number	1403201
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Physics-I and Introduction to Math-II
Course Coordinator	Abdellatif Semeia

Course Objective

The objective of this course is to learn analysis techniques for linear electrical circuits

Catalog Description

Electric circuit laws, resistive circuits, inductive and capacitive circuits, two-port networks

Course Contents

1. Introduction - 2. Basic Circuit Laws - 3. Circuit Structure - 4. Resistance Equivalent Circuits - 5. Nodal Analysis - 6. Mesh Analysis - 7. Circuit Theorems - 8. Inductance and Capacitance Equivalent Circuits - 9. First order circuits (RL,RC) - 10. Second order circuits (RLC) - 11. Two-port circuits

Text Book

Nilson and Susan, Electric Circuits, 9th Edition, Prentice Hall, 2011

Reference Material

Johnson and Hilurn, Basic electric circuit analysis, Prentice Hall, 2010

1403201 (Circuit Theory) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to analyse resistive circuits by applying electrical circuit laws [BL 3, Topics 1 to 6]
2	An ability to analyse first order and second order circuits by applying electrical circuit laws [BT 3, Topics 7, 8, 9]
3	An ability to analyse basic two-port circuits by applying electrical circuit laws [BL 3, Topic 10]
4	An ability to design and conduct experiments in the area of basic electrical circuits [BT 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	1	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	1	0	0	0	0	0	0
CLO 4	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Kadry Montasser
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403271 (Switching Theory) Syllabus - Part 1

General Information

Course Number	1403271
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Circuit Analysis-I or Circuit Theory
Course Coordinator	Muhammad Rashid

Course Objective

The objective of this course is to provide fundamental knowledge of digital design

Catalog Description

Number Systems, Boolean Algebra, design and analysis of combinational and sequential circuits.

Course Contents

1. Introduction to Digital Systems - 2. Number Systems and Codes - 3. Boolean Algebra and Logic - 4. Circuits Optimization - 5. Combinational Logic: Design and Analysis - 6. Sequential Logic: Design and Analysis

Text Book

M. Morris Mano and Michael D. Ciletti, Digital Design, 5th Edition, 2007, Prentice Hall, ISBN-10:01398926X, ISBN-13: 978-013989269.

Reference Material

Not Specified

1403271 (Switching Theory) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to understand number systems and codes. [BL 1, Topics 1, 2]
2	An ability to apply Boolean algebra for optimizing logic circuits. [BL 3, Topics 3]
3	An ability to design combinational logic circuits. [BL 3, Topic 4]
4	An ability to design sequential circuits. [BL 3, Topic 5]
5	An ability to design and conduct experiments in the area of basic digital circuits [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	0	0	1	0	1	0	0	0	0	0	0
CLO 4	0	0	1	0	1	0	0	0	0	0	0
CLO 5	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Not Specified
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403311 (Electronics) Syllabus - Part 1

General Information

Course Number	1403311
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	General Physics-II
Course Coordinator	Abdellatif Semeia

Course Objective

The objective of this course is to understand the fundamentals of electronic circuits

Catalog Description

Electronics devices: introduction, operation, characteristics, specifications and applications

Course Contents

1. Semiconductor Theory - 2. Diodes - 3. Diode Devices - 4. Transistor - 5. DC and AC Analysis - 6. Field-Effect Transistor

Text Book

1.Electronic Devices and Circuit Theory, Robert Boylestad and Louis Nashelsky, 10th ed., Prentice Hall, 2009

Reference Material

2.Digital Integrated Circuits, Thomas DeMassa and zack Ciccone, John Wiley & Sons, 1996
3.Microelectronics, Millman, McGraw-Hill, 1999

1403311 (Electronics) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to apply the theory of diodes to solve electronic circuits [BL 3, Topics 1, 2, 3]
2	An ability to apply the theory of transistors to solve electronic circuits [BL 3, Topics 4, 5]
3	An ability to apply the theory of FETs to solve electronic circuits [BL 3, Topic 6]
4	An ability to design and conduct experiments in the area of electronic circuits [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	1	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	1	0	0	0	0	0	0
CLO 4	0	1	0	1	0	0	0	0	0	0	1

Approvals

Prepared by	Kadry Montasser
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403381 (Numerical Analysis) Syllabus - Part 1

General Information

Course Number	1403381
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Computer Programming and Eng. Math-II
Course Coordinator	Khaled Almotairi

Course Objective

The objective of this course is to solve numerical problems using computers

Catalog Description

Theory of key concepts on equation solving, curve fitting, numerical integration and differentiation and the solution of differential equations are introduced with the computer implementation using MATLAB

Course Contents

1. Introductory material (Absolute and relative errors, Rounding and chopping, Computer errors in representing numbers, Review of Taylor series - 2. Locating roots of algebraic equations - 3. Systems of linear equations - 4. The Method of Least Squares - 5. Interpolation - 6. Numerical Integration - 7. Numerical Differentiation - 8. Ordinary Differential Equations

Text Book

1.Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 6th Edition, McGraw-Hill, 2009. ISBN: 0073401064

Reference Material

2.W. Cheney and Kincaid, Numerical Mathematics and Computing, 6th Edition, Brookes Cole, 2007. ISBN: 9780495114758

1403381 (Numerical Analysis) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	The ability to apply Taylor Series to approximate functions [BL 3, Topic 1]
2	The ability to apply various algorithms to locate the roots of equations [BL 3, Topic 2]
3	The ability to solve problems involving linear algebraic equations [BL 3, Topic 3]
4	The ability to apply least squares method and polynomials [BL 3, Topics 4, 5]
5	The ability to solve numerical differentiation and integration problems [BL 3, Topics 6, 7]
6	The ability to solve ordinary differential equations [BL 3, Topic 8]
7	The ability to use MATLAB to solve various numerical problems [BL 3, Topics 1 to 8]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0
CLO 5	1	0	0	0	0	0	0	0	0	0	0
CLO 6	1	0	0	0	0	0	0	0	0	0	0
CLO 7	0	0	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403372 (Computer Organization) Syllabus - Part 1

General Information

Course Number	1403372
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Switching Theory and Electronics
Course Coordinator	Muhammad Rashid

Course Objective

The objective of this course is to provide the fundamentals of Computer organization and architecture

Catalog Description

Computer performance, Instruction set architecture, Data path and Control

Course Contents

1. Introduction to Computer Organization and Architecture - 2. Performance and performance assessment - 3. Instruction Set Architecture - 4. Datapath and Control

Text Book

•D. Patterson and J. Hennessy, Computer Organization and Design, The Hardware L Software Interface, 4th Edition, Morgan Kaufmann, 2009

Reference Material

Not specified.

1403372 (Computer Organization) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to evaluate and analyze computer performance [BL 4, Topics 1, 2]
2	An ability to use MIPS instruction set architecture for assembly language programming [BL 3, Topic 3]
3	An ability to implement MIPS instruction set architecture by building data path and controller [BL 3, Topic 4]
4	An ability to write assembly language programs using MIPS assembly language [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	1	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	1	0	0	0	0	0	0	0	0
CLO 4	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Muhammad Rashid
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403312 (Digital Electronic Systems and Circuits) Syllabus - Part 1

General Information

Course Number	1403312
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Electronics
Course Coordinator	Abdellatif Semeia

Course Objective

The objective of this course is to provide advanced knowledge of electronic circuits

Catalog Description

BJT transistor modeling, BJT small-signal analysis, FET small-signal analysis, operational amplifiers, oscillator circuits, digital ICs

Course Contents

1. Amplification in AC domain, BJT transistor modeling, hybrid equivalent model - 2. CE and CB configurations and networks, collector feedback configuration, approximate and complete hybrid equivalent circuit - 3. Fixed and self-biasing, CG configuration, designing FET amplifier networks - 4. Differential and common mode operation, Op-Amp basics and circuits, different applications of Op-Amp - 5. Feedback concepts and connection types, practical feedback circuits, oscillator operation and types - 6. Diode and transistor modeling, DRL, DTL, RTL and TTL gates and characteristics

Text Book

Louis Nashelsky and Robert Boylestad, Discrete and Integrated, 10th ed., Prentice Hall 2009

Reference Material

Not specified.

1403312 (Digital Electronic Systems and Circuits) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to apply the knowledge of modeling and small signal analysis of BJT and FET [BL 3, Topics 1, 2, 3]
2	An ability to understand and apply the knowledge of operational amplifiers [BL 3, Topic 4]
3	An ability to analyze the feedback and oscillator circuits. [BL 4, Topic 5]
4	An ability to identify the characteristics of digital ICs. [BL 2, Topic 6]
5	An ability to design and conduct experiments in the area of digital electronic systems and circuits [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	1	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	1	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0
CLO 5	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Kadry Montasser
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403322 (Computer Communication System) Syllabus - Part 1

General Information

Course Number	1403322
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Signal Analysis
Course Coordinator	Anas Basalamah

Course Objective

The objective of this course is to provide fundamentals of computer communication

Catalog Description

A conceptual view of data communications and network layers and models, internetworking of networks and addressing. Physical layer concepts that includes data and signal transmission, transmission impairment, signal conversion, modulation, bandwidth and throughput

Course Contents

1. Introduction to Communication - 2. Network Models - 3. Introduction to Physical Layer - 4. Digital Transmission - 5. Analog Transmission - 6. Bandwidth Utilization - 7. Transmission Media - 8. Switching

Text Book

Data Communications and Networking, By: Behrouz A. Forouzan (5th Edition)

Reference Material

Data and Computer Communications, By: William Stallings (6th Edition).
Computer Networks, By: Andrew Tanenbaum. (4th Edition)

1403322 (Computer Communication System) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to comprehend the fundamentals of data communications. [BL 2, Topics 1,2]
2	An ability to apply mathematical foundations to solve problems involving digital and analog signals. [BL 3, Topic 3]
3	An ability to comprehend analog and digital transmission. [BL 2, Topics 4,5]
4	An ability to apply knowledge of multiplexing and spectrum spreading. [BL 3, Topic 6]
5	An ability to understand the fundamentals of transmission media. [BL 1, Topic 7]
6	An ability to design different types of switches. [BL 3, Topic 8]
7	An ability to highlight the challenges/issues of modern communication systems through a technical report/presentation [BL 4, 5]
8	An ability to design and conduct experiments in the area of communications [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	1	0	0	0	0	0	0
CLO 5	1	0	0	0	0	0	0	0	0	0	0
CLO 6	0	0	1	0	0	0	0	0	0	0	0
CLO 7	0	0	0	0	0	1	1	0	0	1	0
CLO 8	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Momen Al-Rawi, Imran Tasadduq
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403371 (Advanced Logic Design) Syllabus - Part 1

General Information

Course Number	1403371
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Switching Theory
Course Coordinator	Muhammad Rashid

Course Objective

The objective of this course is to provide the knowledge of digital system design

Catalog Description

Register Transfer Level (RTL) Design, Hardware Description Language (HDL), Physical implementation on ICs

Course Contents

1. Revision of basic concepts in digital logic design: combinational and sequential - 2. Introduction to Hardware Description Language (HDL) - 3. Combinational circuit design in HDL - 4. Finite State Machines (FSMs) and controller design - 5. Design of data path components - 6. Register Transfer Level (RTL) design - 7. Physical implementation on ICs: ASICs and FPGAs - 8. Simulation and synthesis of HDL design on FPGAs

Text Book

(1)Frank Vahid, Digital Design with RTL Design, VHDL and Verilog, Second Edition, 2011, John Wiley and Sons
(2)Frank Vahid and Roman Lysecky, Verilog for Digital Design , Edition 2007, John Wiley and Sons

Reference Material

Not Specified

1403371 (Advanced Logic Design) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to design and capture combinational as well as sequential behaviors in HDL [BL 3, 4, Topics 1 to 4]
2	An ability to design digital systems at Register Transfer Level [BL 3, Topic 5]
3	An ability to comprehend the basic concepts in ASICs and FPGAs [BL 2, Topic 6]
4	An ability to design and conduct experiments in the area of digital systems design [BL 3, Topic 7]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	1	0	0	0	0	0	0	0	0
CLO 2	1	0	1	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	0	1	0	1	0	0	0	0	0	0	1

Approvals

Prepared by	Muhammad Rashid
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403422 (Computer Networks) Syllabus - Part 1

General Information

Course Number	1403422
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Computer Communication System
Course Coordinator	Anas Basalamah

Course Objective

The objective of this course is to provide fundamentals of computer networks

Catalog Description

Data-Link design issues, Framing, Flow Control, Error Control, Multiple Access, Channelization, Ethernet, WANs, Network layer design issues, Routing and congestion control, Internetworking, Transport layer design issues and protocols, Application layer design issues and protocols, Examples of protocol suites and networks

Course Contents

1. Data link layer: Error Detection and Correction; Framing; Design of Data-link protocols; Multiple Access, Controlled Access, Channelization; 4. Wireless LAN, Connecting Devices; Backbone Networks, VLAN, Wireless WAN, SONET - 2. Network Layer: IPV4; IPV6; Fragmentation; Transition from IPv4 to IPv6; 8. Delivery, Forwarding, Routing and routing tables, Unicast and Multicast Routing Protocols - 3. Transport Layer: Process-to-Process delivery; UDP; TCP; SCTP; Congestion Control, QoS - 4. Application Layer: Domain Name System; Domain Name Space; DNS in the Internet; Mapping names to Addresses and vice versa; DDNS; SNMP; Multimedia

Text Book

Data Communications and Networking, By: Behrouz A. Forouzan (4th Edition)

Reference Material

Data and Computer Communications, By: William Stallings (6th Edition).
Computer Networks, By: Andrew Tanenbaum. (4th Edition)

1403422 (Computer Networks) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	A comprehension of the fundamental principles of the data link layer including Link Control, Multiple Access, and Wired/Wireless LANs. [BL 1,2, Topic 1]
2	The ability to apply Error Detection and Correction on data link layer. [BL 3, Topic 1]
3	An understanding of the Network Layer, Delivery, Forwarding and Routing of Packets in the Internet. [BL 1,2, Topic 2]
4	The ability to design a network by addressing and subnetting. [BL 5, Topic 2]
5	Recognition of the key principles of the Transport layer, Transport Layer protocols, and Congestion Control and Quality of Service. [BL 1,2, Topic 3]
6	Grasping the basic concepts of the Application Layer and mapping to network layer addresses. [BL 1,2, Topic 4]
7	An ability to design and conduct experiments in the area of Computer Networks. [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	1	0	0	0
CLO 4	1	0	1	0	1	0	0	0	0	0	0
CLO 5	1	0	0	0	0	0	0	0	0	0	0
CLO 6	1	0	0	0	0	0	0	0	0	0	0
CLO 7	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Momen Al-Rawi
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403484 (Databases) Syllabus - Part 1

General Information

Course Number	1403484
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Data Structures & Algorithms
Course Coordinator	Khaled Almotairi

Course Objective

Not specified.

Catalog Description

This course highlights the importance of database design, use, and management to information technology systems. It includes the following topics: databases and database users, database system concepts and architecture, data modelling using the entity-relationship (ER) model, the relational data model and relational database constraints, relational database design by ER-to-relational mapping, SQL: schema definition, constraints, and queries and views, functional dependencies and normalization for relational databases

Course Contents

Databases and database users - Database system concepts and architecture - Data modelling using the entity-relationship (ER) model - The relational data model and relational database constraints - Relational database design - SQL: schema definition, constraints, and queries and views - Functional dependencies and normalization for relational databases

Text Book

Fundamentals of Database Systems, 6th edition, Elmasri & Navathe, Addison Wesley, 2011, ISBN: 978-0136086208

Reference Material

Not specified.

1403484 (Databases) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An understanding of the basic definitions of a database system and roles of different users
2	An ability to design relational databases using entity-relationship (ER) model and ER-to-relational mapping
3	An ability to write SQL statements

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	1	0	1	0	0	0
CLO 2	1	0	1	0	0	0	0	0	0	0	1
CLO 3	1	0	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Maher El-Shakankiri
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403472 (Computer Architecture) Syllabus - Part 1

General Information

Course Number	1403472
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Computer Organization
Course Coordinator	Muhammad Rashid

Course Objective

The objective of this course is to provide the advanced knowledge of computer organization and architecture

Catalog Description

Revision of fundamental concepts, Pipelined data path and control, memory hierarchy, multiprocessing.

Course Contents

1. Revision of fundamental concepts: ISA and its implementation (data path and control) - 2. Pipelining (pipelined data-path and control) - 3. Pipelining hazards (structural, data and control) - 4. Cache memory: principles, types and performance - 5. Virtual memory - 6. Storage and I/O - 7. Multi-core, multiprocessors, and clusters

Text Book

Computer Organization & Design: The Hardware/Software Interface, D. Patterson and J. Hennessy (4th edition or newer)

Reference Material

Not specified.

1403472 (Computer Architecture) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to comprehend fundamental concepts of computer organization and architecture [BL 2, Topic 1]
2	An ability to apply the concepts of pipelining to MIPS data path and control [BL 3, Topics 2, 3]
3	An ability to analyze and design memory hierarchy [BL 4, 5, Topics 4, 5]
4	An ability to understand I/O and storage devices [BL 1, Topic 6]
5	An ability to understand the architecture of multiprocessors [BL 1, Topic 7]
6	An ability to highlight the challenges/issues of modern computer architectures through a technical report/presentation [BL 4, 5, Topic 7]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	1	0	1	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0
CLO 5	1	0	0	0	0	0	0	0	0	0	0
CLO 6	0	0	0	0	0	1	1	0	0	1	0

Approvals

Prepared by	Muhammad Rashid
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403489 (Microprocessors) Syllabus - Part 1

General Information

Course Number	1403489
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Computer Organization
Course Coordinator	Omar Sonbul

Course Objective

The objective of this course is to provide the knowledge of microprocessor based system design

Catalog Description

Microprocessor-based systems, Programming the 8085, Interfacing peripherals and applications

Course Contents

1. Introduction to microprocessors-based system design - 2. 8085 microprocessor: architecture and bus timing as well as interfacing of memory and I/O devices - 3. 8085 assembly language programming and instructions - 4. Additional programming techniques, counters and time delays, stack and subroutines - 5. Interfacing Peripherals: interrupts, programmable interface devices, serial I/O and data communication - 6. Microprocessor applications

Text Book

Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085," Prentice Hall. 5th edition, 2002

Reference Material

Not specified.

1403489 (Microprocessors) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to comprehend the knowledge of microprocessor based systems [BL 2, Topics 1, 2]
2	An ability to use 8085 instruction set architecture for assembly language programming [BL 3, Topics 3, 4]
3	An ability to apply the knowledge of interfacing peripherals to design a microprocessor based system [BL 3, Topics 5, 6]
4	An ability to design a system or component through a hardware project in the area of microprocessor based system [instructor will evaluate the project on the basis of self-learning (SO
5	An ability to design and conduct experiments in the area of microprocessor based system (BL 3)

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	1	0	0	0	0	0	0	0	0
CLO 4	0	0	0	0	0	0	0	1	1	0	0
CLO 5	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Maher Rajab and Muhammad Rashid
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403450 (Microcomputers System Design) Syllabus - Part 1

General Information

Course Number	1403450
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	Microprocessors
Course Coordinator	Omar Sonbul

Course Objective

The objective of this course is to provide the knowledge of microcomputer based system design

Catalog Description

Microcomputer based architecture, assembly language of PIC, microcomputer interfacing

Course Contents

1. Introduction to microcontroller/microcomputer based system design - 2. PIC18 family Architecture and program development - 3. PIC18 family instruction set and assembly language programming - 4. PIC18 family hardware specifications - 5. Basic input outputs and interrupts - 6. Controlling Systems and advanced topics

Text Book

Barry B. Brey, Applying PIC18 Microcontrollers; Architecture, Programming and Interfacing using C and Assembly, Pearson Education, Inc., 2008

Reference Material

Computer Organization and design: The hardware/Software Interface, The Morgan Kaufmann Series in Computer Architecture and Design, 4th Edition, 2008

1403450 (Microcomputers System Design) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to comprehend the knowledge of microcomputer/microcontroller based systems [BL 2, Topics 1, 2]
2	An ability to use PIC18 instruction set architecture for assembly language programming [BL 3, Topic 3]
3	An ability to apply the knowledge of PIC 18 hardware and interfacing peripherals to design a microcomputer based system [BL 3, Topics 4,5,6,]
4	An ability to design a system or component through a hardware project in the area of microcomputer/microcontroller based system [Instructor will evaluate the project on the basis of se
5	An ability to design and conduct experiments in the area of microcomputer/microcontroller based systems [BL 3]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	1	0	0	0	0	0	0	0	0
CLO 4	0	0	0	1	0	0	0	1	1	0	0
CLO 5	0	1	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Abdellatif Semeia
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403364 (Basics of Integrated Circuits Design) Syllabus - Part 1

General Information

Course Number	1403364
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Electronics
Course Coordinator	Abdullah Baz

Course Objective

Not specified.

Catalog Description

This course teaches the fundamental issues involved in the design, manufacturing, and testing of digital integrated circuits (ICs).

Course Contents

Representation and modeling of the characteristics and operation of MOS (NMOS & CMOS) transistors at the System, Component, Circuit and Device level - relationships between MOS transistor representations and models at different levels of IC design hierarchy, and their limitations - design of combinational and sequential circuits using MOS circuits - dynamic and static design - understanding the interrelationships between device and circuit levels in IC design, and corresponding analysis including that of design trade-offs - MOS IC fabrication, layout and design rules, stick diagrams, transistor sizing, subsystem design and practical considerations

Text Book

S.-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 2nd ed., 1999

Reference Material

N. Weste and K. Eshraghian, Principles of CMOS VLSI Design, Addison Wesley, 1993.
Ken Martin, Digital Integrated Circuit Design, Oxford Press, 2000.
Jan Rabaey, Digital Integrated Circuits; A design Perspective, Prentice Hall, 1996.

1403364 (Basics of Integrated Circuits Design) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Knowledge and critical understanding of CMOS manufacturing process
2	Knowledge and critical understanding of the basics of IC Design at different levels including System, Components, Circuits and Devices
3	An ability to understand the interrelationships between device and circuit levels in IC design, and corresponding analysis including that of design trade-offs
4	Applications of different models in the design hierarchy and understanding of their relationships and limitations
5	The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility, active learning, and communication skills

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	1	0
CLO 2	1	0	1	0	0	0	0	1	0	1	0
CLO 3	1	0	1	0	1	0	0	0	0	0	0
CLO 4	1	0	1	0	1	0	0	0	0	0	0
CLO 5	0	0	0	0	0	0	1	0	1	0	0

Approvals

Prepared by	Kadry Montasser, M.K. Ibrahim
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403464 (Design of Integrated Circuits) Syllabus - Part 1

General Information

Course Number	1403464
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Basics of Integrated Circuit Design
Course Coordinator	Abdullah Baz

Course Objective

Not specified.

Catalog Description

This course introduces the MOS system design, layout and design rules, layout graphic editors, design rule checking, layout extraction and verification (LVS). It emphasizes on full custom versus semicustom design styles, design entry tools, schematic capture and HDLs. It applies logic and switch level simulation for layout generation and design synthesis. The course stresses hands-on experience of VLSI design using CAD tools

Course Contents

MOS and BiCMOS circuit design process programming model - Basic circuit concepts - Subsystem design and layout interfacing concepts - Subsystem design processes

Text Book

Etienne Sicard& Sonia D. Bendhia, Advanced CMOS Cell Design, McGraw Hill, 2007

Reference Material

Kamran Eshraghian, Douglas A. Pucknell and Sholeh Eshraghian, Essentials of VLSI circuits and Systems, Prentice-Hall of India, INC., 2005.
Designing with FPGA's& CPLD's, Bob Zeidman, CMP Books, 2002

1403464 (Design of Integrated Circuits) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Synthesize MOS layers, stick diagrams, design rules and layout, layout diagrams and symbolic diagrams.
2	Calculate and analyse the sheet resistance, area capacitances of layers, inverter delays, propagation delays, wiring capacitances, choice of layers.
3	Analyse and evaluate general considerations, design processes, observations, the real world of VLSI design, test and testability

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	1	0	1	0	0	0	0	0	0
CLO 2	1	0	1	0	1	0	0	0	0	0	0
CLO 3	1	0	1	0	1	0	0	0	0	1	1

Approvals

Prepared by	Kadry Montasser
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403446 (Mobile Computing) Syllabus - Part 1

General Information

Course Number	1403446
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Computer Networks
Course Coordinator	Emad Felemban

Course Objective

Not specified.

Catalog Description

Introduction to Wireless Networks in different layers. Starting from Physical layer, RF, Signal propagation, Antennas. Wireless access technologies, multiple access and mobility management. Network and service architecture, routing, ad hoc networking, capacity planning. Mobility issues and handling. Wireless network security managements

Course Contents

Introduction to wireless networks and systems - Introduction to wireless protocols, standards and policies - RF Engineering (Link budget, fading models, path loss and capacity estimation, antenna scheme selection) - Wireless MAC schemes (Analysis, performance measurement, bandwidth estimation, tradeoff analysis, frequency re-use factor, Satellite systems) - Wireless Network Routing (Mobile IP schemes, Ad hoc routing, Routing Algorithms analysis & design)

Text Book

Jochen Schiller, Mobile Communications, 2nd Edition, Addison-Wesley, 2003; ISBN: 978-0321123817

Reference Material

Supplemental materials

1403446 (Mobile Computing) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Recognize existing wireless networking systems, constraints, challenges and opportunities.
2	Extend the knowledge and networking fundamental concepts from wired networks to wireless networks
3	Apply mathematical knowledge and engineering skills to Radio Frequency (RF) Engineering including, 1) Formulate RF problems, 2) Theoretical Design of RF systems based on given require
4	Recognize classical Wireless MAC and routing schemes.
5	High Level design of a wireless system to solve a community problem

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	0	1	0	1	0
CLO 2	0	0	0	0	0	0	0	1	0	1	0
CLO 3	1	0	0	0	1	0	0	0	0	0	1
CLO 4	0	0	0	0	0	0	0	1	0	1	0
CLO 5	1	0	1	0	1	0	0	0	1	0	0

Approvals

Prepared by	Emad Felemban
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403487 (Process Control) Syllabus - Part 1

General Information

Course Number	1403487
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Microcomputer Systems Design
Course Coordinator	Esam Khan

Course Objective

Not specified.

Catalog Description

The objective of this course is to teach the principles of embedded real-time systems design and their use for process control and other real-time applications. The course will cover both the theoretical and practical aspects of the subject matter. Both stand-alone and PC-based systems will be considered. Although emphasis will be on the hardware design and interconnection, the software development will also be included in the curricula

Course Contents

Introduction to control Systems, Types of control systems - Introduction to real time embedded systems - Types of real time systems: Hard real time systems, Soft real time systems - Components of control systems: Sensors and actuators, A/D & D/A converters, processors & controller (ASICs, programmable processors, reconfigurable hardware), communication channels - Embedded software: real time operating systems (RTOS), scheduling techniques, RTOS mechanisms, middleware - Design of control systems: Specification, Flowcharts and Finite State Machines (FSMs), Hardware/software co-design, Implementation - Validation, reliability and fault tolerance, simulation and testing, Design examples

Text Book

1.Peter Marwedel, Embedded System Design, Springer, 2006

Reference Material

Not specified.

1403487 (Process Control) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to design and analyze basic embedded real-time systems to meet some real-time constraints.
2	An ability to work in small teams to acquire knowledge and achieve certain objectives
3	An understanding and a better knowledge of the principles of embedded real-time systems and their importance in recent advances in control systems.

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	1	0	1	0	0	0	0	0	1
CLO 2	0	0	0	1	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	1	0	1	0

Approvals

Prepared by	Adnan Gutub
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403476 (Simulation and Modeling) Syllabus - Part 1

General Information

Course Number	1403476
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Data Structures & Algorithms
Course Coordinator	Fahd Aldosari

Course Objective

Not specified.

Catalog Description

Basic discrete-event simulation modeling, queuing models, simulation languages, review of basic probability and statistics, random-number generators, generating random variables, output data analysis, validation of simulation models

Course Contents

Introduction to simulation modelling - Queuing Models - Simulation Examples (Monte Carlo simulation) - Concepts in discrete-event simulation - Statistical models in simulation - Input Modeling - Verification and validation of simulation models - Output analysis for a single model - Output analysis for comparison of multiple systems - Random number and Random-Variate generation - Simulation software

Text Book

Jerry Banks, John S. Carson, Barry L. Nelson and David M. Nicol, Discrete-Event System Simulation, 5th Edition, Prentice-Hall, 2009

Reference Material

Not specified.

1403476 (Simulation and Modeling) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Formulate simulation problems
2	Build valid and creditable simulation models
3	Design or observe systems for data collection
4	Fit distributions from raw data
5	Develop queuing models to validate simulation or analyse systems
6	Use a simulation language to program and run simulation models
7	Design simulation experiments to obtain valid results
8	Analyze and interpret the results of simulation models

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	1	0	0	0	0	0	0	0	0
CLO 2	1	0	1	0	0	0	0	0	0	0	0
CLO 3	0	1	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0
CLO 5	1	0	0	0	0	0	0	0	0	0	0
CLO 6	0	0	0	0	0	0	0	0	0	0	1
CLO 7	0	1	0	0	0	0	0	0	0	0	0
CLO 8	1	0	0	0	0	0	0	0	0	0	0

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403490 (Special Topics) Syllabus - Part 1

General Information

Course Number	1403490
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Not specified.
Course Coordinator	Not specified.

Course Objective

Varies with course contents

Catalog Description

Varies with course contents

Course Contents

Not specified.

Text Book

Not specified.

Reference Material

Not specified.

1403490 (Special Topics) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Not Specified
2	Not Specified
3	Not Specified

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	0	0	0	0	0
CLO 2	0	0	0	0	0	0	0	0	0	0	0
CLO 3	0	0	0	0	0	0	0	0	0	0	0

Approvals

Prepared by	Not specified.
Approved by	Not specified.
Last Update	Not specified.

1403480 (Artificial Intelligence) Syllabus - Part 1

General Information

Course Number	1403480
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Data Structures and Algorithms
Course Coordinator	Anas Basalamah

Course Objective

Not specified.

Catalog Description

The course introduces the fundamental areas of artificial intelligence: knowledge representation and reasoning; machine learning; planning; game playing; natural language processing; and vision

Course Contents

Introduction to AI
Search - review of basic search techniques - heuristic search - game playing - constraint propagation
Machine Learning for Classification - learning theory - decision tree learning - neural nets
Knowledge Representation - semantic networks, frames - pattern matching, unification - representation of action - representational challenges
Uncertainty - review of probability theory - compactly represented distribution - inference in compact distributions
Planning - STRIPS representation - solution strategies: graphplan - uncertainty: Markov decision processes
Machine Learning About Action Dynamics - temporal difference learning - reinforcement learning, Q learning

Text Book

Artificial Intelligence: A New Synthesis, Nils Nilsson, Morgan Kaufman, 1998, ISBN No. 1558604677

Reference Material

Not specified.

1403480 (Artificial Intelligence) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	a practical and theoretical understanding of uninformed and informed machine search and machine learning techniques.
2	a basic familiarity with the mathematics of knowledge representation.
3	an aquaintance with the fundamental difficulties involved in designing intelligent programs.
4	knowledge of key previous work in a broad range of artificial intelligence subareas.
5	an ability to apply AI techniques both in analytical and in programming contexts to solve problems, and to communicate the result of such application

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	1	1	0	1	0	0	0	0	0	1
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	1	0	1	1
CLO 4	1	0	0	0	0	1	0	1	0	1	0
CLO 5	1	1	1	0	1	0	1	0	0	1	1

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403421 (Digital Signal Analysis) Syllabus - Part 1

General Information

Course Number	1403421
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Signal Analysis
Course Coordinator	Imran Tasadduq

Course Objective

Not specified.

Catalog Description

Classification of signals and their mathematical representation. Discrete-time systems classification. Linear shift-invariant system response, difference equations, convolution sum, and frequency response. Discrete Fourier transform. z-transform and its application to system analysis. Realization forms. Sampling and aliasing. Finite-impulse response (FIR). Design windowing technique. Introduction to infinite impulse-response (IIR). Filter design techniques

Course Contents

Introduction and fundamentals of discrete-time signal processing - Discrete-time signals and systems - Frequency analysis of discrete-time signals - Properties of Fourier Transform for discrete-time signals - Frequency-Domain Characteristics of LTI Systems - Implementation of discrete-time systems using FIR and IIR filters

Text Book

J.G. Proakis and D. G. Manolakis, Digital Signal Processing, Algorithms and Applications (4th Edition), Prentice Hall, 2007

Reference Material

Vinay K. Ingle and J.G. Proakis, Digital Signal Processing Using Matlab, 2nd Edition, Thomson Learning, 2007
V. Oppenheim and W. Schafer, Digital- Time Signal Processing, 4th Edition,
Oxford Publishing, 1998

1403421 (Digital Signal Analysis) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	an ability to manipulate and understand digital signals
2	an ability to find the response of digital LTI systems to any input signal
3	an understanding of the definitions and basic properties (e.g. time-shift, modulation, Parseval's Theorem) of discrete-time Fourier series, discrete-time Fourier transforms, and an ability to compu
4	an ability to perform and analyze sampling, reconstruction, analog to digital and digital to analog conversion
5	an ability to implement discrete-time systems using FIR and IIR filters

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	1
CLO 3	1	0	0	0	0	0	0	0	0	0	1
CLO 4	1	0	0	0	1	0	0	0	0	0	1
CLO 5	1	0	0	0	1	0	0	0	0	0	1

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403478 (Computer Vision) Syllabus - Part 1

General Information

Course Number	1403478
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Calculus and Advanced Programming
Course Coordinator	Maher Rajab

Course Objective

Not specified.

Catalog Description

The course introduces computer vision and proceeds to key vision and recognition concepts. The topics include: image acquisition and formation, transformations, camera calibration, basic image processing, invariants, template matching, edge detection, point and patch feature detection and matching, invariants, segmentation, motion estimation and 3D stereo vision

Course Contents

Image formation, transformations and camera calibrations - Basic image processing operations; including equalization, sampling, filtering - Feature detection and matching with vision and recognition applications; edges, points, patches and holistic - Segmentation, Dense motion estimation, 3D stereo vision.

Text Book

Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010

Reference Material

Not specified.

1403478 (Computer Vision) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	The students will gain a solid knowledge with hands on experience in a number of key computer vision and pattern recognition problems.
2	The students will learn about the challenges of designing a computer vision system and will gain a practical insight in trading off between system requirements (e.g. full automation or invariance ver
3	The students will write brief technical reports on the lab experiments which will improve on their writing skills.
4	The students will develop skills in using Matlab for computer vision and pattern recognition.

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	1	0	0	1	0	0	0	0	0	0
CLO 2	0	1	1	0	1	0	0	0	0	0	0
CLO 3	0	0	0	0	0	0	1	0	0	0	0
CLO 4	0	0	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Faisal Al-Osaimi
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403481 (Neural Networks) Syllabus - Part 1

General Information

Course Number	1403481
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Probability & Statistics
Course Coordinator	Khalid Alhindi

Course Objective

Not specified.

Catalog Description

Introduces basic (artificial) neural network architectures and learning rules. Emphasis is placed on mathematical analysis of these networks, on methods of training them, and on their application to practical problems in areas such as pattern recognition, signal processing, and control systems. The course shows how to construct a network of "neurons" and train them to serve a useful function

Course Contents

Introduction - Neuron model and network architecture, Illustrative example - Perceptron learning rule, Signal and weight vector spaces - Linear transformations for neural networks - Supervised Hebb - Performance surfaces and optimum points - Performance optimization, Widrow Hoff, Back-propagation - Variations on back-propagation

Text Book

Martin T. Hagan, Howard B. Demuth, and Mark H. Beale, Neural Network Design, Thomson Learning, 1996, ISBN: 978-0971732100

Reference Material

Not specified.

1403481 (Neural Networks) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Have an understanding of the concepts and techniques of neural networks through the study of the most important neural network models
2	Have a knowledge of sufficient theoretical background to be able to reason about the behavior of neural networks
3	To be able to train a neural network using different training techniques.
4	To be able to design and apply neural networks to particular applications, and to know what steps to take to improve performance

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	1
CLO 4	1	0	1	0	1	0	0	0	0	0	0

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	14 February, 2012

1403401 (Seminar) Syllabus - Part 1

General Information

Course Number	1403401
Credit Hours	2/0/2 (Theory credit hours = 2; Lab. credit hours = 0; Total credit hours = 2)
Prerequisites	None
Course Coordinator	Imran Tasadduq

Course Objective

The objective of this course is to provide the knowledge of ethics and contemporary issues, and teach presentation skills

Catalog Description

The course mainly covers some of the professional skills required for engineering practice such as ethics, presentation skills and contemporary issues.

Course Contents

1. Engineering ethics and ethical decision making - 2. Basic presentation skills - 3. Contemporary issues in computer engineering - 4. Student presentation sessions

Text Book

E. A. Stephan et al, (2013), “Thinking Like an Engineer: An Active Learning Approach” Second Edition, Pearson Prentice Hall

Reference Material

Not specified.

1403401 (Seminar) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	An ability to make ethical decisions in complex situations [BL 3]
2	An understanding of professional and ethical responsibility [BL 1]
3	An ability to make effective presentations on PowerPoint [BL 2]
4	A knowledge of contemporary issues [BL 1]

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	1	0	0	1	0	1
CLO 2	0	0	0	0	0	1	0	0	0	0	0
CLO 3	0	0	0	0	0	0	1	0	0	0	0
CLO 4	0	0	0	0	0	0	0	0	0	1	0

Approvals

Prepared by	Imran Tasadduq
Approved by	Curriculum Committee
Last Update	28 April, 2016

1403499 (Project) Syllabus - Part 1

General Information

Course Number	1403499
Credit Hours	4/0/4 (Theory credit hours = 4; Lab. credit hours = 0; Total credit hours = 4)
Prerequisites	Not specified.
Course Coordinator	Abdellatif Semeia

Course Objective

Not specified.

Catalog Description

The objective of this course is to train the student on how to accomplish a complete integrated computer engineering project, write a technical report and defend the work. The main purpose of the project is to encourage students to apply the knowledge acquired during their studies. Students are also expected to show how proficient they are in solving real world problems with certain constraints for the outcome-based evaluation suggested by ABET and ACM/IEEE

Course Contents

Literature review - Requirement analysis - Specification development - Preliminary design - Implementation - Final Report - Formal presentation

Text Book

All requirements of this course for students, supervisors and faculty members are published in “Final Year Graduation Project Handbook” available at the department’s website

Reference Material

Not specified.

1403499 (Project) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Ability to identify and formulate engineering problems in the area of Computer Engineering
2	Ability to function in multidisciplinary teams
3	Ability to conduct enough literature review in the project domain
4	Ability to design a system, component or process with defined constraints
5	Ability to solve engineering problems and implement designed solutions
6	Ability to collect and analyze data, and draw conclusions through experiments while testing a proj
7	Ability to communicate effectively in written engineering report and in oral presentation

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	1	0	0	0	1	0	0
CLO 2	0	0	0	1	0	0	0	0	0	0	0
CLO 3	1	0	1	0	1	1	0	0	1	1	1
CLO 4	1	1	1	0	0	0	0	1	0	1	1
CLO 5	1	1	1	0	1	0	0	1	0	1	1
CLO 6	0	1	0	0	0	0	0	0	0	1	1
CLO 7	0	0	0	0	0	1	1	0	0	0	0

Approvals

Prepared by	Faisal Osaimi and Imran Tasadduq
Approved by	Curriculum Committee
Last Update	14 February, 2012

1401102-3 - Computer Programming (3 credits)

Coordinator: Abdulbaset Gaddah

Catalog Description

Introduce students to the basics of writing software programs including variables, types, arrays, procedures, control structures, input/output, and general rules for writing good code.

Prerequisites

1401101-3 – Introduction to Computer Science

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Introduction to basic concepts of writing code, compilation, and execution	1-2
Using Classes/Objects/Data members as building blocks	3
Defining methods: parameters, return values	4
Primitive data types and operations (variables, types, assignment, and expressions)	5-6
Control statements	7-8
Loops and arrays	9-11
Vectors	12-13
Input/output via console	14

Weekly Hours

2 x 50 mins lectures, 2 x 50 mins labs

Textbook/References/References

- Head First Java, 2nd Edition by Kathy Sierra and Bert Bates, O'Reilly Media, 2005
- Absolute Java, 4th Edition, Walter Savitch, Addison Wesley, 2009
- Java Programming, 7th Edition, Joyce Farrell, 2013, 1285081951
- Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760

Assessment Methods

- Assignments and quizzes (40%)
- Midterms (20%)
- Final Exam (40%)

Course Learning Outcomes (CLOs)

1. Students will be able to solve problems using programming.
2. Students will learn to use professional programming coding style and comments to improve code readability and maintainability.
3. Students will learn to write error-free code using debugging and testing techniques.

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓	✓	✓								
CLO 2					✓				✓		
CLO 3	✓								✓		

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students apply knowledge of programming to solve simple programming problems.

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

Students acquire the ability to study programming problems and write programs that realize the required logic.

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs

Students are required to write (implement) their assignment in the form of methods to be called from the main method and test their methods by passing different appropriate values.

d. an ability to function effectively on teams to accomplish a common goal

---

e. an understanding of professional, ethical, legal and social issues and responsibilities

Students will understand the importance of code readability and maintainability.

f. an ability to communicate effectively

---

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

---

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

Students use the command line and an IDE for writing, formatting, compiling, running, and debugging code.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

---

k. an ability to apply design and development principles in the construction of software systems of varying complexity

---

Approvals

Course Coordinator	***Abdulbaset Gaddah***	***25 Dec 2012***
Undergraduate Director	***Mohammad Ansari***	***30 Jan 2013***

1401104-3 - Structured Programming (3 credits)

Coordinator: Abdulbaset Gaddah

Catalog Description

Builds on 1401102-3 introducing object oriented programming concepts such as classes, objects, and methods. Also explores larger design concepts such as encapsulation, inheritance, abstraction and polymorphism.

Prerequisites

1401102-3 – Computer Programming

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Review Object Oriented Programming concepts	1
Objects: Defining, Creating, and Using	2-5
Inheritance	6-7
Polymorphism-Part1	8-9
Polymorphism-Part2	10-11
UML for Object Oriented Programming	12
Object Oriented Design	13-14

Weekly Hours

2 x 50 mins lectures, 2 x 50 mins labs

Textbook/References

Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760
Object-Oriented Analysis and Design: Undergraduate Topics in Computer Science, Sarnath Ramnath and Brahma Dathan, Springer, ISBN 978-1-84996-521-7

Assessment Methods

Assignments and quizzes (60%)
Midterm (20%)
Final exam (20%)

Course Learning Outcomes (CLOs)

1. Students will understand object oriented concepts including – classes, objects, inheritance, data abstraction, encapsulation, and polymorphism
2. Students will learn how to design applications using object oriented design methodology
3. Students will appreciate the benefits of code reuse by learning how to make use of off-the-shelf Java libraries such as the Java String

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓	✓	✓	✓					✓		
CLO 2	✓	✓	✓	✓					✓	✓	✓
CLO 3		✓									✓

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students acquire the concepts of Object Oriented Programming and use it to design applications.

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

Students acquire the ability to decompose problems into components and design and code each component.

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

Students are required design and implement software to meet specifications.

d. an ability to function effectively on teams to accomplish a common goal

Students are required to communicate with their group members efficiently to accomplish their assignment and to be able to defend it individually.

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

---

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

---

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

Students acquire the ability to learn advanced IDE features such as UML class diagrams and sequence diagrams.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Students acquire the ability to design advanced logical algorithms by decomposing it and writing objects realizing these tasks.

k. an ability to apply design and development principles in the construction of software systems of varying complexity

Students acquire the principles of OOD through the use of UML design principles and tools.

Approvals

Course Coordinator	***Abdulbaset Gaddah***	***30 Jan 2013***
Undergraduate Director	***Mohammad Ansari***	***30 Jan 2013***

1401105-3 - Advanced Programming (3 credits)

Coordinator: Abdulbaset Gaddah

Catalog Description

Extends the programming knowledge introduced in 1401102-3 and 1401104-3. The course will focus more heavily upon application development with an emphasis on more advanced programming concepts. Topics include, but are not limited to, GUI (Swing), Collections, Exception handling, and I/O file management. Students will develop several GUI-based computer programming projects.

Prerequisites

1401104-3 – Structured Programming

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Review of OOD	1
Exception handling and input validation	2-3
File management and object persistence	4-5
GUI building	6-8
Collections	9-10
Other advanced topics (e.g., recursion, generic programming, design patterns, …)	11-14

Weekly Hours

2 x 50 mins lectures, 2 x 50 mins labs

Textbook/References/References

- Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760
- Absolute Java, 4th Edition, Walter Savitch, Addison Wesley, 2009
- Java Programming, 7th Edition, Joyce Farrell, 2013, 1285081951
- Head First Java, 2nd Edition by Kathy Sierra and Bert Bates, O'Reilly Media, 2005

Assessment Methods

- Projects (60%)
- Midterm (20%)
- Final (20%)

Course Learning Outcomes (CLOs)

1. Students will be familiar with exception handling and input validation.
2. Students will gain knowledge about I/O file management and object persistence
3. Students will be able to develop GUI-based Java applications.
4. Students will learn how to use different types of collections provided in the standard library as well as the fundamental operations of the **Arrays** and **Collections** classes
5. Students will learn about other advanced Java topics.
6. Students will get the experience of working in groups to design and develop complete GUI-based Java application projects.

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs

CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓								✓		
CLO 2	✓								✓		
CLO 3									✓		
CLO 4	✓								✓		
CLO 5	✓							✓	✓		
CLO 6	✓	✓	✓	✓		✓		✓	✓		✓

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students apply knowledge of object-oriented programming to solve programming problems.

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

Students acquire the problem analysis and solving skills throughout the course projects.

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

Students are required to design and develop programming projects to meet the desired requirements.

d. an ability to function effectively on teams to accomplish a common goal

Students work on teams to accomplish the building blocks of their projects.

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

Students improve their communication skills as they discuss and exchange the ideas with each other to build their projects.

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

Students are encouraged to conduct self-study on some advanced topics.

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

Students will use an IDE to facilitate the development process of the programming projects.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

---

k. an ability to apply design and development principles in the construction of software systems of varying complexity

The students are required to use standard design and development principles on some significant programming problems.

Approvals

Course Coordinator	***Abdulbaset Gaddah***	***30 Jan 2013***
Undergraduate Director	***Mohammad Ansari***	***30 Jan 2013***

1401210-3 - Discrete Structures (3 credits)

Coordinator: Imdadullah Khan

Catalog Description

This course covers the mathematical foundations of computer science and engineering. It provides an introduction to elementary concepts in mathematics such as definitions, logic, proofs, functions, relations and counting principles. The course also introduces students to elementary discrete structures such as sets, partial orders, graphs and trees.

Prerequisites

404151-4 – Introduction to Set Theory

Major Topics Covered in the Course (14 week semester)

Topic	**Reading**	**Week**
Logic, Truth Table, Propositional equivalences	[KR] 1.1, 1.2	1,2
Predicates and Quantifiers	[KR] 1.3	3
Sets and Functions	[KR] 1.4 – 1.6 [JMJN] 1.2,1.4	4
Relations, Equivalences and Partial Orders	[KR] Chapter 6 [JMJN] 1.5, 1.6, 2.1	5,6
Proofs: Induction, Contradiction, Contrapositives	[KR] 3.1, 3.2 [JMJN] 1.3	7,8,9
Counting Principles: Cardinality, factorials, permutations, Binomial coefficients, Inclusion-Exclusion, Pigeon-Hole Principle, sums and asymptotics	[KR] 4.1 – 4.3, 5.5,5.6 [JMJN] 3.1 – 3.3, 3.7 [KR] 1.7, 1.8	10,11, 12
Graphs and Trees: Representation, degree sequences and hand shaking lemma, Euler tours, Planar graphs, Euler Formula. Properties of Tree, Spanning Trees	[KR] 7.1 – 7.3, 7.5, 7.6, 8.1, 8.2, 8.5, 8.6 [JMJN] 4.1 – 4.3, 4.4, 5.1, 5.3. 5.4	13,14

Weekly Hours

3 x 50 mins lectures, 0 lab hours

Textbook/References

[KR] Discrete Mathematics and Its Applications, 4th Edition, By Kenneth Rosen
[JMJN] Invitation to Discrete Mathematics, 2nd Edition, By Jiri Matousek and Jaroslav Nesetril

Assessment Methods

Homework: 20%
Quizzes: 10%
Midterm: 30%
Final: 40%

Course Learning Outcomes (CLOs)

1. Be able to analyze complexity of algorithms
2. Be able to apply number theory to practical problems
3. Be able to synthesize elementary proofs
4. Be able to apply concepts of graph theory and trees to solve real world problems

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓									✓	
CLO 2	✓									✓	
CLO 3	✓									✓	
CLO 4	✓									✓	

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students will be able to analyze computational processes

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

---

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

---

d. an ability to function effectively on teams to accomplish a common goal

---

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

---

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

---

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

---

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

This course provides the foundation for algorithms and theory of computing. Hence the students will be able to apply methods learned in this course to analyze and reason mathematically about the tradeoffs involved in design choices. Furthermore this course will enable students to model many systems using discrete structures.

k. an ability to apply design and development principles in the construction of software systems of varying complexity

---

Approvals

Course Coordinator	***Imdadullah Khan***	***11 Dec 2011***
Undergraduate Director	***Mohammad Ansari***	***13 Dec 2011***

1401218-4 - Data Structures & Algorithms (4 credits)

Coordinator: Amine Marref

Catalog Description

The objective of this course is to provide the fundamentals of data structures and algorithm design needed in the remainder of the curriculum, introduce algorithm analysis, and develop students' problem solving and computer programming skills. Emphasis on linked lists, stacks, queues, trees, priority queues, heaps and graphs, and abstract data types. Also includes object oriented concepts.

Prerequisites

1401105-3 - Advanced Programming

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Basics of algorithm analysis	3-4
Linear Data Structures	5
Sorting	6-7
Search Trees	8-9
Hash Tables	10-11
Priority Queues	12
Graphs	13-15

Weekly Hours

2 x 50 mins lectures, 2 x 50 mins labs

Textbook/References

Data Structures and Algorithms in Java, 4th edition, by M.T. Goodrich and R. Tamassia. John Wiley and Sons, Inc., ISBN: 0-471-73884-0

Assessment Methods

The students are expected to complete programming assignments, and pass written examinations on class material. The mark division is 50% for final exam, 25% for midterm exam, and 25% for practical work and quizzes.

Course Learning Outcomes (CLOs)

1. The students will be able to describe, construct, and use various implementations for fundamental data abstractions such as lists, stacks, queues, trees, and graphs
2. The students will be able to design and implement efficient algorithms for manipulating data structures
3. The students will be able to compare the efficiency of various data structures and algorithms and to choose the most appropriate ones for a given application

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1			✓						✓		
CLO 2	✓	✓								✓	

CLO 3	✓	✓	✓							✓	

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students appreciate the use of mathematical proofs to reason about and compare the asymptotic complexity of various algorithms through the use of Big-Oh and other notations. They will also develop an understanding of how to represent different algorithm resource requirements as mathematical functions on the size of the input (logarithmic, linear, etc.)

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

Students can analyze the time and space requirements of a particular problem by performing asymptotic analysis.

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

Students are asked to modify algorithms to produce different outputs or combine algorithms and data structures to offer new solutions e.g. search trees + in-order traversal for sorting.

d. an ability to function effectively on teams to accomplish a common goal

---

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

---

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

---

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

The students learn how to use the most up-to-date libraries in the course-selected programming language to implement different data structures e.g. maps in Java.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Students are able to compare various algorithms e.g. which of the sorting algorithms is best for which kind of input, which is best in parallel systems, which is best when memory is limited, which is best when implemented as part of a dependable system, etc.

k. an ability to apply design and development principles in the construction of software systems of varying complexity

---

Approvals

Course Coordinator	***Amine Marref***	***20 Jul 2011***
Undergraduate Director	***Mohammad Ansari***	***13 Dec 2011***

1401311-3 - Operating Systems (3 credits)

Coordinator: Faizan UrRehman

Catalog Description

This course provides an introduction to operating system design and implementation. It covers the major components of most operating systems, in particular process management, memory management (segmentation, paging, swapping), file systems, and OS protection and security.

Prerequisites

1401215-3 - Computer Architecture

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Introduction to Operating Systems	1-2
Process and thread management	3-8
Memory management	9-11
File system	12-13
I/O system	14
Protection & Security	15

Weekly Hours

3 x 50 mins lectures, 0 lab hours

Textbook/References

Operating Systems Concepts, seventh edition, Silberchatz, Galvin, and Gagne, John Wiley & Sons Inc., ISBN 0-471-69466-5

Assessment Methods

Theoretical homework (20%), Four written exams (5%+20% +5%+ 40%)

Course Learning Outcomes (CLOs)

a. Awareness of basic components of operating system and knowledge of the services provided by it.
b. Appreciate the main principles and techniques used to implement processes and threads, inter-process communication, process synchronization, and algorithms for process scheduling.
c. Appreciate memory management techniques including virtual memory abstractions.
d. Appreciate I/O mechanisms, disk organization and file system structure.
e. Evaluate security risks in operating systems and understand the role operating systems can and should play in establishing security.

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓			✓					✓	✓	
CLO 2	✓			✓					✓	✓	

CLO 3	✓			✓					✓	✓	
CLO 4	✓			✓					✓	✓	
CLO 5	✓			✓					✓	✓	

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students apply knowledge of computing and design to programming assignments

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

---

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

---

d. an ability to function effectively on teams to accomplish a common goal

Programming assignments are implemented in teams.

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

---

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

---

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

Students leverage the capabilities of a modern OS to solve real problems.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.

k. an ability to apply design and development principles in the construction of software systems of varying complexity

---

Approvals

Course Coordinator	***Faizan UrRehman***	***17 Sep 2012***
Undergraduate Director	***Mohammad Ansari***	***27 Dec 2012***

1401313-3 - Software Engineering (3 credits)

Coordinator: Basem Kazemi

Catalog Description

Software engineering concepts including the software life cycle and other software-development process models. Specification techniques, design methodologies, performance analysis, and verification techniques. Team-oriented software design and development, and project management techniques. Introduction to design and debugging tools of a modern programming language. Homework and laboratory projects that emphasize design and the use/features of a modern programming language in software development

Prerequisites

1401222-3 – System Analysis & Design

Major Topics Covered in the Course (14 week semester)

Topic	**Week**
Introduction to software engineering and its impact on software development	1
Critical software engineering principles such as modularity, abstraction, software evolution, etc	2,3
Software development process models such as waterfall, spiral, etc. and case studies on their usage. Object-oriented development models	4,5,6
Traditional and object-oriented software design concepts and techniques	6,7
Software verification via testing, analysis, and debugging	8,9
Software engineering tools and environments. Practice in using tools for software design, and testing	10,11,12
Basic management concepts including an introduction to team aspects of solving software design problems	13,14

Weekly Hours

3 x 50 mins lectures, 0 lab hours

Textbook/References

Software Engineering – Principle and Practice Hans Van Vliet, 3rd, 2010, 978-0-470-03146

Assessment Methods

The student is expected to complete theoretical homework and programming tasks, to pass written examinations, and to successfully complete a significant project

Course Learning Outcomes (CLOs)

1. The student will have a working knowledge of established software engineering issues and practice and their relationship to emerging methodologies, paradigms, techniques, tools, and languages.
2. The student will be able to analyze, design and implement a modern application from an architectural perspective, which includes a decomposition into components of software, hardware, and their interdependencies.
3. The student will be able to design and prototype software from written specifications and/or supplied application libraries.

Relationship between CLOs and Student Outcomes

Student Outcomes – Mapped to CLOs											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CLO 1	✓							✓			
CLO 2			✓	✓		✓		✓	✓	✓	✓
CLO 3			✓	✓		✓		✓	✓		✓

Relationship of Course to ABET Student Outcomes

a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline

Students apply knowledge of computing and design to a project

b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

---

c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired

Students are required design and implement a software project to meet a specification.

d. an ability to function effectively on teams to accomplish a common goal

Projects are implemented in teams.

e. an understanding of professional, ethical, legal and social issues and responsibilities

---

f. an ability to communicate effectively

The projects require communications, specifications, progress reports, and final report.

g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues

---

h. a recognition of the need for, and an ability to engage continuing professional development

The students often must utilize the internet to learn and apply the new technologies that they have chosen in support of their projects.

i. an ability to use the current techniques, skills, and tools necessary for computing practice.

Projects use current computing and modeling/design tools.

j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.

k. an ability to apply design and development principles in the construction of software systems of varying complexity

The students are required to use standard design and development principles on a significant software project

Approvals

Course Coordinator	***Basem Kazemi***	***17 Oct 2011***
Undergraduate Director	***Mohammad Ansari***	***13 Dec 2011***

802321 (Signal Analysis) Syllabus - Part 1

General Information

Course Number	802321
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Engineering Mathematics II (800202)
Course Coordinator	Communication sequence committee

Course Objective

Not specified.

Catalog Description

This course is to the different models and classifications of signals (periodic, non periodic, Analog, Digital and Power, energy). The students will be able to represent signals in both the Time-Domain and Frequency-Domain. The students will be introduced to signal processing and characterization techniques, such as convolution, frequency response, and transforms. Hence, the student can start successfully in studying the different Electrical, Electronic, and Communication courses. Topics on Fundamentals of the Analysis and Processing of Continuous and Discrete Signals, Fourier Series and Integrals, Linear Systems, Impulse Response, Convolution, Analog Filters, Signal Flow Graphs, Introduction to Discrete Fourier Transforms (DFT & FFT) and z-Transform are covered in this course.

Course Contents

Introduction to Signals - Signals and Systems - Fourier Series - Fourier Transform - Discrete-time signals & systems

Text Book

Alan V. Oppenheim, Alan S. Willsky, with S. Hamid Nawab, Signals & Systems, 2nd edition, Prentice-Hall, 2014.

Reference Material

1.B. P. Lathi, Zhi Ding, Modern Digital and Analog Communication Systems. 4th Ed., Boston, MA: Oxford, 2009.
2.Haykin S., Moher M., Communication Systems, 5th Ed., NY: John Wiley & Sons, Inc, 2009.

802321 (Signal Analysis) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Classify signals with different properties and characteristics.
2	Calculate the energy and power for a wide range of continuous-time signals, apply time operations to signals, and analyze the unit impulse, unit step, exponential and sinusoidal functions.
3	Describe the analogy between signals and vectors, and demonstrate the understanding of the components of a signal and orthogonal signals to calculate the energy of the sum of orthogonal sig
4	Characterize systems in terms of their interconnections and properties to analyze LTI (linear Time-Invariant) systems.
5	Express a periodic signal in terms of Exponential and Trigonometric Fourier Series to determine the Fourier Transform and the Inverse Fourier Transform of periodic and aperiodic signals, and ap
6	Determine the correlation and the correlation coefficient of signals and demonstrate how to solve the convolution integral in the time and frequency domain.
7	Demonstrate how to determine the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) of signals using appropriate software tool.
8	Apply the z-Transform to analyze discrete-time signals

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	1	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0
CLO 5	1	0	0	0	1	0	0	0	0	0	0
CLO 6	1	0	0	0	1	0	0	0	0	0	0
CLO 7	1	0	0	0	1	0	0	0	0	0	0
CLO 8	1	0	0	0	0	0	0	0	0	0	1

Approvals

Prepared by	Not specified.
Approved by	Not specified.
Last Update	Fall 2016

Course Description

4800130-4 General Physics (I)

Institution: Umm Al-Qura University.
College/Department: Preparatory Year Deanship, Natural Sciences Department.

A. Course Identification and General Information:

1. Course title and code: General Physics (I), 4800130 - 4
2. Credit hours: 4 credit hours (3+1) - "2nd Term (Semester) = 4 cr. hrs."
3. Program(s) in which the course is offered. - Preparatory year Scientific Track
4. Name of faculty member responsible for the course: Members of staff
5. Level/year at which this course is offered: Preparatory year
6. Pre-requisites for this course (if any): 4800140 – 4 Introduction to Mathematics (I)
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main Campus
9. Lectures: 45 contact hours.
10. Practical section: 28 contact hours.

B. Objectives:

1. Summary of the main learning outcomes for students enrolled in the course.
   By the end of the course the students will be able to:

- Evaluate the components and direction angles of a vector.
- Determine the unit vector describing the direction of a vector.
- Determine the properties of a set of concurrent forces required for them to have a specified resultant.
- Compute the component of a vector.
- Evaluate the forces required for static equilibrium of a particle.
- Compute the cross product of two vectors.
- Compute the torque of a force about a point and a line.
- Resolve a set of given forces into a force-couple system.
- Evaluate the magnitude, direction, and location of a point on the line of action of the single force that is equivalent to a system of planar or parallel forces.
- Determine the nature of the supports of a rigid body and to draw a free body diagram.
- Evaluate unknown reactions holding a rigid body in equilibrium by solving the equations of static equilibrium.
- Formulate and solve in a logical sequence the equilibrium equations for a frame, in order to evaluate the forces acting on each member of the structure.
- Understand the principles of dry friction.
- Evaluate the friction forces required to hold a system in equilibrium.
- Develop the ability to use constant acceleration formulas that describe the position and velocity of a point in rectilinear motion.
- Understand the definitions of the basic parameters for Cartesian coordinates.
- Develop the ability to convert velocities and accelerations from one kinematical description to another.
- Evaluate the kinematical properties of a projectile.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

- Continues updating for content of lectures as a result of recent achievements and researches in the field.
- Encouraging the students to deal with electronic books, as they are using many web based reference material and by providing them with continues update for information.
- Trying to Decrease the direct theoretical teaching load of the course and putting more time for explaining correlations and student-directed learning sessions and seminars.
- Planning for elective self studies in the course to encourage students to engage in depth study of areas of interest.
- More efforts will be exerted to develop and improve the course to enable the student to clearly understand the Physics basis.

C. Course Description:

1. Topics to be Covered			
Week #	**Ses #**	**Activities**	**Topics**
1	1	Class	What Is Physics, Measuring Things, The International System of Units.
	2	Class	Changing Units. Length, Time and Mass.
	3	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased) .
2	4	Class	Motion, Position and Displacement, Average Velocity and Average Speed, Instantaneous Velocity and Speed.
	5	Class	Acceleration, Constant Acceleration: A Special Case, Another Look at Constant Acceleration, Free-Fall Acceleration, Graphical Integration in Motion Analysis.
	6	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
3	7	Class	Vectors and Scalars, Adding Vectors Geometrically, Components of Vectors.
	8	Class	Unit Vectors, Adding Vectors by Components, Vectors and the Laws of Physics, Multiplying Vectors.
	9	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased)
4	10	Class	Newtonian Mechanics, Newton's First Law.
	11	Class	Force, Mass.
	12	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
5	13	Class	Newton's Second Law, Some Particular Force.
	14	Class	Applying Newton's Laws.
	15	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
6	16	Class	Kinetic Energy, Work, Work and Kinetic Energy.

	17	Class	Work Done by the Gravitational Force, Work Done by a Spring Force, Work Done by a General Variable Force, and Power.
	18	Problem solving	REVIEW , SUMMARY and PROBLEMS (calculus biased).
7	19	Class	What Is a Fluid, Density and Pressure, Fluids at Rest.
	20	Class	Measuring Pressure, Pascal's Principle.
	21	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
8	22	Class	Midterm Exam.
	23	Class	Archimedes' Principle, Ideal Fluids in Motion.
	24	Class	The Equation of Continuity, Bernoulli's Equation.
	25	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
9	26	Class	Types of Waves, Transverse and Longitudinal Waves, Wavelength and Frequency, The Speed of a Traveling Wave and Wave Speed on a Stretched String.
	27	Class	Energy and Power of a Wave Traveling Along a String.
	28	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
10	29	Class	The Wave Equation, The Principle of Superposition for Waves, Interference of Waves.
	30	Class	Phasors, Standing Waves, Standing Waves and Resonance.
	31	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
11	32	Class	Sound Waves, The Speed of Sound.
	33	Class	Traveling Sound Waves, Interference.
	34	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
12	35	Class	Sources of Musical Sound, Beats.
	36	Class	The Doppler Effect, Supersonic Speeds, Shock Waves.
	37	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).

13	38	Class	Temperature, The Zeroth Law of Thermodynamics, Measuring Temperature, The Celsius and Fahrenheit Scales, Thermal Expansion, Temperature and Heat.
	39	Class	The Absorption of Heat by Solids and Liquids, A Closer Look at Heat and Work, The First Law of Thermodynamics, Some Special Cases of the First Law of Thermodynamics, Heat Transfer Mechanisms.
	40	Problem solving	REVIEW, SUMMARY and PROBLEMS (calculus biased).
14	41	Class	REVIEW, SUMMARY and PROBLEMS (calculus biased).
	42		
	43		
15	44	Class	Revision.
16	45	Final exam.	

2. Course components (total contact hours per semester):				
Lecture: 45	Tutorial: ……	Laboratory: →	Practical/Field work/Internship: 28	Other.....

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week):

There is no scheduled private study/ learning hours but the students can directly contact the lecturer during his office hours.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill.
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired:
At the end of this course, the students are expected to be able to:

- Provide an Introduction to fundamentals of Physics, that gives the students a command of its

concepts, such as; MEASUREMENT, MOTION ALONG A STRAIGHT LINE, FORCE AND MOTION—II; VECTORS, MOTION—I, FORCE AND MOTION—II, FLUIDS, WAVES—I, WAVES—II, TEMPERATURE, HEAT, AND THE FIRST LAW OF THERMODYNAMICS.

- Subject taught using the TEAL (Technology Enabled Active Learning) studio format which utilizes small group interaction and current technology to help students develop intuition about, and conceptual models of physical phenomena.

(ii) Teaching strategies to be used to develop that knowledge:

The knowledge is given in form of lectures. Each lecture is accompanied by an assigned reading which is important for mastering the learning objectives. The strategies include:

- Provide clear and informative lecture notes with learning objectives that focus on important points.
- Give clear, informative, and stimulating 50-minute lectures with PowerPoint or other visual electronic aids to enhance the learning experience for students.
- Answer questions either in or outside class or via e-mail or telephone.
- Compose thoughtful and fair exam questions that assess student learning and application of the course content.
- Directing the case sessions and facilitators to provide an effective learning experience in small group, team-oriented sessions.
- Providing answers and explanations to student inquiries regarding any aspect of the course.
- Providing advice and assistance to students for improving their learning strategies and performance in the course.
- Reviewing and implementing appropriate changes in the course based on student feedback and evaluations.

Also;

Written Homework

There will be one homework handed in on paper each week. To receive full credit for your hardcopy homework handed in, you must prepare and submit lucid and clearly reasoned written solutions. These problems will be graded and returned.

In-class Group and Personal Assignments

In almost all classes, individuals and groups, will submit answers to questions about desktop experiments done in class, material covered in the lecture in that class, and so on. You must be present in class to receive credit for assignments submitted either by you or by your group.

Group Work

You will be assigned to a group of three for collaborative work. Your group assignment will be announced near the beginning of the term. If you are not satisfied with the way your group is working, first try to discuss it with your group members. If you cannot arrive at a satisfactory solution, then discuss the problems with your instructor.

Laboratory

You will be offered hands-on, inquiry-based activities during the class period. These labs allow you to discover various aspects of a physics concept. Labs will be done in groups.

Tests

There is tests will be given. There will be Midterm and Final exams in the course. The final will be a comprehensive exam and will cover all of the subject material.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Ask the student to clear the misunderstanding of some physical principle.
- Discussions with the students, and ask quality question.
- Exams:
  a) Quizzes
  b) Mid Term Exam.
  c) Final Exam

d) Oral exams, Lab reports, and Lab Final Exam.

TASKS	WEIGHTS
Lab report & Lab Exam +Quizzes + Mid + Final Exam.	20%+10%+ 30%+40%
Quizzes + Homework.	10%
Lab report.	10%
Lab final exam.	10%
Mid Term exam.	30%
Final exam.	40%
Total	100 %

A	Excellent	90 -100
B	Very good	80 – 89
C	Good	70 – 79
D	Pass	60 – 69
F	Fail	59 and below

b. Cognitive Skills

(i) Cognitive skills to be developed

The course has an aim to improve the ability in the following cognitive skills:

- How to use physical laws and principles to understand the subject.
- How to simplify problems and analyze phenomena.
- Analyse and explain natural phenomena.
- Ability to explain the idea with the student own words.
- Represent the problems mathematically.

Also to develop;

- Effective Learning skills.
- Problem solving skills.
- Self assessment and development.
- Reading and searching.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Preparing main outlines for teaching.
- Following some proofs.
- Define duties for each chapter
- Home work assignments.
- Ask the student to do small research.
- Encourage the student to look for the information in different references.
- Ask the student to attend lectures for practice solving problem.

(iii) Methods of assessment of students cognitive skills:

Those skills can be assessed by:

- Improvement in the overall performance of the student in consequent examinations during the course.
- Interaction of the course and its effect on other courses offered for the students, which can be measured by their feedback.

Also;

- Discussions of how to simplify or analyze some phenomena.
- Asking about physical laws previously taught
- Writing reports on selected parts of the course
- Midterm Exam. Final Exam, Lab Exam, and short quizzes.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

The course has an aim to improve the ability in the following interpersonal skills and responsibilities:

- Work independently.
- The students learn independently and take up responsibility.
- Following the learner manners and ethics including; commitment, respect and communication with confidence.

(ii) Teaching strategies to be used to develop these skills and abilities

Students are expected to:

- Learn how to search on the internet and use the library.
- Learn how to cover missed lectures.
- Learn how to summarize lectures or to collect materials of the course.
- Learn how to solve difficulties in learning: solving problems – enhance educational skills.
- Develop her interest in Science through :(lab work, field trips, visits to scientific and research.
- Encourage the student to attend lectures regularly by:
  - Giving bonus marks for attendance
  - Assigning marks for attendance.
  - Give students tasks of duties.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Those skills are reflected on the student behaviour inside and outside the class. It can be assessed by the feedback from the lecturer regard the student's interaction and behaviour.

Also;

- Quizzes on the previous lecture.
- Checking report on internet use and trips
- Discussion
- The accuracy of the result gained by each group will indicate good group work.
- Presenting the required research on time and the degree of the quality will show the sense of responsibility.

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

The course has an aim to improve the ability in the following Information Technology and Numerical Skills:

- Computation, and designing presentations..
- Problem solving.
- Feeling physical reality of results.
- Data analysis and interpretation.
- Enhance the ability to use the search engines.

(ii) Teaching strategies to be used to develop these skills, give the students tasks in:

- Know the basic Physics principles.
- Use the web for research.
- Discuss with the student.
- Exams to measure the mathematical skill.
- Clear the weakness point that should be eliminated.
- Encourage the student to ask for help if needed.
- Computational analysis.
- Data representation.
- Focusing on some real results and its physical meaning.
- Lectures for problem solution.
- Encourage the student to ask good question to help solve the problem.
- Display the lecture note and homework assignment at the web.

(iii) Methods of assessment of students numerical and communication skills

Those skills can be predicted by:

- Their interaction with the lectures and discussions.
- The reports of different asked tasks.
- Homework, Problem solutions assignment and exam should focus on the understanding, and Research.
- Results of computations and analysis.
- Comments on some resulting numbers.

e. Psychomotor Skills:

(i) Description of the psychomotor skills to be developed and the level of performance required:

Contributions in the improvement of Physics education level.

(ii) Teaching strategies to be used to develop these skills:

1. Provide the role and the fundamental of Physics.
2. Develop basic laboratory skills and techniques for the study of Physics.

(iii) Methods of assessment of students' psychomotor skills:

It is not included in the overall assessment of the students.

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Problem sets.	Around the semester.	10 %
2	Mid-term exam	8	30%

3	Lab report.	Around the semester.	10 %
4	Practical Exam (Lab Final Exam).	15	10%
5	Final Exam	16	40 %
Total Assessment		100%	

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

The student has the right to contact the lecturer or coordinators by their e-mails or during their office hours for academic advices or consultations.

E- Learning Resources

1. Required Text(s):

- Fundamentals of PHYSICS, 9 th Edition, by HALLIDAY / RESNICK / WALKER, Wiley, Binder Ready Version edition (March 2010).

2. Essential References;

- Physics for scientists and engineering by Serway 7 th edition, Cengage Learning; (February 20, 2007).
- Fundamentals of Physics: Mechanics, Relativity, and Thermodynamics (The Open Yale Courses Series), Yale University Press (December 2, 2013).

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List):

- Electromagnetism Principles and Applications by Paul Lorrain and Dale R. Corson.
- Physics for student of science and Engineering by A.L.Stanford and J.M. Tanner, Harcourt College Pub. (January 1985).

4-.Electronic Materials, Web Sites etc.

- http://www.physicsclassroom.com
- http://www.eskimo.com
- http://ocw.mit.edu/OcwWeb/Physics/8-02Electricity-and-Magnetism/VideoLectures/index.htm

5- Other learning material such as computer-based programs/CD, professional standards/regulations:

Wikipedia.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in

classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) Audio-visual equipment for teaching (projector, microphones, speakers, board.
2. Computing resources: None.
3. Other resources (specify –e.g. If specific laboratory equipment is required, list requirements or attach list) None.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching: Evaluation questionnaires of the staff at the end of the semester.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department: None.
3. Processes for Improvement of Teaching: Reviewing and implementing appropriate changes in the course based on the student feedback and evaluations.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution): None
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Regular meeting with the staff to review the course effectiveness.

403102 (General Physics II) Syllabus - Part 1

General Information

Course Number	403102
Credit Hours	3/1/4 (Theory credit hours = 3; Lab. credit hours = 1; Total credit hours = 4)
Prerequisites	General Physics I
Course Coordinator	Not specified

Course Objective

To develop physical understanding and problem-solving skills utilizing calculus for solving problems of electrostatic field, electrostatic energy, and magnetic field.

Catalog Description

This course is an applied study of the basic laws and principles of calculus-based physics in the following areas: electric charge, the electric field, gauss' law, electric potential, capacitance, current and resistance, circuits, magnetic field, magnetic field due to currents, and induction.
Subject taught using the TEAL (Technology Enabled Active Learning) studio format which utilizes small group interaction and current technology to help students develop intuition about, and conceptual models of, physical phenomena.

Course Contents

Introduction to TEAL; Fields; Review of gravity; Electric field; Electric charge; Electric fields; Dipoles; Continuous charge distributions; Coordinate systems; Gradients; Line and surface integrals; electric potential, equipotential; Gauss's law; Conductors and capacitors; Current, Resistance, and DC circuits; Magnetic fields: Creating magnetic fields - Biot-Savart, Ampere's Law, Feeling magnetic fields, charges and dipoles, Magnetic levitation; Magnetic forces on dipoles, Force and torque on a current loop, Faraday's law; Mutual inductance and transformers; Inductors and magnetic energy; RC and RL circuits; LC, and undriven LRC circuits; Driven LRC circuits; Maxwell's equations, EM radiation and energy flow, EM radiation, Generating EM radiation.

Text Book

Physics by : Halliday, D and Resnick, Krane

Reference Material

1)Electromagnetism Principles and Applications by Paul Lorrain and Dale R. Corson 2)Physics for scientists and engineering by Serway 7Th edition. 3)Physics for student of science and Engineering by A.L.Stanford and J.M. Tanner

403102 (General Physics II) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Not Specified
2	Not Specified
3	Not Specified
4	Not Specified

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	0	0	0	0	0
CLO 2	0	0	0	0	0	0	0	0	0	0	0
CLO 3	0	0	0	0	0	0	0	0	0	0	0
CLO 4	0	0	0	0	0	0	0	0	0	0	0

Approvals

Prepared by	Not specified
Approved by	Not specified
Last Update	Not specified

3. LEVEL-5 3rd Year: Basic Sciences: 4 Credits (College of Applied Sciences)
402101: General Chemistry
Lecture Credit Hours: 3, Lab Credit Hours: 1, Total Credit Hours: 4
Lecture Contact Hours: 3, Lab Contact Hours: 3, Total Contact Hours: 6
Instructor's /Course Coordinator's Name: _____
Level/year at which this course is offered : First year
Pre-requisites for this course (if any): No-Pre-Requisite
Co-requisites for this course (if any): No-Co-requisite
Textbook:
C. Raymond. Chemistry. 9th Ed., McGrawhill, 2008.

Course Objectives:

Chemistry is concerned with the study of matter (materials) and its properties. Since matter is the structural unit of the universe, every entity we see or use relates to chemistry and therefore chemistry is considered the central science. The bulk properties of matter derive from these entities and the forces between them. Hence, to understand chemistry is to understand matter and its properties. The aim of this course is:

1. To obtain a firm grounding in the core fundamentals of basic chemistry, involving the composition, properties, structures and reactions of compounds.
2. To gain experience in the development of working methods on how to solve problems.
3. To emphasize the importance of developing an understanding of concepts in science rather than learning by rote.

Course Description:

The main concepts covered in this course include the classification of matter, basics of physical chemistry, different factors affecting the states of matter, chemical reactions and determination of their physical constants, conversion of chemical energy to thermal or electrical energies and the used laws, some examples concerning industrial applications.

Reading Material:

The following chapters will be covered in one semester (14 weeks).

Subject Number	Title of Subject	Sections Covered	No of Weeks
1	Concentrations and units	1.1 Different expressions of concentrations 1.2 Concentration of pure substances 1.3 International syste m of units and dimensional analysis	2
2	Gases	2.1 Gases: What Are They Like? 2.3 Gas Pressure. 2.4 Boyle's Law: The Pressure-Volume Relationship. 2.5 Charles's Law: The Temperature-Volume Relationship. 2.6 Avogadro's Law: The Mole-Volume Relationship. 2.7 The Combined Gas Law. 2.8 The Ideal Gas Law and Its Applications. 2.9 The kinetic gas theory	3

3	**States of Matter**	**3.1 Liquid state.** **3.2 Evaporation .** **3.3 Vapor pressure of a liquid.** **3.4 Boiling and boiling point.** **3.5 Heat of evaporation.** **3.6 Surface tension.** **3.7 Viscosity.** **3.8 Solid state, crystallization and melting.** **X-ray and crystalline structure.**	**2**
	Midterm Examination		**1**
4	**Thermodynamics**	**4.1Thermodynamics and thermochemistry.** **4.2 The first law of thermodynamics.** **4.3 Hess's law and its applications.**	**2**
5	**Electrochemistry**	**5.1 Galvanic cells** **5.2 Electrochemical series** **5.3 Cell potential** **5.4 Nernst law** **5.6 Electroanalysis cells** **Faraday's laws of electroanalysis**	**2**
6	**Industrial chemistry**	**6.1 Cement (composition, properties, types, the theories of cement solidification).** **6.3Water (natural resources, water hardness and its treatment, water purification).** **6.4 Petroleum (origin of crude oil, petroleum refining, estimation of crude oil, different types of fuels).**	**2**

Assessment :

Your grades will be determined as follows:

Description	Lecture	Lab
Final Exam	**40**	**10**
Mid Term Exam	**10**	**5**
Progress Exams & Home Work	**15**	**5**
Attendance	**5**	**-**
Lab Activities	**-**	**10**
Total	**70**	**30**

Attendance:

Attendance at lectures is compulsory. During each lecture, attendance will be taken. It is very important that students turn up to lectures on time. Please conform to this rule in the interests of both yourself and your fellow students.

Course Description

4800140 – 4 Introduction to Mathematics (I)

Institution: Umm Al-Qura University.
College/Department: Preparatory Year Deanship, Natural Sciences Department.

A. Course Identification and General Information:

1. Course title and code: Introduction to Mathematics (I), 4800140 - 4
2. Credit hours: 4 credit hours - "1st Term (Semester) = 4 cr. hrs."
3. Program(s) in which the course is offered. - Preparatory year Scientific Track - Preparatory year Administrative Track - Engineering and sciences students
4. Name of faculty member responsible for the course: Members of staff
5. Level/year at which this course is offered: Preparatory year
6. Pre-requisites for this course (if any): None
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main Campus
9. Lectures: 60 contact hours
10. Practical section: None

B. Objectives:

3. Summary of the main learning outcomes for students enrolled in the course.

By the end of the course the students will be able to:

- Using the concepts of introductory calculus.
- Solving linear equations and inequalities two.
- Solving quadratic equations and inequalities two.
- Finding derivatives of functions using theorems and rules.
- Evaluating the limit of functions.
- Concise and authoritative definitions of mathematical terms.
- Extending the concept of limits to infinity.
- Differentiating of implicit and explicit functions two.
- Study a function;
  - Where it goes.
  - How it evolves.
  - Studying its monotonicity and critical points.
  - Sketch its graph: concavity and inflexion points.

2. **Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)**

- Continues updating for content of lectures as a result of recent achievements and researches in the field.
- Encouraging the students to deal with electronic books, as they are using many web based reference material and by providing them with continues update for information.
- Trying to Decrease the direct theoretical teaching load of the course and putting more time for explaining correlations and student-directed learning sessions and seminars.
- Planning for elective self studies in the course to encourage students to engage in depth study of areas of interest.
- More efforts will be exerted to develop and improve the course to enable the student to clearly understand the Calculus basis.

C. Course Description:

1. Topics to be Covered

Week #	Ses #	Activities	Topics
1	1	Class	Lesson 1: Real numbers.

	2	Class	Lesson 2: Exponents and Radicals.
	3	Problem solving	REVIEW & SUMMARY & PROBLEMS.
2	4	Class	Lesson 3: Polynomials: Basic Operations and Factoring.
	5	Class	Lesson 4: Solving Equations.
	6	Problem solving	REVIEW & SUMMARY & PROBLEMS.
3	7	Class	Lesson 5: Rational Expressions: Basic Operations.
	8	Class	Lesson 6: Inequalities.
	9	Problem solving	REVIEW & SUMMARY & PROBLEMS.
4	10	Class	Lesson 7: Absolute Values.
	11	Class	Lesson 8: Definition of Functions (Domain and Range).
	12	Problem solving	REVIEW & SUMMARY & PROBLEMS.
5	13	Class	Lesson 9: Graphs of Functions.
	14	Class	Lesson 10: Operations on Functions
	15	Problem solving	REVIEW & SUMMARY & PROBLEMS.
6	16	Class	Lesson 11: Trigonometric Functions and Identities
	17	Class	Lesson 12: Introduction to Limits.
	18	Problem solving	REVIEW & SUMMARY & PROBLEMS.
7	19	Class	Lesson 13: Limits Theorems.
	20	Class	Lesson 14: Limit from Right and from Left.
	21	Problem solving	REVIEW & SUMMARY & PROBLEMS.
8	22	Class	Lesson 15: Definition of Continuity.
	23	Class	Midterm Exam.
	24	Class	Lesson 16: Definition of Derivative (Using Limits).
	25	Problem solving	REVIEW & SUMMARY & PROBLEMS.
9	26	Class	Lesson 17: Rules and Theorems for Finding Derivatives.

	27	Class	Lesson 18: Derivative of Trigonometric Functions.
	28	Problem solving	REVIEW & SUMMARY & PROBLEMS.
10	29	Class	Lesson 19: Chain Rule.
	30	Class	Lesson 20: Higher Order Derivatives.
	31	Problem solving	REVIEW & SUMMARY & PROBLEMS.
11	32	Class	Lesson 21: Implicit Differentiation.
	33	Class	Lesson 22: Maxima and Minima.
	34	Problem solving	REVIEW & SUMMARY & PROBLEMS.
12	35	Class	Lesson 23: Monotonicity.
	36	Class	Lesson 24: Local Maxima and Minima.
	37	Problem solving	REVIEW & SUMMARY & PROBLEMS.
13	38	Class	Lesson 25: Concavity. Lesson 26: Asymptotes.
	39	Class	Lesson 27: Sketching the Graphs.
	40	Problem solving	REVIEW & SUMMARY & PROBLEMS.
14	41	Class	Lesson 28: Integration of Functions.
	42	Class	Lesson 29: Definite Integrals.
	43	Problem solving	REVIEW & SUMMARY & PROBLEMS.
15	44	Class	Revision.
16	45	Final exam.	

2. Course components (total contact hours per semester): 60				
Lecture: 60.	Tutorial: 15.	Laboratory:…	Practical/Field work/Internship: …….	Other….

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week):

There is no scheduled private study/ learning hours but the students can directly contact the lecturer during his office hours.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired:

At the end of this course, the students are expected to be able to:

- Calculate various forms of limits.
- Calculate derivative of trigonometric functions and polynomials.
- Use limits and derivatives to study different functions.
- Subject taught using the TEAL (Technology Enabled Active Learning) studio format which utilizes small group interaction and current technology to help students develop intuition about, models of problems.

(ii) Teaching strategies to be used to develop that knowledge:

The knowledge is given in form of lectures. Each lecture is accompanied by an assigned reading which is important for mastering the learning objectives. The strategies include:

- Provide clear and informative lecture notes with learning objectives that focus on important points.
- Give clear, informative, and stimulating 50-minute lectures with PowerPoint or other visual electronic aids to enhance the learning experience for students.
- Answer questions either in or outside class or via e-mail or telephone.
- Compose thoughtful and fair exam questions that assess student learning and application of the course content.
- Directing the case sessions and facilitators to provide an effective learning experience in small group, team-oriented sessions.
- Providing answers and explanations to student inquiries regarding any aspect of the course.
- Providing advice and assistance to students for improving their learning strategies and performance in the course.
- Reviewing and implementing appropriate changes in the course based on student feedback and evaluations.

Also;

Written Homework

There will be one homework handed in on paper each week. To receive full credit for your hardcopy homework handed in, you must prepare and submit lucid and clearly reasoned written solutions. These problems will be graded and returned.

In-class Group and Personal Assignments

In almost all classes, individuals and groups will submit answers to questions done in class, material covered in the lecture in that class, and so on. You must be present in class to receive credit for assignments submitted either by you or by your group.

Group Work

You will be assigned to a group of three for collaborative work. Your group assignment will be announced near the beginning of the term. If you are not satisfied with the way your group is working, first try to discuss it with your group members. If you cannot arrive at a satisfactory solution, then discuss the problems with your instructor.

Tests

There is tests will be given. There will be Midterm and Final exams in the course. The final will be a

comprehensive exam and will cover all of the subject material, also Quizzes and Problem sets.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Ask the student to clear the misunderstanding of some Math principles.
- Discussions with the students, and ask quality question.
- Exams:
  a) Quizzes
  b) Mid Term Exam.
  c) Final Exam
  d) Discussions with the students.

TASKS	WEIGHTS
Problem sets (Quizzes + Exams).	20 %
Midterm exam.	20%
Final exam.	60%
Total	100 %

A	Excellent	90 -100
B	Very good	80 – 89
C	Good	70 – 79
D	Pass	60 – 69
F	Fail	59 and below

b. Cognitive Skills

(i) Cognitive skills to be developed

The course has an aim to improve the ability in the following cognitive skills:

- How to use laws and principles of Math to understand the subject.
- How to simplify problems and analyze it.
- Ability to explain the idea with the student own words.
- Represent the problems mathematically.

Also to develop;

- Effective Learning skills.
- Problem solving skills.
- Self assessment and development.
- Reading and searching.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Preparing main outlines for teaching.
- Homework assignments.
- Ask the student to do small research.
- Encourage the student to look for the information in different references.
- Reading the problems carefully.

(iii) Methods of assessment of students cognitive skills:

Those skills can be assessed by:

- Improvement in the overall performance of the student in consequent examinations during the course.
- Interaction of the course and its effect on other courses offered for the students, which can be measured by their feedback.
- Also;

- Midterm Exam, Exams.
- Continuous assessment (short quizzes).
- Homework.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

The course has an aim to improve the ability in the following interpersonal skills and responsibilities:

- Work independently.
- The students learn independently and take up responsibility.
- Following the learner manners and ethics including; commitment, respect and communication with confidence.

(ii) Teaching strategies to be used to develop these skills and abilities.

Students are expected to:

- Learn how to search on the internet and use the library.
- Learn how to cover missed lectures.
- Learn how to collect materials of the course.
- Learn how to solve difficulties in learning: solving problems – enhance educational skills.
- Develop the interest in Math.
- Encourage the student to attend lectures regularly by:
  - Giving bonus marks for attendance
  - Assigning marks for attendance.
  - Give students tasks of duties.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Those skills are reflected on the student behaviour inside and outside the class. It can be assessed by the feedback from the lecturer regard the student's interaction and behavior.

Also;

- Quizzes.
- Discussion
- Homework.
- Presenting the required research on time and the degree of the quality will show the sense of responsibility.

d. Communication, Information Technology and Numerical Skills

(iv) Description of the skills to be developed in this domain.

The course has an aim to improve the ability in the following Information Technology and Numerical Skills:

- Computation and designing presentations.
- Problem solving.
- Data analysis and interpretation.
- Enhance the ability to use the search engines.

(ii) Teaching strategies to be used to develop these skills, give the students tasks in:

- Know the basic mathematical principles.
- Use the web for research.
- Discuss with the students.
- Exams to measure the mathematical skill.
- Clear the weakness points that should be eliminated.
- Encourage the student to ask for help if needed.
- Encourage the student to ask good questions to help solve the problem.
- Display the lecture note and homework assignment at the web.

(iii) Methods of assessment of students numerical and communication skills

Those skills can be predicted by:

- Their interaction with the lectures and discussions.
- The reports of different asked tasks.
- Homework, Problem solutions assignment and exam should focus on the understanding.
- Results of computations and analysis.
- Comments on some resulting numbers.
- Research.

e. Psychomotor Skills:

(i) Description of the psychomotor skills to be developed and the level of performance required:

Contributions in the improvement of Math education level.

(ii) Teaching strategies to be used to develop these skills

1. Provide the role and the fundamental of Calculus for students.
2. Develop basic skills and techniques for the study of Math.

(iii) Methods of assessment of students' psychomotor skills:

It is not included in the overall assessment of the students.

5. Schedule of Assessment Tasks for Students During the Semester.

Assessment	Assessment task (eg. test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Problem sets (Quizzes +Homework).	Around the semester.	20 %
2	Midterm exam.	8	20%
3	Final Exam	16	60 %
Total Assessment			100%

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

The student has the right to contact the lecturer or coordinators by their e-mails or during their office

hours for academic advices or consultations.

E- Learning Resources

1. Required Text(s) - **Calculus**, (Ninth Edition) by Dale Varberg, Edwin Purcell and Steven Rigdon 2007.
2. Essential References; - Elementary Calculus: An Infinitesimal Approach. H. Jerome Keisler, revised December 2013.
3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List): - http://faculty.ncu.edu.jm/hforbes/MATHTMETHODS.pdf
4- Electronic Materials, Web Sites etc. - http://www2.rps205.com/Parents/Academics/Learning/Science/Pages/Physics-First.aspx - http://www-math.mit.edu/~djk/calculus_beginners/ - http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx
5- Other learning material such as computer-based programs/CD, professional standards/regulations: Wikipedia. http://en.wikipedia.org/wiki/calculus

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) Audio-visual equipment for teaching (projector, microphones, speakers, board.
2. Computing resources: None.
3. Other resources (specify –e.g. If specific laboratory equipment is required, list requirements or attach list) None.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching: Evaluation questionnaires of the staff at the end of the semester.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department:

None.

3. Processes for Improvement of Teaching:

Reviewing and implementing appropriate changes in the course based on the student feedback and evaluations.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution):

None.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

Regular meeting with the staff to review the course effectiveness.

Course Description

4800141 – 4 Introduction to Mathematics (II)

Institution: Umm Al-Qura University.
College/Department: Preparatory Year Deanship, Natural Sciences Department.

A. Course Identification and General Information:

1. Course title and code: Introduction to Mathematics (II), 4800141 - 4
2. Credit hours: 4 credit hours - "2nd Term (Semester) = 4 cr. hrs."
3. Program(s) in which the course is offered. - Preparatory year Scientific Track - Preparatory year Administrative Track - Engineering and sciences students
4. Name of faculty member responsible for the course: Members of staff
5. Level/year at which this course is offered: Preparatory year
6. Pre-requisites for this course (if any): 4800140 – 4 Introduction to Mathematics (I)
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main Campus
9. Lectures: 60 contact hours
10. Practical section: None

B. Objectives:

1. Summary of the main learning outcomes for students enrolled in the course.

This course aim to develop the skills of students in the art of integration. This is easily achievable by recalling previous knowledge gained from Calculus (I). Thus in this course, special techniques are introduced that will make integration more of a routine than a guess work.

By the end of the course the students will be able to:

- Compute numerically the area under a curve.
- Evaluate definite integrals.
- Evaluate indefinite integrals.
- Evaluate integrals involving trigonometric functions such as sinx, cosx, tan x, cotx, cosecx and secx.
- Evaluate integrals involving rational functions.
- Evaluate integrals involving product functions.
- Obtain reduction formula for certain categories of functions.
- Compute area bounded by two intersecting curves.
- Compute the volumes of solid of revolution.
- Find the distance traveled by a moving object with a constant.
- Compute the work done by compressing or stretching a spring.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg. increased use of IT or web based reference material, changes in content as a result of new research in the field).

- Continues updating for content of lectures as a result of recent achievements and researches in the field.
- Encouraging the students to deal with electronic books, as they are using many web based reference material and by providing them with continues update for information.
- Trying to Decrease the direct theoretical teaching load of the course and putting more time for explaining correlations and student-directed learning sessions and seminars.
- Planning for elective self-studies in the course to encourage students to engage in depth study of areas of interest.
- More efforts will be exerted to develop and improve the course to enable the student to clearly understand the Calculus basis.

C. Course Description:

1. Topics to be Covered:			
Week #	**Ses #**	**Activities**	**Topics**
1	1	Class	Review of Calculus (I).
	2	Class	Antiderivatives.
	3	Problem solving	REVIEW & SUMMARY & PROBLEMS.
2	4	Class	The Definite Integral.
	5	Class	The first Fundamental Theorem of Calculus.
	6	Problem solving	REVIEW & SUMMARY & PROBLEMS.
3	7	Class	The second Fundamental Theorem of Calculus and the method of substitution.
	8	Class	The Natural Logarithm Functions.
	9	Problem solving	REVIEW & SUMMARY & PROBLEMS.
4	10	Class	Inverse Functions and Their Derivatives.
	11	Class	The Natural Exponential Function.
	12	Problem solving	REVIEW & SUMMARY & PROBLEMS.
5	13	Class	General Exponential and Logarithmic Functions.
	14	Class	The Inverse Trigonometric Functions.
	15	Problem solving	REVIEW & SUMMARY & PROBLEMS.
6	16	Class	The Hyperbolic functions and their Inverses.
	17	Class	Basic Integration Rules.
	18	Problem solving	REVIEW & SUMMARY & PROBLEMS.
7	19	Class	Integration by Parts.
	20	Class	Some Trigonometric Integrals.
	21	Problem solving	REVIEW & SUMMARY & PROBLEMS.
8	23	Class	Rationalizing Substitutions.
	24	Class	Integration of Rational Functions Using Partial Fractions.

	25	Problem solving	REVIEW & SUMMARY & PROBLEMS.
	26	Class	Midterm Exam.
9	27	Class	Indeterminate Forms of Type $(\frac{0}{0})$.
	28	Class	Other Indeterminate Forms.
	29	Problem solving	REVIEW & SUMMARY & PROBLEMS.
10	30	Class	Improper Integrals "Part 1".
	31	Class	Improper Integrals "Part 2".
	32	Problem solving	REVIEW & SUMMARY & PROBLEMS.
11	33	Class	Infinite Limits of integration.
	34	Class	Infinite Limits of integration.
	35	Problem solving	REVIEW & SUMMARY & PROBLEMS.
12	36	Class	Infinite Integrands.
	37	Class	Infinite Integrands.
	38	Problem solving	REVIEW & SUMMARY &PROBLEMS.
13	39	Class	The Area of a Plane Region.
	40	Class	Volumes of Solids: Slabs, Disks & Washers.
	41	Problem solving	REVIEW & SUMMARY & PROBLEMS.
14	42	Class	Revision.
	43	Final exam	

2. Course components (total contact hours per semester):				
Lecture: 60.	Tutorial: 15.	Laboratory:….	Practical/Field work/Internship:	Other……

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week):

There is no scheduled private study/ learning hours but the students can directly contact the lecturer during his office hours.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge:

(i) Description of the knowledge to be acquired:

At the end of this course, the students are expected to be able to:

- Develop the skills in the art of integration. This is easily achievable by recalling previous knowledge gained from Calculus (I). Thus in this course, special techniques are introduced that will make integration more of a routine than a guess work.

  Also;
- Subject taught using the TEAL (Technology Enabled Active Learning) studio format which utilizes small group interaction and current technology to help students develop intuition about, models of problems.

(ii) Teaching strategies to be used to develop that knowledge:

The knowledge is given in form of lectures. Each lecture is accompanied by an assigned reading which is important for mastering the learning objectives. The strategies include:

- Provide clear and informative lecture notes with learning objectives that focus on important points.
- Give clear, informative, and stimulating 50-minute lectures with PowerPoint or other visual electronic aids to enhance the learning experience for students.
- Answer questions either in or outside class or via e-mail or telephone.
- Compose thoughtful and fair exam questions that assess student learning and application of the course content.
- Directing the case sessions and facilitators to provide an effective learning experience in small group, team-oriented sessions.
- Providing answers and explanations to student inquiries regarding any aspect of the course.
- Providing advice and assistance to students for improving their learning strategies and performance in the course.
- Reviewing and implementing appropriate changes in the course based on student feedback and evaluations.

Also;

Written Homework

There will be one homework handed in on paper each week. To receive full credit for your hardcopy homework handed in, you must prepare and submit lucid and clearly reasoned written solutions. These problems will be graded and returned.

In-class Group and Personal Assignments

In almost all classes, individuals and groups will submit answers to questions about desktop experiments done in class, material covered in the lecture in that class, and so on. You must be present in class to receive credit for assignments submitted either by you or by your group.

Group Work

You will be assigned to a group of three for collaborative work. Your group assignment will be announced near the beginning of the term. If you are not satisfied with the way your group is working, first try to discuss it with your group members. If you cannot arrive at a satisfactory solution, then discuss the problems with your instructor.

Tests

There is tests will be given. There will be Midterm and Final exams in the course. The final will be a comprehensive exam and will cover all of the subject material, also Quizzes and Problem sets.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Ask the student to clear the misunderstanding of some Math principles.
- Discussions with the students, and ask quality question.
- Exams:
  a) Quizzes
  b) Short exams (Mid Term Exam).
  c) Long exams (Final Exam).

TASKS	**WEIGHTS**
Problem sets (Quizzes + Exams).	20 %
Midterm Exam.	20%
Final Exam.	60%
Total	100 %

A	Excellent	90 -100
B	Very good	80 – 89
C	Good	70 – 79
D	Pass	60 – 69
F	Fail	59 and below

b. Cognitive Skills

(i) Cognitive skills to be developed:

The course has an aim to improve the ability in the following cognitive skills:

- How to use laws and principles of Math to understand the subject.
- How to simplify problems and analyze it.
- Ability to explain the idea with the student own words.
- Represent the problems mathematically.

Also to develop;

- Effective Learning skills.
- Problem solving skills.
- Self assessment and development.
- Reading and searching.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Preparing, and arrange main outlines for teaching.
- Homework assignments.
- Ask the student to do small research by using different references.
- Reading the problems carefully.

(iii) Methods of assessment of students cognitive skills:

Those skills can be assessed by:

- Improvement in the overall performance of the student in consequent examinations during the course.
- Interaction of the course and its effect on other courses offered for the students, which can be measured by their feedback.
- Also;

- Midterm Exam, Exams.
- Continuous assessment (short quizzes).
- Homework.

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

The course has an aim to improve the ability in the following interpersonal skills and responsibilities:

- Work independently.
- The students learn independently and take up responsibility.
- Following the learner manners and ethics including; commitment, respect and communication with confidence.

(ii) Teaching strategies to be used to develop these skills and abilities

Students are expected to:

- Learn how to search on the internet and use the library.
- Learn how to cover missed lectures.
- Learn how to summarize lectures or to collect materials of the course.
- Learn how to solve difficulties in learning: solving problems – enhance educational skills.
- Develop the interest in Math.
- Encourage the student to attend lectures regularly by:
  - Giving bonus marks for attendance
  - Assigning marks for attendance.
  - Give students tasks of duties.

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Those skills are reflected on the student behaviour inside and outside the class. It can be assessed by the feedback from the lecturer regard the student's interaction and

behaviour.

Also;

- Quizzes.
- Discussion
- Homework.
- Presenting the required research on time and the degree of the quality will show the sense of responsibility.

d. Communication, Information Technology and Numerical Skills

5- Description of the skills to be developed in this domain.

The course has an aim to improve the ability in the following Information Technology and Numerical Skills:

- Computation and designing presentations.
- Problem solving.
- Data analysis and interpretation.
- Enhance the ability to use the search engines.

(ii) Teaching strategies to be used to develop these skills, give the students tasks in:

- Know the basic mathematical principles.
- Use the web for research.
- Discuss with the students.
- Exams to measure the mathematical skill.
- Clear the weakness point that should be eliminated.
- Encourage the student to ask for help if needed.
- Encourage the student to ask good questions to help solve the problem.
- Display the lecture note and homework assignment at the web.

(iii) Methods of assessment of students numerical and communication skills

Those skills can be predicted by:

- Their interaction with the lectures and discussions.
- The reports of different asked tasks.
- Homework, Problem solutions assignment and exam should focus on the understanding.
- Results of computations and analysis.
- Comments on some resulting numbers.
- Research.

e. Psychomotor Skills:

(i) Description of the psychomotor skills to be developed and the level of performance required:

Contributions in the improvement of Math education level.

(ii) Teaching strategies to be used to develop these skills

1. Provide the role and the fundamental of Calculus for students.
2. Develop basic skills and techniques for the study of Math.

(iii) Methods of assessment of students' psychomotor skills:

It is not included in the overall assessment of the students.

5. Schedule of Assessment Tasks for Students During the Semester.

Assessment	Assessment task (eg. tests, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Problem sets (Quizzes +Homework).	Around the semester.	20 %
2	Midterm Exam.	8	20%
3	Final Exam.	16	60 %
Total Assessment		100%	

D. Student Support

1. Arrangements for availability of teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

The student has the right to contact the lecturer or coordinators by their e-mails or during their office hours for academic advices or consultations.

E- Learning Resources

1. Required Text(s)

- Calculus (Ninth Edition) by Dale Varberg, Edwin Purcell and Steven Rigdon, 2007.

2. Essential References;

- Introduction to Integration. Evan Dummit, 2012.

3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List):

- http://faculty.ncu.edu.jm/hforbes/MATHTMETHODS.pdf

4-.Electronic Materials, Web Sites etc.

- http://www2.rps205.com/Parents/Academics/Learning/Science/Pages/Physics-First.aspx
- http://www-math.mit.edu/~djk/calculus_beginners/
- http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx

5- Other learning material such as computer-based programs/CD, professional standards/regulations:
Wikipedia.

- http://en.wikipedia.org/wiki/calculus

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)
Audio-visual equipment for teaching (projector, microphones, speakers, board.

2. Computing resources:
None.

3. Other resources (specify –e.g. If specific laboratory equipment is required, list requirements or attach list) None.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching: Evaluation questionnaires of the staff at the end of the semester.
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department: None
3. Processes for Improvement of Teaching: Reviewing and implementing appropriate changes in the course based on the student feedback and evaluations.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution): None.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Regular meeting with the staff to review the course effectiveness.

800201-4 (Engineering Mathematics I) Syllabus - Part 1

General Information

Course Number	800201-4
Credit Hours	4/0/4 (Theory credit hours = 4; Lab. credit hours = 0; Total credit hours = 4)
Prerequisites	Not specified.
Course Coordinator	Not specified.

Course Objective

The aims of this course are provide the student with good knowledge and understanding of the basic concepts and theorems on ordinary differential equations (ODEs) and some effective methods of solutions (Laplace transform). Also, to formulate the mathematical model of the engineering problem from its physical phenomena and then apply the methods of solution to find the real response. Finally, to make the student manipulate complex numbers with confidence; understand geometrically their representation on the Argand diagram including the nth roots of unity, know the polar representation form and be able to apply it.

Catalog Description

Engineering Mathematics is a course that introduces the basic theorems and knowledge of the ordinary differential equations with its different methods of solutions and some engineering applications.

Course Contents

Complex numbers: complex plane, real and imaginary parts, modulus and argument, complex conjugate, addition, multiplication, division, De Moivre's theorem; the roots of unity, addition formulae for cosine and sine - Homogeneous second order ordinary DEs - Ordinary Differential Equations: First order DEs, Exact DEs, DEs reducible to exact, linear DEs and Bernoulli DEs, modeling of LR-electric circuits, orthogonal trajectory, civil engineering application - modeling of free oscillations of spring mass system - Non-homogeneous second order ordinary Des: Wronskian and the undetermined coefficient method, the variation of parameter method, modeling of forced oscillation and LRC-electric circuits - Laplace transform (LT): Introduction, linearity, first shift. Second shift, multiplication by t and division by t, inverse LT, Heaviside theorem, convolution theorem, unit step and Dirac-Delta function, applications on Initial value problems (IVP) and systems of such equations - Double integrals, surface integrals, triple integrals, applications (area, mass, moment of inertia, center of gravity) - Line Integrals, relation between line integrals and double integral, green's theorem, conditions for a line integral to be independent of the path, applications

Text Book

Not specified.

Reference Material

Not specified.

800201-4 (Engineering Mathematics I) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Ability to classify the different types of ODEs.
2	Ability to find the general, particular and the singular (if exist) solutions of different types of ODEs.
3	Generate the mathematical model from the physical phenomena and then solve it.
4	Use these knowledge, theorems and methods in other engineering courses.

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0

Approvals

Prepared by	Not specified.
Approved by	Not specified.
Last Update	Not specified.

800202-4 (Engineering Mathematics (2)) Syllabus - Part 1

General Information

Course Number	800202-4
Credit Hours	4/0/4 (Theory credit hours = 4; Lab. credit hours = 0; Total credit hours = 4)
Prerequisites	Not specified.
Course Coordinator	Not specified.

Course Objective

The aims of this course are to provide the student with good knowledge and understanding of the basic concepts and theorems on linear algebra of matrices (especially in solving system of algebraic equations with some effective methods of solutions), special functions (Gamma, Beta and Bessel functions). Also, a Fourier analysis with applications on partial differential equations (Heat, wave and potential partial differential equations).

Catalog Description

Engineering Math.-2 is a course that introduces the basic concepts, theorems and knowledge of the linear algebra of matrices, special functions, Fourier analysis and partial differential equations.

Course Contents

Not specified.

Text Book

Not specified.

Reference Material

Not specified.

800202-4 (Engineering Mathematics (2)) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Classify the different types of linear systems of linear algebraic equations.
2	Solve all integrals that related to Gamma, and Beta functions.
3	Expand a piece-wise continuous functions in Fourier series, Fourier sine series and Fourier cosine series.
4	Solve PDEs (especially heat, wave and potential partial differential equations) using Fourier and some other methods.

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	0	0	0	0	0	0	0	0	0
CLO 3	1	0	0	0	0	0	0	0	0	0	0
CLO 4	1	0	0	0	0	0	0	0	0	0	0

Approvals

Prepared by	Not specified.
Approved by	Not specified.
Last Update	Not specified.

804343-3 (Engineering Statistcis and Propability Theory) Syllabus - Part 1

General Information

Course Number	804343-3
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	800201-4
Course Coordinator	Prof. Dr. Hamdy Youssef

Course Objective

1.Perform descriptive statistics calculations and present results in different graphical formats including probability densities.
2.Understand and Perform basic probability theorems calculation including Bayes' theorem.
3.Understand and Perform probability calculations for discrete probability density functions including Binomial, Hypergeometric, Poisson, Geometric, Multinomial and Chebyshev's theorem.
4.Understand and Perform probability calculations for continuous probability density functions including Normal, Uniform, Lognormal, Gamma, exponential, Beta. Perform calculations for the sampling distribution of the mean (central limit theorem) and the variance (χ2 and F distributions).
5.Understand and perform calculations for parameter estimation, Type I and II errors, hypothesis testing, OC curves, simple linear regression and correlation and be able to collect real life data, perform statistical analysis, convert and perform appropriate probability calculations for system design applications.

Catalog Description

Frequency distributions. Graphs of frequency distributions. Descriptive measures. Calculations for central tendency and variability. Sample space and events. Counting. Axioms of probability. Elementary probability theorems. Conditional probability. Bayes' theorem. Mathematical expectations. Discrete random variables. Probability distribution functions. Cumulative distribution functions. Binomial distribution. Hypergeometric distributions. Mean and variance of a probability distribution. Chebyshev's theorem. Poisson distribution. Multinomial distribution. Continuous random variables. Normal distribution. Uniform, lognormal, gamma, exponential, beta and weibull probability distributions. Joint probability densities. Population and samples. Sampling distribution of the mean. Central limit theorem. Sampling distribution of the variance. Point and interval estimation. Test of hypothesis. Probability of Type I and Type II errors. Hypothesis concerning one and two means. Operating characteristics curves. Method of least squares. Inference based on least square methods. Correlation.

Course Contents

Not specified.

Text Book

Miller & Freund's Probability and Statistics for Engineers, 8/E, Prentice Hall, 2011, ISBN-13

Reference Material

Miller & Freund's Probability and Statistics for Engineers, 8/E, Prentice Hall, 2011, ISBN-13

804343-3 (Engineering Statistcis and Propability Theory) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Perform descriptive statistics calculations and present results in different graphical formats including probability densities.
2	Understand and Perform basic probability theorems calculation including Bayes' theorem.
3	Understand and Perform probability calculations for discrete probability density functions including Binomial, Hypergeometric, Poisson, Geometric, Multinomial and Chebyshev's theorem.
4	Understand and Perform probability calculations for continuous probability density functions including Normal, Uniform, Lognormal, Gamma, exponential, Beta. Perform calculations for the s
5	Understand and perform calculations for parameter estimation, Type I and II errors, hypothesis testing, OC curves, simple linear regression and correlation and be able to collect real life data, per

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	0	0	0	0	0
CLO 2	1	0	1	0	0	0	0	0	0	0	1
CLO 3	0	0	0	0	1	0	0	0	0	0	1
CLO 4	1	1	0	0	1	0	1	0	0	0	1
CLO 5	1	1	0	0	1	0	1	0	0	0	1

Approvals

Prepared by	Miller & Freund's
Approved by	Not specified.
Last Update	1436/1437

804344-2 (Engineering Economics) Syllabus - Part 1

General Information

Course Number	804344-2
Credit Hours	2/0/2 (Theory credit hours = 2; Lab. credit hours = 0; Total credit hours = 2)
Prerequisites	Level 6
Course Coordinator	Dr. Mohamed Al Alashhab

Course Objective

Students completing this course will be able to:

1.Understand the fundamentals of engineering economy,
2.Draw the cash-flow diagrams
3.Identify and Compare different interest rates i.e., simple, compound, MARR, ROR, nominal and effective.

Catalog Description

This course consists of fundamentals of engineering economy, the basic principles of the time value of money, drawing the cash-flow diagrams different interest rates i.e., simple, compound, MARR, ROR, nominal and effective, comparing economic alternatives based on equivalent present worth (PW), future worth (FW), annual worth (AW), Using of depreciation methods related to machines/projects and Performing replacement and breakeven analysis.

Course Contents

1-Foundation of Engineering Economy
2-Factors
3-Present, Future and Annual worth Analysis
4-Comparing Alternatives

Text Book

Basics of Engineering Economy

Reference Material

Lectures Notes

804344-2 (Engineering Economics) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Performing AW, FW, and AW analysis
2	Comparing economic alternatives
3	Performing replacement studiy
4	Calculating depreciation methods related to machines/projects
5	Performing breakeven analysis

CLO-SO Map

	SO IDs										
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	0	1	0	0	0
CLO 2	0	0	0	0	1	0	0	0	0	0	0
CLO 3	0	0	0	0	1	0	0	0	0	0	0
CLO 4	0	0	0	0	1	0	0	0	0	0	0
CLO 5	0	0	0	0	1	0	0	0	0	0	0

Approvals

Prepared by	Dr. Mohamed Al Alashhab
Approved by	Dr. Motaser Tahat
Last Update	10-2015

Learning and Study Skills 4800104-3

Course Title	Learning and Study Skills		
Course Number	4800104-3	Credit Hours	3 hours
Prerequisites	None	Contact Hours	6 hours

Course Description:

This course seeks to develop students understating of higher education, further increase their performance, foster their self-motivation, develop their research skills, and train them on important university life skills, e.g. managing time and priorities. The course expands student's knowledge of the basics of university life success. It develops skills of coexistence with others, negotiation and management of differences. In addition, it promotes communication skills and helps students attain maximum self-sufficiency. Furthermore, the course trains students in constructive discussion and debate and teaches them how to write curriculum vitae (CV) and other skills that can better set them to compete.

Major Topics Covered in the Course:

- Methods of success and obstacles to adapt to everyday stress of university life.
- The concept of thinking and its characteristics, thinking patterns, and programs of multiple intelligences.
- The concept of scientific research and its methods and tools. This includes needed skills for writing a good scientific research paper.
- Communication skills.
- Knowledge process skills.
- Entrepreneurship and innovation.
- Coexistence skills, negotiation skills, and difference management skills.
- Motivation and self-motivation strategies, time management skills.
- CV writing skills, and the ability to conduct effective and successful interviews.

Textbooks / References / Web Sites / Journals:

- ***The course textbook is prepared by the faculty section staff, titled "Active learning skills".***

Essential References:

- ***Edward de Bono;*** *translation by Dina Omar Faidi. & Abdul Hakim Al-Safi, Cort program to teach thinking. Amman. Dar Al Fekr for publication and distribution. 2008.*
- ***Khalid Mohammed Al-Maghamessy****: Dialogue and its Arts, Applications in Education. King Abdul Aziz Centre for National Dialogue. Riyadh. 1430.*
- ***Mohammed Al-Sayed Al-Habet****: Adaptation and Mental Health. Cairo. Modern University Office. 2003.*

Recommended Books and Reference Material (Journals, Reports, etc.)

- Journal of Modern Education.
- Journal of Science Education.
- Science magazine in Arabic.
- Gulf Arab Scientific Research magazine.
- Human Development magazine.
- Curricula and Methodology magazine.
- King Fahd National Library.

Electronic Materials, Web Sites etc.:

- *http://www.agu.edu.bh/AGJSR/journal_rules.aspx*
- *http://sciarab.org/*
- *http://academic.research.microsoft.com/*
- *http://www.kfnl.gov.sa/Ar/Pages/default.aspx*
- *http://scholar.google.com/*

Computer Skills 4800150-2

Course Title	**Computer Skills**		1435/1434
Course Number	4800150-2	Credit Hours	2 credit hours.
Prerequisites	None.	Contact Hours	4 hours.

Course Description:

This course is provided to Preparatory Year students all Tracks, in order to achieve the following learning outcomes:

- To understand basic computer components.
- To be able to use and search through the Internet.
- To be able to use windows 7.
- To be able to type papers and reports using MS-Word 2010.
- To be able to create charts and analyze data using MS-Excel 2010.
- To be able to create presentation using MS-Power point 2010.

Major Topics Covered in the Course:

- Basic computer components.
- Computer Networks.
- Introduction to Internet.
- Windows 7.
- MS-Word 2010.
- MS-Excel 2010.
- Computer Graphics (MS-PowerPoint 2010).

Textbooks / References / Web Sites / Journals:

- **Computer Skills, by Khawarizm Academic – Arabic/English.**
- **Computer are your Future 12th edition (eText on PEARSON)** , by Catherine LaBerta.
- **Exploring Microsoft Office 2010 (Volume 1 &2),** by MaryAnne Poatsy, Keith Mulbery, Cynthia Krebs, Lynn Hogan, Amy M. Rutledge, Robert T. Grauer.

Essential References:

- "GO! With Concepts Getting Started", by Shelley Gaskin, Victor Giol.
- http://www.ualr.edu/gblane/cpsc1370/links.htmlx

Electronic Materials, Web Sites etc.:

- http://www.tutorialspoint.com/listtutorials/computer-basics/1
- http://plato.stanford.edu/entries/ethics-computer/
- http://www.electricteacher.com/tutorials.htm
- http://wordprocessing.about.com/cs/introtowor1/a/wordoutline.htm
- http://www.lynda.com/Excel-training-tutorials/192-0.html
- http://www.tutorialspoint.com/listtutorials/windows/1
- http://chandoo.org/wp/excel-basics/
- http://www.tutorialspoint.com/listtutorials/ms-excel/1
- http://www.tutorialspoint.com/listtutorials/ms-powerpoint/1
- http://www.ualr.edu/gblane/book/GO_Computer_Concepts.pdf

Recommended Books and Reference Material (Journals, Reports, etc.)

- Massive Open Online Courses.
- Edx.
- Coursera.

Computer Programming Skills 4800153-3

Course Title	Computer Programming Skills.		
Course Number	4800153-3	Credit Hours	3 credit hours.
Prerequisites	Computer Skills 4800150-2	Contact Hours	4 hours.

Course Description:

This course is provided to Preparatory Year students all Tracks, in order to achieve the following learning outcomes:

- Do conversion of number systems.
- Acquire an introductory knowledge of problem solving and a sound knowledge of basic computer programming concepts.

Major Topics Covered in the Course:

- Introduction to Information Technology and computer architecture.
- Numbering Systems (Decimal, Binary, Hexadecimal, and Octal).
- Conversion between numbering systems; data representation and coding.
- Arithmetic operations in Binary System (Addition, Subtraction).
- General Problem Solving Concepts, Introduction to Programming and Programming Languages (C language).
- Beginning Problem Solving Concepts for the Computer Programming, Problem Solving Tools
- The formal definition of an Algorithm; representing Algorithms; the efficiency of Algorithms; Analysis of Algorithms.
- Fundamentals of writing code, compilation, and execution
- Basic types, variables, assignment, expressions, comments, identifiers, constants
- Formatted Input/Output
- Logical expressions and selection structures
- Repetition and Loop Statements
- Arrays
- Functions

Textbooks / References / Web Sites / Journals:

- Brian W. Kernighan. 1988. "The C Programming Language" (2nd ed.). Prentice Hall Professional Technical Reference.
- 2. David A. Scanlan. 1989. "Structured Flowcharts Outperform Pseudocode: An Experimental Comparison". IEEE Softw. 6, 5 (September 1989), 28-36.
- 3. John C. Mitchell. 1996. "Foundations of Programming Languages". MIT Press, Cambridge, MA, USA.
- 4. Ravi Sethi. 1989. "Programming Languages: Concepts and Constructs". Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.

Electronic Materials, Web Sites etc.:

- http://www.robotroom.com/NumberSystems.html
- http://www.rapidtables.com/math/number/Numeral_system.htm
- http://www.math.grin.edu/~rebelsky/Courses/152/97F/Readings/student-binary
- www.cimt.plymouth.ac.uk/projects/mepres/book9/bk9_1.pdf
- http://cprogrammingexpert.com/
- http://www.cprogramming.com/tutorial/c-tutorial.html
- http://www.learn-c.org/
- https://www.edx.org/course/introduction-to-computer-science-harvardx-cs50x

Recommended Books and Reference Material (Journals, Reports, etc.)

- Massive Open Online Courses.
- Edx.
- Coursera.

4800170 (English Language) Syllabus - Part 1

General Information

Course Number	4800170
Credit Hours	3/0/3 (Theory credit hours = 3; Lab. credit hours = 0; Total credit hours = 3)
Prerequisites	Not specified
Course Coordinator	Not specified

Course Objective

Build students' confidence and motivation through exposure to a wide range of universal topics selected from a wide variety of materials.Provide English Language instruction to enhance students' proficiency and enable them to understand and use four language skills of grammar, Oral Communication, Reading, and Writing. Enhance use of everyday English to practice functional language skills and social interaction.

Catalog Description

Not specified

Course Contents

READING COMPREHENSION: Simple mathematical concepts, simple scientific topics. Exercises for the three levels from very simple to advance. - Reading texts for technical terms, fill in the blanks, choose the best answers and answer simple comprehension questions. - WRITING: Writing simple and compound sentences about numbers, expressions, figures and shapes, Describe forces energy and graphical concepts in simple sentences, Translate tree diagrams and tables into simple sentences, Describe fully labeled diagrams into sentences, Answer simple questions about visual presentation in sentences, Write short paragraph about instruments and simple processes (devices). - LECTURE & NOTE-TAKING: Listening and note-taking skills through simple to medium level oral texts from Engineering and Islamic Architecture

Text Book

Not specified

Reference Material

Not specified

4800170 (English Language) Syllabus - Part 2

Course Learning Outcomes

	Course Learning Outcome (CLO)
1	Ability to cmprehend simple to advance level mathematical and scientific topics
2	Ability to write about numbers, expressions, figures and shapes and technical diagrams and tables
3	Ability to take notes by listening to lectures of engineering and architecture

CLO-SO Map

	SO IDs									
CLO ID	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CLO 1	0	0	0	0	0	0	1	0	0	0	0
CLO 2	0	0	0	0	0	0	1	0	0	0	0
CLO 3	0	0	0	0	0	0	1	0	0	0	0

Approvals

Prepared by	Not specified
Approved by	Not specified
Last Update	Not specified

Umm Al-Qura university

Deanship Of Preliminary Year

جامعة ام القرى

عمادة السنة التحضيرية

Course Description for Technical English

Preparatory Year Program (PYP) – 2011/2012

Introduction

This is an ESP (English for Specific Purposes) course which runs in the second semester of every year beginning in February. We use a professional careers curriculum provided by Oxford University Press consisting of two textbooks: Technology 1 and Technology 2. The goal of these ESP levels is to focus on the functional language needed in order to succeed in university in their specific program of choice. Overall, *Technology* 1 and 2 gives students the language, information, and skills needed for their university program of study. It presents them with English from a variety of technological fields and situations, and develops their communication skills.

Course Details

Course Code:	4800171-4
Course Duration:	1 Semester (16 weeks)
Contact Hours:	16 hrs per week (256 hours per semester)
Credit Hours:	4.0

Prerequisite

English for General Purposes (EGP) – 4800170-6

Course Objectives

1. To Provide ESP instruction to enhance students' reading and writing in order to provide practice & interest in the language.

2. To prepare students to sit for assessments and evaluations such as tests and quizzes in order to test and revise proper acquisition of the English language.

3. To build students' confidence and motivation through exposure to facts, figures, quotations, and the latest technological innovations so to generate interest in the language from an ESP perspective.

4. To allow students to gain key strategies and expressions for communicating with professionals and non-specialists.

Course Description

This is an ESP course for students studying in Umm Al-Qura University, especially in the Engineering College. Key features are language skills development focus, a task-based approach, fifteen units each of Technology 1 and Technology 2 covering a wide range of authoritative integrated syllabi. These integrated levels are adopted for the Middle East and includes an audio-CD and a teacher's book which provides opportunities for further listening in the lass in dealing with oral and written instructions. The following core language elements have all been integrated into a single curriculum by Oxford University Press.

Core English Elements

1. Grammar – Students will learn basic forms of English grammar including simple and progressive verb tenses, parts of speech, and prepositions. Students will practice these structures through communicative and functional activities.

2. Oral Communication – Through listening comprehension and oral performances, students will practice their communication skills. Students will learn to comprehend the main ideas in short passages, listen for specific details, engage in short conversations, report personal information and express opinions.

3. Reading Skills – Emphasis will be on vocabulary growth, comprehension and expression of the main idea. Students will develop study and reading skills such as pre-reading.

4. Writing Skills – Emphasis will be on the development of sentence structure and sentence variety to the paragraph level. Students will also be introduced to the paragraph form, including expression of the main idea in technical sentences.

Teaching Facility

The Preparatory Year (PY) at Umm Al-Qura University uses a number of language laboratories enhanced with audio-visual systems used as aids in learning the four language skills. Each student in a lab has access to a flat screen monitor, desk-top computer set and a set of

microphones. The teachers' position is electronically connected to the student's carrels, containing a student headset with a microphone to ensure proper communication between the instructor and the students. The purpose of these labs is to benefit the students with their study of the English language and to build their confidence in using the language in order to prepare them for their professional studies and for competitive assessments and evaluations.

Exam Committee

The Exam Committee at the English Language Centre (ELC) organizes and coordinates all mid-term and final exams. Faculty and students can turn to the Exam Committee regarding the execution of the rules and regulations as stipulated in the official rules and regulations put forward by the ELC.

Learning Strategies

- ✓ Lectures
- ✓ Discussions
- ✓ Group Interaction
- ✓ Self-Learning

Assessment Tools

- ✓ Class participation
- ✓ Short quizzes
- ✓ Midterm Exam
- ✓ Final Exam
- ✓ Presentations

Assessment & Evaluation

The final course mark will be based on the following three major assessments. The assignments for the course are included within the course work.

Course Work	20%
Mid-Term Test	30%
Final Exam	50%
---	---
Total Mark	100%

Unit Titles for Technology 1 and 2

Technology 1

Unit 1: Technology and Society
Unit 2: Studying Technology

Unit 3: Design
Unit 4: Technology in Sport
Unit 5: Appropriate Technology
Unit 6: Crime Fighting and Security
Unit 7: Manufacturing
Unit 8: Transport
Unit 9: High Living: Skyscrapers
Unit 10: Medical Technology
Unit 11: Personal Entertainment
Unit 12: Information Technology
Unit 13: Telecommunications
Unit 14: Careers in Technology
Unit 15: The future of Technology

Technology 2

Unit 1: Ways in Technology
Unit 2: Food and Agriculture
Unit 3: Bridges and Tunnels
Unit 4: Plastics
Unit 5: Alternative Energy
Unit 6: Aeronautics
Unit 7: Future Homes
Unit 8: Mass Transportation
Unit 9: Petroleum Engineering
Unit 10: Environmental Engineering
Unit 11: Robotics
Unit 12: Household Technology
Unit 13: Defense Technology
Unit 14: Electronics
Unit 15: Career Development

Course Materials and Resources

Texts

- Glendinning, E. (2007). Technology 1 – Student's Book. Oxford University Press. Oxford, UK.
- Glendinning, E. (2007). Technology 2 – Student's Book. Oxford University Press. Oxford, UK.

Teacher's Book

- Glendinning, E. (2007). Technology 1 – Teacher's Book. Oxford University Press. Oxford, UK.

- Glendinning, E. (2007). Technology 2 – Teacher's Book. Oxford University Press. Oxford, UK.

CDs

- Technology 1 and Technology 2 Audio CDs.

Internet

- Additional readings are provided in all units located on the internet. Therefore, all students are advised to expand their language skills by searching links related to each unit topic.

Appendix B – Faculty Vitae

Abdellatif I M Semeia

Education – degree, discipline, institution, year:

- Ph.D. in Computer Engineering, Stevens Institute of Technology, Hoboken, NJ., 2002
- M.S. in Electrical Engineering, Al-AzharUniversity, Egypt, Cairo, 1993
- B.S. in Electrical Engineering, Al-AzharUniversity, Egypt, Cairo,1986

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Computer Engineering, Al-AzharUniv., Egypt, Cairo(2009-present)
- Assistant Professor, Computer Engineering, Al-AzharUniv., Egypt, Cairo (2003-2008)
- Member, Curriculum Revision Committee, Computer Engineering, Umm Al-Qura University, KSA, (2011-present)
- Chair, Capstone Project Committee,Computer Engineering, Umm Al-Qura University, KSA, (2011-present)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2006-present)
- Research Assistant, Electrical Engineering, Al-AzharUniv., Egypt, Cairo (1988-1996)
- Teaching Assistant, Electrical Engineering, Stevens Institute of Technology, Hoboken, NJ, USA, (1998-2001)
- *Supervised 7 Graduate Theses:*
  2 PhDs, 10 Masters
- *Thesis Committee Examiner:*
  1 PhDs,11Masters

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Senior System Engineering Consultant, Lucent Technologies (WaveStar program), USA (1997-2002), part time
- Senior System Engineering Consultant, Kamputech Technologies, USA (1997-2002), part time

Service activities (within and outside of the institution):

- Member of the editorial referees of KSU, TU, BU Journal – Computer and Information Sciences.
- Member of the MSc program committee of the College of Computer and Information Sciences.

Briefly list the most importantpublications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- A. I. Moustafa “Smart Parking/Leaving buses management system: Hajj journey case study” AEUC Dec. 23-25, 2014
- A. I. Moustafa On Coverage Determination and Exploiting Node Redundancy in Wireless Sensor Networks” International Journal of Application or Innovation in Engineering & Management (IJAIEM), Volume 3, Issue 11, November 2014, ISSN 2319 – 4847
- A. I. Moustafa “Timing Structure Mechanism of Wireless Sensor Network MAC layer for Monitoring Applications” International Journal of Distributed Systems and Technologies (IJDST), Volume 7, Issue 3 and article number 1, (230215-091244, July 2016.
- A. I. Moustafa “Designing a Channel Access Mechanism for Wireless Sensor Network” Wireless Communications and Mobile Computing Volume, Article ID 7493269, 31 pages, 2017

Conferences/Presentations:

- The 13th Scientific Symposium for Hajj research, The Custodian of the Two Holy Mosques Institute of Hajj Research, Umm AL-Qura University, KSA, 2013.

- A. I. Moustafa “Energy Aware Approach for Underwater Wireless Sensor Networks Scheduling: UMOD_LEACH” SCS-NCC’ 2018 21st Saudi Computer Society National Computer Conference Apr. 25 – 26, 2018

Briefly list the most recent professional development activities:
Chairman of committee on reviewing the Networks track of Master of Computer science and Engineering Program, College of Computers and Information Systems

Abdulaziz Miyajan

Education – degree, discipline, institution, year:

- Ph.D. in CSE. University of Connecticut, Storrs, CT 06269, USA. 2016
- M.S. in CSE. University of Connecticut, Storrs, CT 06269, USA. 2012
- B.S. in CE, Umm Al-Qura University, Makkah, Saudi Arabia, 2005

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Umm Al-Qura University (2016-present)
- Teaching Assistant, Umm Al-Qura University (2008-2016)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Network Engineer, Saudi Electricity Company, (2005-2008)

Current membership in professional organizations:

- Member, IEEE

Honors and awards:

- Best Paper Award in (ICCES) Conference (2015)

Service activities (within and outside of the institution):

- Member Advising Committee of the Collage of Computer and Information Systems

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

-

Abdulbasit Abid

Education – degree, discipline, institution, year:

- Ph.D. in Computer Engineering, John Moores University, Liverpool, UK, 2008
- M.S. in Computer Engineering, University of essex, Essex, UK, 2005
- B.S. in Electrical Engineering, Umm Al-Qura University, Makkah, KSA, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistance Professor, Umm Al-Qura University, KSA (2008-Present)

Service activities (within and outside of the institution):

- Curriculum committee member
- ABET steering committee member

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Abid A., (Feb. 2017) " FPGA Implementation for Fringe Pattern Demodulation Using the One-Dimensional Continuous Paul Wavelet Transform," International Journal of Engineering and Innovative Technology, Vol. 6, Issue 8, pp: 7-10.

- Abid A., (Jan. 2017) " FPGA Implementation for Fringe Pattern Demodulation Using the Two-Dimensional Modified Continuous Wavelet Transform," International Journal of Engineering and Innovative Technology,Vol 6, Issue 7, pp: 45-48.

- Miraoui M., El-etriby S., Tadj C., Abid A., "A Hybrid Context-Aware Services Adaptation for Smart Living Room," Intelligent Automation & Soft Computing, (2017).

- Miraoui M., El-etriby S., Abid A., Tadj C. "A Logic Based Context Modeling and Context Aware Services Adaptation for a Smart Office," International Journal of Advanced Studies in Computer Science and Engineering, Vol. 5, Issue 11 (2016), pp. 1-

- Miraoui M., El-etriby S., Abid A., Tadj C. "Agent-Based Context-Aware Architecture for a Smart Living Room," International Journal of Smart Home, Vol. 10, No. 5 (2016)

- Abid A., (July 2013) " FPGA Implementation for Fringe Pattern Demodulation Using the One-Dimensional Modified Morlet Wavelet Transform," International Journal of Engineering and Innovative Technology, Vol. 3, Issue 1, pp: 261-264.

Abdulghani Sayegh

Education – degree, discipline, institution, year:

- M.S. in Computer Engineering, King AbdulAziz University, JEDDAH, 2012
- B.S. in Computer Engineering, Umm AL-Qura University, MAKKAH, 2005

Academic experience:

- Teaching Assistant with Master Degree, Computer Engineering, Umm Al-Qura University (2018-present)
- Teaching Assistant, Computer Engineering, Umm Al-Qura University (2010-2017)
- Teaching Assistant, Computer Engineering, Technical College in MAKKAH (2005-2010)

Non-academic experience:

- Member in Committee of College Of Technology at MAKKAH (2013-present), part time

Honors and awards:

- **Second Honor Degree in B.S, Umm Al Qura University, MAKKAH (2005).**

Service activities (within and outside of the institution):

- None

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

-

Abdullah Baz

Education – degree, discipline, institution, year:

- Ph.D. in Electrical, Electronics, and Computer Engineering, Newcastle University, Newcastle Upon Tyne, UK, 2014
- M.S. in Communications and Signal Processing, Newcastle University, Newcastle Upon Tyne, UK, 2009
- B.S. in Electrical and Computer Engineering, Umm Al-Qura University, Makkah, Saudi Arabia, 2002

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- DSR Vice-dean for IT, Umm Al-Qura University, KSA, (2015-Present)

Current membership in professional organizations:

- Senior member, IEEE
- Review committee member, IEEE International Symposium on Circuits and Systems (ISCAS)
- Permanent member, technical committee of IEEE VLSI systems and applications
- Editorial board member, American Journal of Circuits, Systems and Signal Processing
- Editorial board member, Review of Control Theory and Informatics

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Adnan Gutub

Education – degree, discipline, institution, year:

- Ph.D. in ECE, Oregon State University; Corvallis, Oregon, USA, 2002
- M.S. in CE, KFUPM; Dhahran, Saudi Arabia, 1998
- B.S. in EE, KFUPM; Dhahran, Saudi Arabia, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Professor, Computer Engineering, Umm Al-Qura University, KSA (2016-Present)
- Vice Dean, Hajj Research Institute, Umm Al-Qura University, KSA (2014-2016)
- Associate Professor and Director, Center of Research Excellence in Hajj & Omrah, Umm Al-Qura University, KSA (2010-2013)
- Chairman, Computer Engineering, KFUPM (2005-2010)
- Coordinator (Acting Dean), College of Computer Sciences & Engineering (CCSE), KFUPM (2009)
- Researcher at Information Security Laboratory, Oregon State University; Corvallis, Oregon, USA (2000-2002)
- Sabbatical year in research collaboration with universities in USA (2017)
- Visiting scholar summer grant in collaboration with Purdue University, USA, (2015)
- Visiting scholar Term grant in collaboration with Purdue University, USA (2013)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Engineer/trainee, Saudi Arabian Marketing and Refining Company (SAMAREC) (1993)

Current membership in professional organizations:

- Certified in Design Thinking Strategy, 2012.
- Certified ISEF innovation Judge to evaluate gifted students Innovation Scientific Competition, 2013.
- Certified for Completion of the Junior Faculty Development Program at KFUPM, March 2007

Honors and awards:

- Summer British Council Grant for scientific research visit at University of Southampton, United Kingdom (2008)
- Summer British Council Grant for scientific research visit at Brunel University, London, United Kingdom (2005)
- Awarded as winner of first round MIT Arab Business Plan Competition (MIT-ABPC) (2009)

Service activities (within and outside of the institution):

- Member, UQU Deanship of Graduate Studies Council (2018)
- Member, UQU Scientific Council: (2018)
- Member, ABET steering committee, Computer Engineering Department, UQU (2017-2018)
- Member of External Advisory Board (EAB) for College of Information Technology and Computer Sciences (CITCS) - University of Prince Mugrin (UPM), Madinah (2017-2018)
- Member of External Advisory Board of Computer Program within the Community College at University of Dammam for three consecutive years: 2016-2018
- Member of organizing committee for Hajj Research forum arranged by UQU: 2010-2016
- Information Systems Security Assessment Framework (ISSAF) Certification, 2006
- Board Member of the Information Security Master Program at Umm Al-Qura University, Makkah, Saudi Arabia

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Salah Aly, Adnan Gutub, "Intelligent Recognition System for Identifying Items and Pilgrims", NED University Journal of Research - Thematic Issue on Advances in Image and Video Processing, ISSN: 2304-716X, Pages: 17-23, May 2018.
- Adnan Gutub, Nouf Al-Juaid, "Multi-Bits Stego-System For Hiding Text in Multimedia Images Based on User Security Priority", Journal of Computer Hardware Engineering, Vol. 1, No. 2, doi: 10.63019/jche.v1i2.513, EnPress Publisher, 2018.
- Mishal Almazrooie, Azman Samsudin, Adnan Gutub, Muhammad Syukri Salleh, Mohd Adib Omar, Shahir Akram Hassan, "Integrity verification for digital Holy Quran verses using cryptographic hash function and compression", Journal of King Saud University - Computer and Information Sciences, Published by Elsevier, Published online: 8 March 2018.
- Adnan Gutub, Nouf Al-Juaid, Esam Khan, "Counting-Based Secret Sharing Technique for Multimedia Applications", Multimedia Tools and Applications: An International Journal – Springer, ISSN 1380-7501, DOI 10.1007/s11042-017-5293-6, Published online: 2 November 2017.
- Nemshan Alharthi and Adnan Gutub, "Data Visualization to Explore Improving Decision-Making within Hajj Services", Scientific Modelling and Research, Vol. 2, No. 1, Pages: 9-18, DOI: 10.20448/808.2.1.9.18, 1 June 2017.
- Norah AlAssaf, Basem AlKazemi, Adnan Gutub, "Applicable Light-Weight Cryptography to Secure Medical Data in IoT Systems", Journal of Research in Engineering and Applied Sciences (JREAS), Vol. 2, No. 2, Pages: 50-58, April 2017.
- Safia Al-Nofaie, Manal Fattani, Adnan Gutub, "Merging Two Steganography Techniques Adjusted to Improve Arabic Text Data Security", Journal of Computer Science & Computational Mathematics (JCSCM), Vol. 6, No. 3, Pages: 59-65, DOI: 10.20967/jcscm.2016.03.004, Published by Science & Knowledge Research Society, September 2016.
- Esraa Ahmadoh and Adnan Gutub, "Utilization of Two Diacritics for Arabic Text Steganography to Enhance Performance", Lecture Notes on Information Theory, Vol 3, No. 1, Pages 42-47, June 2015.
- Sujeong Kim, Stephen J. Guy, Karl Hillesland, Basim Zafar, Adnan Abdul-Aziz Gutub, Dinesh Manocha, "Velocity-Based Modeling of Physical Interactions in Dense Crowds", The Visual Computer , Springer , 3 June 2014.

Ahmad Alzahrani

Education – degree, discipline, institution, year:

- Ph.D. in CE, University of Central Florida, Orlando, USA, 2015
- M.S. in CE, University of Arkansas, Fayetteville, USA, 2009
- B.S. in ECE, Umm Al-Qura University, Makkah, Saudi Arabia, 2002

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Umm Al-Qura University (2005-Present)
- Lecturer, Jeddah College of Technology (2002-2005)

Current membership in professional organizations:

- Member, IEEE
- Reviewer, IEEE Transactions on Computers Journal
- Reviewer, IEEE Transactions on Circuits and Systems II Journal
- Reviewer, ACM Transactions on Design Automation of Electronic Systems Journal
- Reviewer, IEEE International Midwest Symposium on Circuits and Systems (MWSCAS)

Service activities (within and outside of the institution):

- Member, curriculum committee
- Member, capstone projects committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- A. Alzahrani and R. F. DeMara, "Leveraging design diversity to counteract process variation: theory, method, and FPGA toolchain to increase yield and resilience in-situ," IET Computers and Digital Techniques, processed for publication in 2018.
- A. Alzahrani and R. F. DeMara, "Fast online diagnosis and recovery of reconfigurable logic fabrics using design disjunction," IEEE Transactions on Computers, vol. 65, no. 10, pp. 3055-3069, Oct 2016.
- A. Alzahrani and R. F. DeMara, "Hypergraph-cover diversity for maximally-resilient reconfigurable systems," in Proc. of IEEE 12th International Conference on Embedded Software and Systems (ICESS'15), New York, USA, pp. 1086-1092, Aug 2015.
- F. Alghareb ; R. Ashraf ; A. Alzahrani and R. F. DeMara, "Energy and delay tradeoffs of soft error masking for 16nm FinFET logic paths: survey and impact of process variation in near threshold region," IEEE Transactions on Circuits and Systems II, vol. 64, no. 6, pp. 695-699, June 2017.
- A. Alzahrani and R. F. DeMara, "Process variation immunity of alternative 16nm HK/MG-based FPGA logic blocks," in Proc. of IEEE 58th International Midwest Symposium on Circuits and Systems (MWSCAS'15), Fort Collins, CO, USA, pp. 129-132, 2015.
- R. Ashraf, A. alzahrani, N. Khoshavi, R. Zand, S. Salehi, A. Roohi, M. Lin,R. F. DeMara, "Reactive rejuvenation of CMOS logic paths using self-activating voltage domains," 2015 IEEE International Symposium on Circuits and Systems (ISCAS), Lisbon, Portugal, pp. 2944-2947, 2015.

Conferences/Presentations:

- R. Ashraf, N. Khoshavi, A. Alzahrani, R. F. DeMara, S. Kiamehr, and M. Tahoori, "Area-energy tradeoffs of logic wear-leveling for BTI-induced aging", in Proceedings of the ACM International Conference on Computing Frontiers (CF '16). ACM, New York, USA, pp. 37-44, 2016.

- A. Alzahrani and R. F. DeMara, "Non-adaptive sparse recovery and fault evasion using disjunct design configurations," in Proc. of 2014 ACM/SIGDA International Symposium on Field-Programmable Gate Arrays (FPGA'14), Monterey, CA, USA, Feb 2014.
- R. Ashraf, A. Alzahrani, and R. F. DeMara, "Extending modular redundancy to NTV: costs and limits of resiliency at reduced supply voltage," in Proc. of 2nd Workshop on Near-threshold Computing (WNTC'14) , Minneapolis, MN, USA, Jun 2014.
- C. Sharma, A. Sarvi, A Alzahrani, and R. F. DeMara, "Self-healing reconfigurable logic using autonomous group testing," Microprocessors and Microsystems, vol. 37, no. 2, pp. 174–184, 2013.

Briefly list the most recent professional development activities:

- Reviewer for the ACM Transactions on Design Automation of Electronic Systems (TODAES) journal.
- Reviewer for the IET Circuits, Devices & Systems journal.
- Reviewer for the The IEEE Transactions on Computers journal.
- Reviewer for The IEEE Transactions on Circuits and Systems—II journal.
- Reviewer for the Microprocessors and Microsystems journal.
- Reviewer foe The IEEE International Midwest Symposium on Circuits and Systems (MWSCAS).

Ahmad Muaz Qamar

Education – degree, discipline, institution, year:

- M.S. in CS, University of Southern California, Los Angeles, USA, 1998
- B.S. in CS, University of the Punjab, Lahore, Punjab, 1996

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, Umm al Qura University (2001-Present)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Software Developer, Al Thunayyan Company (1999-2001)
- Technical Support Expert, Optimax Solutions (1993-1996)

Current membership in professional organizations:

- ACM Member

Honors and awards:

- Best Demo Award Runner Up ACM SIGSPATIAL (2014)

Service activities (within and outside of the institution):

- Member, Summer Internship Committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Imad Afyouni, Faizan Ur Rehman, Sohaib Ghani, Ahmad Muaz Qamar, Syed Osama Hussain, Bilal Sadiq, Mohamed Abdur Rahman, Abdullah Murad, Saleh Basalamah, “A Therapy-Driven Gamification Framework for Hand Rehabilitation”, User Modeling and User-Adapted Interaction: The Journal of Personalization Research (UMUAI), June 2017, Volume 27, Issue 2, pp 215–265.
- Imad Afyouni, Faizan Ur Rehman, Ahmad Qamar, Akhlaq Ahmad, Mohamed Abdur Rahman, Sohaib Ghani, and Saleh Basalamah, “Gamifying hand physical therapy with intelligent 3D navigation”, ACM SIGSPATIAL Special 8, 1, Jun 2016, 42-49.
- Ahmad Qamar, Mohamed Abdur Rahman, Saleh Basalamah, "Adding Inverse Kinematics for Providing Live Feedback in a Serious Game-based Rehabilitation System", International Journal of Simulation, Systems, Science and Technology (IJSSST), Volume 15, No. 3, Page 215, June 2015.

Conferences/Presentations:

- Imad Afyouni, Ahmad Qamar, Syed Osama Hussain, Faizan Ur Rehman, Bilal Sadiq, Abdullah Murad 2016. Motion-Based Serious Games for Hand Assistive Rehabilitation. Intelligent User Interfaces Committee (ACM IUI), 13-16 March 2017. Impact Factor: 2+
- Imad Afyouni, Faizan Ur Rehman, Ahmad Qamar, Akhlaq Ahmad, Mohamed Abdur Rahman, Sohaib Ghani, and Saleh Basalamah, “Gamifying hand physical therapy with intelligent 3D navigation”, ACM SIGSPATIAL Special 8, 1, Jun 2016, 42-49.
- Akhlaq Ahmad, Faizan Ur Rehman, Md. Abdur Rahman, Abdullah Murad, Ahmad Qamar, Bilal Sadiq, Salah Basalamah, Mohamed Ridza Wahiddin, “i-Diary: A Crowdsource-based Spatio-Temporal Multimedia Enhanced Points of Interest Authoring Tool”, ACM International Conference on Multimedia (ACM MM), Brisbane, Australia, October 26-30, 2015.

- Faizan Ur Rehman, Ahmed Lbath, Abdullah Murad, Md. Abdur Rahman, Bilal Sadiq, Akhlaq Ahmad, Ahmad Qamar, Saleh Basalamah, “A Semantic Geo-Tagged Multimedia-Based Routing in a Crowdsourced Big Data Environment”, ACM International Conference on Multimedia (ACM MM), Brisbane, Australia, October 26-30, 2015.
- Ahmad Qamar, Abdullah Murad, Md. Abdur Rahman, Faizan Ur Rehman,Akhlaq Ahmad, Bilal Sadiq, Saleh Basalamah, “A Multi-sensory Gesture-Based Login Environment”, ACM International Conference on Multimedia (ACM MM), Brisbane, Australia, October 26-30, 2015.
- Ahmad Qamar, Ahmed Riaz Khan, Syed Osama Husain, Md. Abdur Rahman, Saleh Basalamah, “A Multi-Sensory Gesture-Based Occupational Therapy Environment for Controlling Home Appliances”, ACM International Conference on Multimedia Retrieval, (ACM ICMR), 23-26 June 2015.
- Ahmad Qamar, Syed Osama Hussain, Bilal Sadiq, Ahmed R. Khan, Md. Abdur Rahman, Saleh Basalamah, “A Multimedia Big Data E-Therapy Framework”, First IEEE International Conference on Big Data Multimedia, (IEEE BigMM), 20-22 April, 2015.
- Imad Afyouni, Faizan Ur Rehman, Ahmad Qamar, Akhlaq Ahmad, Md. Abdur Rahman and Saleh Basalamah, "A GIS-based Serious Game Recommender for Online Physical Therapy", Third International ACM SIGSPATIAL Workshop on HealthGIS (HealthGIS'14), Dallas, Texas, USA, November 4, 2014.
- Ahmad Qamar, Imad Afyouni, Md. Abdur Rahman, Faizan Ur Rehman, Delwar Hossain, Saleh Basalamah and Ahmed Lbath, "A GIS-based Serious Game Interface for Therapy Monitoring", 22nd ACM International Conference on Advances in Geographic Information Systems, (ACM SIGSPATIAL), Dallas, Texas, USA, November 4-7, 2014. (BEST DEMO RUNNER UP AWARD)
- Ahmad Qamar, Imad Afyouni, Faizan Ur Rehman, Delwar Hossain, Asad Toonsi, Mohamed Abdur Rahman and Saleh Basalamah, "A Multimedia E-Health Framework Towards An Interactive And Non-Invasive Therapy Monitoring Environment", The 22nd ACM International Conference on Multimedia (ACM MM), Orlando, Florida, USA, November 3-7, 2014.
- Md. Abdur Rahman, Mohamed Ahmed, Ahmad Qamar, Delwar Hossain, Saleh Basalamah, "Modeling Therapy Rehabilitation Sessions using Non-Invasive Serious Games", IEEE International Symposium on Medical Measurement and Applications (IEEE MeMeA), Lisbon, Portugal, June 11-12 2014.

Anas Basalamah

Education – degree, discipline, institution, year:

- Ph.D. in CE, Waseda University, Tokyo, Japan, 2009
- M.S. in CE, Waseda University, Tokyo, Japan, 2006
- B.S. in CE, Umm Al-Qura University, Makkah, Saudi Arabia, 2014

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Umm Al-Qura University (2011-Present)
- Post Doctoral Researcher, Tokyo University (2009-2010)
- Visiting Scholar, University of Minnesota (2010-2011)

Current membership in professional organizations:

- IEEE
- ACM

Honors and awards:

- Okaz Innovator Award (2016)
- Fulbright Scholarship Award (2010)
- Monbukagakushou Scholarshop Award (2004)
- Science and Innovation Student Award (2010)

Service activities (within and outside of the institution):

- General Chair, 5th International Workshop on GeoStreaming (IWGS) 2014, Dallas, TX, USA In Conjunction with ACM SIGSPATIAL 2014
- General Chair 4th International Workshop on GeoStreaming (IWGS) 2013, Orlando, FL, USA In Conjunction with ACM SIGSPATIAL 2013
- Japan Program Chair, 2nd International Symposium on Networked Sensing, Urban Lives, and Human Probes, Tokyo,

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Heba Aly , Anas Basalamah, Moustafa Youssef "Robust and ubiquitous smartphone-based lane detection," in Pervasive and Mobile Computing, vol. 26, no. , pp. 35-56 Jan 2016.
- Lo'ai A. Tawalbeh , Anas Basalamah, Rashid Mehmood , Hala Tawalbeh "Characterizing the Impact of GPS Signal Strength on Power Consumption," in IEEE Access , vol. 4, no. , pp. 858-868 Jan 2016.
- Huai Wang, Anas Basalamah, Song Min Kim, Shuo Guo, Yoshito Tobe, Tian He "Link-Correlation-Aware Opportunistic Routing in Wireless Networks," in IEEE Transactions on Wireless Communications , vol.14, no.1, pp.47,56, Jan 2015.
- Shuja Jamil, Anas Basalamah, Ahmed Lbath, Moustafa Youssef "Hybrid participatory sensing for analyzing group dynamics in the largest annual religious gathering," in Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp'15), Osaka, Japan, Sep 2015.
- Bin Cao, Louai Alarabi, Mohamed F. Mokbel, Anas Basalamah, "SHAREK: A Scalable Dynamic Ride Sharing System," in Proceedings of the 16th IEEE International Conference on Mobile Data Management (MDM 2015), Pittsburgh, PA, USA, Jun 2015.
- Abdeltawab M. Hendawi, Amruta Khot, Aqeel Rustum , Anas Basalamah, Ankur Teredesai , Mohamed Ali "COMA: Road Network Compression for Map-Matching," in Proceedings of the

16th IEEE International Conference on Mobile Data Management (MDM 2015), Pittsburgh, PA, USA, Jun 2015.

- Heba Aly, Anas Basalamah, Moustafa Youssef, “LaneQuest: An Accurate and Energy-Efficient Lane Detection System,” in Proceedings of the IEEE International Conference on Pervasive Computing (PERCOM 2015), St. Louis, MI, USA, Mar 2015. (7.7% full paper acceptance rate) Shuja Jamil Anas Basalamah and Ahmad Lbath, “Crowdsensing traces using bluetooth low energy (BLE) proximity tags,” in Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct Publication (UBICOMP’14), Seattle, Sep 2014.
- Heba Aly, Anas Basalamah and Moustafa Youssef, “Map++: A Crowd-sensing System for Automatic Map Semantics Identification,” in Proceedings of the 2014 IEEE International conference on Sensing, Communications, and Networking (SECON’14), Singapore, Jun 2014. (19.8% acceptance rate)

Briefly list the most recent professional development activities:

- Saudi Delegation for ITU AI for Good, May, 2018.
- Talk at University of Washington Tacoma, Tacoma, WA, USA Sep 2014.
- Talk at NSF Workshop on Smart and Connected Health, Al Ain, UAE, Jun 2014.

Ayman Alharbi

Education – degree, discipline, institution, year:

- Ph.D. in Computer Science Engineering, 2015
- M.S. in Computer Science Engineering, 2012
- B.S. in Computer Engineering, 2006

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistance professor, Umm Al-Qura University 01/01/2009 – Currently working
- Teaching Assistance, University of Connecticut (2013–2015)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Multimedia Programmer, STC company (2004–2004)
- Web developer, IT Department of Umm Al-Qura (2005–2005)

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Alharbi, A.; Alhumyani, H.; Ammar, R " Performance Analysis of Efficient Pipeline Architectures for Underwater Big Data Analytics" Computers and Communication (ISCC), 2015 IEEE Symposium, 6-9 July 2015.
- Alharbi, A.; Alhumyani, H.; Ammar, R.; Jun-Hong Cui, SanguthevarRajasekaran" Efficient Pipeline Architectures for Underwater Big Data Analytics" IEEE International Symposium on Signal Processing and Information Technology, December 2014
- Alharbi, A.; Alhumyani, H.; Tolba, S.; Ammar, R.; Jun-Hong Cui, "Underwater Sensing and Processing Networks (USPN)," Computers and Communication (ISCC), 2014 IEEE Symposium on , vol., no., pp.1,7, 23-26 June 2014.
- Alhumyani, H.; Alharbi, A.; Tolba, S.; Ammar, R.; "Efficient Surface-level Gateway Deployment Using Underwater Sensing And Processing Networks" the OCEANS '15 MTS/IEEE Washington (Accepted).
- Manville, C.; Miyajan, A.; Alharbi, A.; Haining Mo; Zuba, M.; Jun-Hong Cui, "Network coding in Underwater Sensor Networks," OCEANS - Bergen, 2013 MTS/IEEE, vol., no., pp.1,5, 10-14 June 2013

Emad Felemban

Education – degree, discipline, institution, year:

- Ph.D. in CE, Ohio State University, Columbus, Ohio, US, 2009
- M.S. in CE, Ohio State University, Columbus, Ohio, US, 2003
- B.S. in CE, KFUPM, Dharan, KSA, 1998

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Umm Al-Qura University (2009-Present)

Current membership in professional organizations:

- Senior Member, IEEE
- ACM
- TRB

Service activities (within and outside of the institution):

- Chairman, Graduate Program Committee
- Member Senior Design Project Committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Bloom Filter-Based Efficient Broadcast Algorithm for the Internet of Things, A. Talpur, FK Shaikh, T. Newe, A. Sheikh, Emad Felemban, A. Khelil, International Journal of Distributed Sensor Networks, Vol 12. 2017
- A Performance Simulation Tool for the Analysis of Data Gathering in Both Terrestrial and Underwater Sensor Networks, M. Ghaleb, Emad Felemban, S Subramaniam, AA Sheikh, SB Qaisar. IEEE Access 5, 4190-4208 2017
- Experimental Evaluation of Vibration Response Based Bridge Damage Detection Using Wireless Sensor Networks, B. Chowdhry, A. Shaikh, F. Karim; A. Shamshad, Emad Felemban, Springer Wireless Personal Communications, Pages : 499-510, 2015
- Comparative Analysis of VANET Routing Protocols: On Road Side Unit Placement Strategies, F. Ali, F. Shaikh, A. Ansari, N. Mahoto, Emad Felemban, Springer Wireless Personal Communications, Pages: 393-406, 2015.
- Underwater sensor network applications: A comprehensive survey, Emad Felemban, F. Shaikh, U. Qureshi, A. Sheikh, S. Qaisar, International Journal of Distributed Sensor Networks, 2015.
- S. Rashid, S. Qiasar, H. Saeed, Emad Felemban "A method for Distributed Pipeline Burst and Leakage Detection in Wireless Sensor Networks using Transform Analysis" International Journal of Distributed Sensor Networks, 2014
- Emad Felemban, A. Sheikh and M. Manzoor. Improving Response Time in Time Critical Visual Sensor Network Applications Ad Hoc Networks Vol. 23 2014 Pages: 65-79
- M. Ata, M. El-Darieby, B. Abdulhai, Emad Felemban, S. Basalamah, and B. Zafar, Estimation Vehicular Waiting Time at Traffic Build-Up Queues. International Journal of Distributed Sensor Networks, 2013.
- CoralCon: An Open Source Low-Cost Modem for Underwater IoT Applications, A. Sheikh, Emad Felemban, A. Ashraf, IEEE Intelligent Computer Communication and Processing (ICCP) 2017
- OpToGen: A Genetic Algorithm Based Framework for Optimal Topology Generation for Linear Networks, A. Sheikh, Emad Felemban, A. Alhindi, A. Naseer, and A. Lbath, IEEE Intelligent Computer Communication and Processing (ICCP) 2017

- STSM A model to detect and predict large crowd anomalies for optimized path recommendation, B. Sadiq, A. Ahmad, S. Atta, Emad Felemban, K Qahtani, Forth International Conference on Software Defined Radio 2017
- Bloom Filter Based Data Collection Algorithm for Wireless Sensor Network, A. Talpur, FK Shaikh, T. Newe, A. Sheikh, Emad Felemban, A. Khelil, IEEE International Conference on Information Networking (iCOIN) 2017.
- Spatial-Crowd: A big data framework for efficient data visualization, S. Atta, B. Sadiq, A. Ahmed, S. Saeed, E. Felemban. IEEE BigData 2016, Page(s):2130 – 2138, Washington, DC. 2016
- A software platform for smart data-driven intelligent transport applications, A. Sheikh, A. Lbath, E. Warriach, S. Awan, S. Saeed, Emad Felemban, IEEE PerCom 2016.

Briefly list the most recent professional development activities:

- IEEE Senior Member 2017
- Attending courses on Data Analytics, Big Data Management, Crowd Safety & Management, Project Management, Mid-Carrier Academic Leader

Fahad Ahmed Alzahrani

Education – degree, discipline, institution, year:

- Ph.D. in CE, Colorado State University, 2005
- M.S. in Florida Institute of Technology, 2001
- B.S. in EE, Umm Al-Qura University, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Computer Engineering, Umm AL-Qura University (2012-Present)
- Assistant professor, Computer Engineering, Umm AL-Qura University (2005-2012)

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Fahd M. Aldosari

Education – degree, discipline, institution, year:

- Ph.D. in Computer Networks, Bradford University, Bradford, UK, 2011
- M.Sc in Personal, Mobile and Satellite Communications, Bradford University, Bradford, UK, 2006
- B.S. in Computer Engineering, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, 1999

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Dean, College of Computer and Information Systems. Umm AlQura University, 2012-2017
- Chairperson, Computer Engineering Department, College of Computer and Information Systems, Umm AlQura University, Jun. 2015 – Oct. 2015
- Chairperson, Information Systems Department, College of Computer and Information Systems, Umm AlQura University, June 2014 – June 2015
- Vice Dean for Development, College of Computer and Information Systems, Umm AlQura University, Saudi Arabia, 2011- 2012
- Assistant Professor, Computer Engineering Department – Umm Al-Qura University, 2011-present
- Teaching Assistant, Computer Engineering Department – Umm Al-Qura University, 2000 – 2004
- Member, Curriculum Revision Committee, Computer Engineering Department
- Member, ABET Steering Committee, Computer Engineering Department
- Chair, Assessment and Evaluation Committee, Computer Engineering Department
- Supervised 4 Masters Theses
- Examined 3 Masters Theses

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Dean, Information Technology Deanship, Umm Alqura University, 2018- present
- Director, Academic Accreditation and Vocational Development Expertise House for Consultation, Umm Alqura University, 2014 - present
- Planning Engineer, Iridium Satellite Communications Company, Jeddah, Saudi Arabia, 1998-2000

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Imam, M.H., Tasadduq, I.A., Ahmad, A.-R., Aldosari, F, "Obtaining ABET student outcome satisfaction from course learning outcome data using fuzzy logic" in Eurasia Journal of Mathematics, Science and Technology Education, 2017.
- Tawalbeh, L.A., Ababneh, F., Jararweh, Y., AlDosari, F., "Trust delegation-based secure mobile cloud computing framework" in International Journal of Information and Computer Security, 2017
- Tawalbeh, L.Haddad, Y. Khamis, O. Benkhelifa E.Jararweh, Y. AlDosari, F., "Efficient and secure software-defined mobile cloud computing infrastructure " in the International Journal of High Performance Computing and Networking, (Jan 2016).
- L. Tawalbeh, Y. Jararweh, F. Ababneh, F. AlDosari, "Large Scale Cloudlets Deployment for Efficient Mobile Cloud Computing" in the Journal of Networks, Vol 10, No 01 (2015).

- L. Tawalbeh, L. Al-Qassas, N. Darwazeh, Y. Jararweh, F. AlDosari, “Secure and Efficient Cloud Computing Framework” in the IEEE International Conference on Cloud and Autonomic Computing (ICCAC), Boston, USA, 2015.
- L. Tawalbeh, Y. Haddad, O. Khamis, F. Aldosari and E. Benkhelif, “Efficient Software-Based Mobile Cloud Computing Framework” in the 2015 IEEE International Conference on Cloud Engineering , Tempe, AZ, USA, 2015.
- F. Aldosari "Localized QoS Routing Based on Links Blocking Probability" in the11th International Conference on Information Technology: New Generations, April 7-9, 2014, Las Vegas, USA.
- Y. Jararweha, L. Tawalbehb, F. Ababneha, A. Khreishahc, and F. Aldosari, “Scalable Cloudlet-based Mobile Computing Model” in the 9th International Conference on Future Networks and Communications (FNC'14), Niagara Falls, Canada, 2014.
- Y. Jararweh, L. Tawalbeh, F. Ababneh, F. AlDosari, “Resource Efficient Mobile Computing Using Cloudlet Infrastructure” in 2013 IEEE Ninth International Conference on Mobile Ad-hoc and Sensor Networks. Dalian, China. 2013
- F. Aldosari, F. Alradady " Localized QoS Routing with End-to-End Delay Guarantees " in the 11th International Conference on Information Technology : New Generations, April 15-17, 2013, Las Vegas, USA

Faisal R. Al-Osaimi

Education – degree, discipline, institution, year:

- Ph.D. in computer vision and pattern recognition, from The School of Computer Science and Software Engineering, The University of Western Australia, Perth, 2010
- M.E. in Computer Systems Engineering, The University of Queensland, Brisbane, 2005
- B.S. in Electrical and Computer Engineering, Umm Al-Qura University, Mecca, 2000

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, The Dept. Of Computer Engineering, Umm Al-Qura University, KSA, (2010)
- Teaching Assistant, The Dept. Of Computer Engineering, Umm Al-Qura University, KSA, (Oct. 2001 - Jul. 2003).
- Visiting scholar, Robotic Institute, Carnegie Mellon University, Pittsburg, USA, (2015)
- Visiting scholar, The School of Computer Science and Sofware Engineering, The University of Western Australia, Perth, Australia, (2012).
- The Vice Dean for Research & Graduate Studies, The college of Computer and Information Systems, Umm Al-Qura University, KSA, (2013 – 2018).
- The head of The Master Steering Committee, which provides the academic departmental duties from the admission to the graduation of the MS students, The college of Computer and Information Systems, Umm Al-Qura University, KSA, (2013 – 2018).
- The Coordinator of Industrial Training for Students, from 2011 to 2013, The college of Computer and Information Systems.
- *Supervised 2 Graduate (master)Theses*

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electrical Engineer, Saudi Telecom Company, Taif, KSA, (Jul. 2000 - Oct. 2001), fulltime.

Certifications or professional registrations:

- Oracle Database Design and Programming

Current membership in professional organizations:

- Avoided due to diminished return.

Honors and awards:

- Three NSTIP grants of a total amount of 6M SAR (about 1.6M USD), starting from 01/2015.
- Two UQU local grants totaling about 411K SAR.

Service activities (within and outside of the institution):

- Headed the revision committee for The Computer Vision and Graphics Track of the master program, CIS, UQU, KSA, 2014.
- Headed the revision committee of The Computer Science and Engineering Master program, CIS, UQU, KSA, (2017-2018).
- Reviewed the Computer Engineering B.Sc. program of Taif University, 2017.
- Committee member of IEEE ICPR 2016.
- Reviewed papers for IEEE ICPR, IEEE TPAMI and UQU journal of Engineering.

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

- **Al- Osaimi, Faisal Radhi M.**, and Mohammed Bennammoun. "3D Face Surface Analysis and Recognition Based on Facial Surface Features." *3D Face Modeling, Analysis and Recognition* (2013): 39-76.
- **Al-Osaimi, Faisal R.** "A Novel Multi-Purpose Matching Representation of Local 3D Surfaces: A Rotationally Invariant, Efficient, and Highly Discriminative Approach With an Adjustable Sensitivity." *IEEE Transactions on Image Processing* 25, no. 2 (2016): 658-672.
- Fan, Wentao, **Faisal R. Al-Osaimi**, Nizar Bouguila, and Jixiang Du. "Proportional data modeling via entropy-based variational bayes learning of mixture models." *Applied Intelligence*: 1-15.
- Bertrand, Adrien, Faisal R. Al-Osaimi, and Nizar Bouguila. "View-Based 3D Objects Recognition with Expectation Propagation Learning." In *International Symposium on Visual Computing*, pp. 359-369. Springer International Publishing, 2016.
- Fan, Wentao, **Faisal R. Al-Osaimi**, and Nizar Bouguila. "A novel 3D model recognition approach using Pitman-Yor process mixtures of Beta-Liouville Distributions." In *Circuits and Systems (ISCAS), 2016 IEEE International Symposium on*, pp. 1986-1989. IEEE, 2016.
- Fan, Wentao, **Faisal R. Al-Osaimi**, Nizar Bouguila, and Ji-Xiang Du. "Accelerated variational inference for Beta-Liouville mixture learning with application to 3D shapes recognition." In *Control, Decision and Information Technologies (CoDIT), 2016 International Conference on*, pp. 394-398. IEEE, 2016.
- Fan, Wentao, **Faisal R. Al-Osaimi**, Nizar Bouguila, and Ji-Xiang Du. "3D object modeling and recognition via online hierarchical Pitman-yor process mixture learning." In *Signal and Information Processing (GlobalSIP), 2015 IEEE Global Conference on*, pp. 448-452. IEEE, 2015.
- **Al-Osaimi, Faisal Radhi M.**, and Mohammed Bennammoun. "3D Face Surface Analysis and Recognition Based on Facial Surface Features." *3D Face Modeling, Analysis and Recognition* (2013): 39-76.

Briefly list the most recent professional development activities:

- Numerous but mostly self-paced

Hussam Aleem Mohammed

Education – degree, discipline, institution, year:

- M.S. in Telecommunications and Computer Network Engineering, London South Bank University, London, U.K. 2009
- B.S. in Electronics and Communications Engineering, JNT University, India, 2007

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer & Administrative Assistant, Umm Al-Qura University (2012-Present)
- Project Management Consultant, HajjCoRE, Hajj Research Institute, Umm Al-Qura University (2010-2012)
- Research Assistant, British Telecommunications, UK (2008-2009)
- Teaching Assistant, London South Bank University, UK (2007-2008)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Network Engineer, OSPS Telecom Services ltd. India (2005-2007)

Current membership in professional organizations:

- Cisco
- Microsoft
- WES

Certifications or professional registrations:

- CCNA
- MCSE
- SAP BASIS
- International Association of Engineers
- Registered professional engineer in Saudi Council of Engineers
- WES verified degree certifications (B'Tech & MSc)

Service activities (within and outside of the institution):

- Steering committee member, MSc. (2013-Present)
- ABET committee member (CS Dept.) (2012-2016)
- Master Program Administration and Management at CCIS, UQU (2013-Present)

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Abuarafah, Adnan & Mohammed, Hussam & Khozium, Osama. "Agent Vs Object with an in-depth insight to Multi-Agent Systems". International Journal of Engineering Science. vol.4, 2013.

Briefly list the most recent professional development activities:

- Upgraded certifications with CISCO and MICROSOFT

Imran Tasadduq

Education – degree, discipline, institution, year:

- Ph.D. Electrical & Computer Engineering, University of Western Ontario, 2002
- M.S. Systems Engineering, KFUPM, 1995
- B.S. Electrical Engineering, NED University of Eng. & Tech., Pakistan, 1990

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Professor & ABET Coordinator, Computer Engineering, Umm Al Qura University (2009-Present)
- Professor, Telecom & Computer Engineering, FAST-National University of Computer & Emerging Sciences, Pakistan (2007-2009)
- Professor & Associate Professor, Computer Engineering, Sir Syed University, Pakistan, (2002 – 2007)
- Visiting Scholar, School of Information Technology & Engineering, University of Ottawa, (2000)
- Systems Engineer, Research Institute, KFUPM, (1995-1998)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electrical Engineer, Siemens, Pakistan (1990-1991)

Current membership in professional organizations:

- Life Member, Pakistan Engineering Council

Honors and awards:

- Canadian Commonwealth Scholarship for Doctoral Studies
- Graduate Student Scholarship, University of Western Ontario

Service activities (within and outside of the institution):

- Chair– Steering Committee, Curriculum Committee, SSR Writing Committee, Assessment & Evaluation Committee (CpE, UQU)
- Member, Graduate Program Development Committee (CpE, UQU)

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Imam, M. H., Tasadduq, I. A., Ahmad, A. R., &Aldosari, F. (2017). Obtaining ABET Student Outcome Satisfaction from Course Learning Outcome Data Using Fuzzy Logic. Eurasia Journal of Mathematics Science and Technology Education, 13(7), 3069-3081.
- Imam, M. H., Tasadduq, I. A., Khan, M. H., Ahmad, A. R., Aldosari, F., & Shaikh, S. V. (2017). eCOOL: An Expert System based Approach to Designing Effective Assessments for Course Outcomes and Learning. Transylvanian Review, 1(4).
- Imam, M. H., Tasadduq, I. A., Ahmad, A. R., Aldosari, F., & Khan, H. (2017). Automated Generation of Course Improvement Plans Using Expert System. International Journal of Quality Assurance in Engineering and Technology Education (IJQAETE), 6(1), 1-12.
- Ahmad, A. R., Tasadduq, I. A., Imam, M. H., &Shaban, K. B. (2015). Automated Discovery and Utilization of Tacit Knowledge in Facility Layout Planning and Optimization. Journal of Software & Systems Development, 2015, b1-13.
- Tasadduq, I. A., Imam, M. H., & Ahmad, A. (2015). A hybrid algorithm for optimising facility layout. South African Journal of Industrial Engineering, 26(1), 120-134.
- Rashid, M., & Tasadduq, I. A. (2014). Holistic development of computer engineering curricula using Y-chart methodology. IEEE Transactions on Education, 57(3), 193-200.

- Ibrahim M. Hussain, Imran A. Tasadduq and Abdul Rahim Ahmad, “On The Contribution of Power Variance in PAPR Reduction for OFDM Signals”, International Journal of Autonomous and Adaptive Communications Systems (IJAACS), vol. 6, no. 4, 2013
- Osama M. Hussain and Imran A. Tasadduq, “Performance of 16-state TCM MC-CDMA with Various SUD techniques over Downlink Wireless Channels”, International Journal of Autonomous and Adaptive Communications Systems (IJAACS), vol. 6, no. 2, pp. 149-166, 2013.

Conferences/Presentations:

- Imam, M. H., Tasadduq, I. A., Ahmad, A. R., &Aldosari, F. M. (2016, January). An Expert System for Assessment of Learning Outcomes for ABET Accreditation. In International Conference on Engineering Education, Singapore, (pp. 07-08).
- Imam, M. H., Tasadduq, I. A., Khan, M. H., Ahmad, A. R., &Aldosari, F. (2017). Assessment Design Through an Expert System and its Application to a Course of Hydraulics. Proceedings of the Canadian Engineering Education Association.

Khalid Alhindi

Education – degree, discipline, institution, year:

- Ph.D. in EE, University of Missouri-Columbia, Missouri, Columbia, USA, 2002
- M.S. in EE, University of Missouri-Columbia, Missouri, Columbia, USA, 1997
- B.S. in Electrical & Computer Engineering, Umm Al-Qura University, Saudi Arabia, 1992.

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Computer Engineering, Umm Al-Qura University (2011-Present)
- Vice Dean for Research of the Institute of Scientific Research since 2011.
- Department Head, Computer Engineering, Umm Al-Qura University (2003-2011).

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electrical Engineer, Load Dispatch Center (LDC), Saudi Electricity Company, Makkah (1992-1994).

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Khalid Al-Hindi, "Teaching Multilayer Feedforward Neural Networks for Engineers Using Graphical User Interface and Matlab", Umm Al-Qura University Journal for Engineering & Architecture, Accepted 21/1/1432 H.
- Khalid Al-Hindi, "A Fully Automated Image Database Creation Tool For Developing Pattern Recognition Systems", Umm Al-Qura University Journal for Engineering & Architecture, Accepted 13/8/1431 H.

Khalid Muhammad Jamil A. Khayyat

Education – degree, discipline, institution, year:

- Ph.D. in ECE, University of Victoria, Victoria, BC, Canada, 2011
- M.S. in ECE, Colorado State University, Fort Collins, USA, 2002
- B.S. in ECE, Umm Al-Qura University, Makkah, KSA, 1991

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Umm Al-Qura University (2011-Present)
- Teaching Assistant, University of Victoria, Victoria, BC, Canada (2005-2009)
- Computer electronics instructor, Raytheon Middle East Equipment Systems (RIMS), KSA (1992-1996)

Certifications or professional registrations:

-

Current membership in professional organizations:

-

Honors and awards:

-

Service activities (within and outside of the institution):

- Member of the supreme standing committee of the curricula and study plans, UQU, 2015-until
- Member of the curricula committee, CE, 2015-2017
- Member of Strategic Plan Committee, CE, 2015-until
- Member of the laboratories committee, CE, 2012
- The chair of Graduation project committee, CE, 2013
- The chair of Academic Advising committee, 2013-2015
- Teaching Methodology Training

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Khaled Almotairi

Education – degree, discipline, institution, year:

- Ph.D. in ECE, University of Waterloo, Waterloo, Canada, 2012
- M.S. in ECE, University of Waterloo, Waterloo, Canada, 2008
- B.S. in ECE, King Abdulaziz University, Jeddah, KSA, 2004

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Dean of E-learning and Distance Education, UQU (2017-2019)

Service activities (within and outside of the institution):

- Member, curriculum committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Loai Tawalbeh

Education – degree, discipline, institution, year:

- Ph.D. in CE, Oregon State University, Corvallis, USA, 2004
- M.S. in CE, Oregon State University, Corvallis, USA, 2002
- B.S. in CE, Jordan University of Science and Technology, Irbid, Jordan, 2000

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Prof, UQU (2013-2018)
- Associate Prof, Jordan Univ. of Science and Tech (2005-2013)

Current membership in professional organizations:

- Senior Member, IEEE

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Maher I. Rajab

Education – degree, discipline, institution, year:

- Ph.D. in CE, UNIVERSITY OF NOTTINGHAM, UK, 2004
- M.S. in CE, KINGH ABDULAZIZ UNIV., JEDDAH, KSA, 1995
- B.S. in CE, UMM AL-QURA UNIV, MAKKAH, KSA, 1990

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Prof, UQU (1998-2018)

Current membership in professional organizations:

- Reviewer of Journal of Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization. Talylor & Francis.

Service activities (within and outside of the institution):

- member curriculum committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Maher I. Rajab. (2016) Performance evaluation of image edge detection techniques. International Journal of Computer Science and Security (IJCSS), vol. 10, Issue 5, pp. 170-185.

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

-

Majed M. Gethami Al Otaibi

Education – degree, discipline, institution, year:

- Ph.D. in Computer Systems Engineering, The University of Queensland, Australia, 2011
- M.S. in Computer Systems Engineering, The University of Queensland, Australia, 2005
- B.S. in Electrical and Computer Engineering, Umm Al Qura University, Makkah, KSA, 2001

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Dean of the College of Computer Information Systems Umm Al-Qura University (2018-Present)
- Assistant Professor, Department of Computer Engineering, Faculty of Computers and Information Systems, Umm Al Qura University (2011-Present).
- Dean of Information Technology, Umm Al Qura University (2015-2017)
- Vice Dean of Information Technology, Umm Al Qura University, (2012-2017)
- Teaching Assistant, Department of Computer Engineering, Faculty of Computers and Information Systems, Umm Al Qura University (2002-2011)
- Quality Engineer, Saudi Telecom Company (2001-2002)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Quality Engineer, Saudi Telecom Company (2001-2002)

Current membership in professional organizations:

- IEEE

Honors and awards:

- Selected best papers, "A Signal strength based tag estimation technique for RFID systems"on4th International conference on RFID Technology and Applications, China, 2010.
- Honors with outstanding student, Umm Al Qura University, 2001.

Service activities (within and outside of the institution):

- The Higher Supervisory Committee for Information Technology in Umm Al-Qura University, 2011-2017.
- The Higher Supervisory Committee for Laboratories and equipment in Umm Al-Qura University, 2015-2017.
- Correction and validation of Data in Umm Al-Qura University, 2013-2017.
- Capstone Projects Committee for ABET Accreditation, 2014-2017.
- Counseling Committee for E-Learning & Distance Learning Deanship, 2015-2017.
- Summer Training Committee in Computer and Information Technology College, 2014-2015.
- Alumni & Surveys Committee for ABET Accreditation, 2014
- Industrial Advisory Board Committee for ABET Accreditation 2014

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Majid Alotaibi.Peer reviewed. "Improved QoS for Multimedia Transmission using Buffer Management in Wireless Sensor Network", International Journal of Advanced Computer Science and Applications (IJACSA), SAI, United Kingdom, (p353-358).Vol 8, Issue 11 November, 2017.doi: 10.14569/IJACSA.2017.081143

- Brahim Hnich, Faisal R. Al-Osaimi, Ata Sasmaz, Ozkan Sayin, Amine Lamine, Majid Alotaibi. Peer reviewed. "*Smart online vehicle tracking system for security applications*". In Proceedings of 2016 *IEEE International Conference on Big Data,* Washington, DC, USA,(p 1724-1733).5-8 December 2016 .
  doi: 10.1109/BigData.2016.7840787

- Majed Alotaibi, Lo'ai A. Tawalbeh1, Yaser Jararweh. "Integrated Sensors System Based on IoT and Mobile Cloud Computing". In Proceedings of 2016 IEEE/ACS 13th International Conference of Computer Systems and Applications (AICCSA), Agadir, Morocco. 29 Nov.-2 Dec. 2016. doi: 10.1109/AICCSA.2016.7945812

Briefly list the most recent professional development activities:

Mohsin Murad

Education – degree, discipline, institution, year:

- M.S. in CE, University of Engineering and Technology, Peshawar, Pakistan, 2011
- B.S. in CE, University of Engineering and Technology, Peshawar, Pakistan, 2009

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, Umm Al Qura University (2012-2018)
- Lecturer, University of Engineering and Technology, Peshawar, Pakistan (2009-2011)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Assistant Manager, Horizon Tech Services, Islamabad, Pakistan (2011-2012)

Service activities (within and outside of the institution):

- Member Capstone Projects Committee, UQU
- Member Laboratories Management Committee, UQU

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Mohsin Murad, Adil A. Sheikh et al. "A Survey on Current Underwater Acoustic Sensor Network Applications." In proceedings of 2014 Euro-Asia Conference on Computational Intelligence and Communication Networks (EACCI) 2014, Antalya, Turkey. Republished in International Journal of Computer Theory and Engineering, Volume 7, 2015.
- Emad Felemban, Mohsin Murad et al. "UniGate: Modular Universal Wireless Gateway." In proceedings of IEEE World Congress on Computer Applications and Information Systems (WCCAIS) 2014, Hammamet, Tunisia.
- Emad Felemban, Mohsin Murad et al. "Demo: Modular Wireless Technology Gateway." In proceedings of IEEE 10th International Conference on Mobile Ad Hoc and Sensor Systems (MASS) 2013, Hangzhou, China.
- Shakil Durrani, Mohsin Murad et al. "Design and development of wireless RTU and Cyber Security framework for SCADA system." In proceedings of 5th International Conference on Information & Communication Technologies (ICICT) 2013, Karachi, Pakistan.

Muhammad Rashid

Education – degree, discipline, institution, year:

- Ph.D. in CE, University of Bretagne, Brest, France, 2009
- M.S. in CE, University of Nice Sophia Antipolis, Nice, France, 2009
- B.S. in EE, UET Peshawar, Peshawar, Pakistan, 1999

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Computer Engineering, Umm Al Qura University (2011-current)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Assistant Manager, Horizon Tech Services, Islamabad, Pakistan (2011-2012)

Honors and awards:

- Registered Engineer (Pakistan Engineering Council)

Service activities (within and outside of the institution):

- Member Capstone Projects Committee, UQU
- Member Laboratories Management Committee, UQU

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- K. Yousaf, Z. Mehmood, M. Rashid, S. Zhang, T. Saba, A. Rehman and M. Altaf, "A Novel Technique for Speech Recognition and Visualization Based Mobile Application to Support Two-Way Communication between Deaf-Mute and Normal Peoples", Wireless Communications and Mobile Computing, Acceptance Date: 18th April 2018. (Impact Factor: 1.899)
- M. Imran, M. Rashid, A. R. Jafri and M. N. Islam, "ACryp-Proc: Flexible Asymmetric Crypto Processor for Point Multiplication", IEEE Access, Acceptance Date: 5th April 2018. (Impact Factor: 3.244)
- K. A. Qazi, T. Nawaz, Z. Mehmood, M. Rashid and H. A. Habib, A hybrid technique for speech segregation and classification using a sophisticated deep neural network, PLOS ONE, Vol. 13, No. 3, March 2018. (Impact Factor: 2.806)
- A. Amjed, F. Azam, W. H. Butt, M. W. Anwar and M. Rashid, "Event-driven Process Chain (EPC) for Modeling and Verification of Business Requirements – A Systematic Literature Review", IEEE Access, Vol. 6, No. 1, Pages 9027-9048, March 2018. (Impact Factor: 3.244)
- M. Yousuf, Z. Mehmood, H. A. Habib, T. Mehmood, t. Saba, A. Rehman and M. Rashid, "A Novel Technique Based on Visual Words Fusion Analysis of Sparse Features for Effective Content-Based Image Retrieval," Mathematical Problems in Engineering, Vol. 2018, Article ID 2134395, 13 pages, March 2018. (Impact Factor: 0.802)
- S. Khan, M. Rashid and F. Javaid, "A High Performance Processor Architecture for Multimedia Applications", Computers & Electrical Engineering, Vol. 66, Pages 14-29 February 2018. (Impact Factor: 1.570)
- A. R. Jafri, M. N. Islam, M. Imran, M. Rashid, "Towards an Optimized Architecture for Unified Binary Huff Curves", Journal of Circuits, Systems and Computers, Vol. 26, No. 11, November 2017. (Impact Factor: 0.481)
- A. Asghar, M. Iqbal, W. Ahmed, S. Ali, H. Parvez, and M. Rashid, Exploring Shared SRAM Tables in FPGAs for Larger LUTs and Higher Degree of Sharing, International Journal of Reconfigurable Computing, Article ID 7021056, June 2017. (ISI Indexed, H-Index:10)

- A. M. Khan, F. Mallet, M. Rashid, “A Framework to Specify System Requirements using Natural Interpretation of UML/MARTE Diagrams”, Software and Systems Modeling, Pages 1-27, March 2017. (Impact Factor: 1.654)
- M. W. Anwar, M. Rashid, F. Azam, M. Kashif, “Model-Based Design Verification for Embedded Systems through SVOCL: An OCL Extension for SystemVerilog”, Design Automation for Embedded Systems, Vol. 21, No. 1, February 2017. (Impact Factor: 0.576)
- N. Ali, K. B. Bajwa, R. Sablatnig, S. A. Chatzichristofis, Z. Iqbal, M. Rashid, H. A. Habib, “A Novel Image Retrieval Based on Visual Words Integration of SIFT and SURF”, PLOS ONE, Vol. 11, No. 06, June 2016. (Impact Factor: 2.806)
- Z. Mehmood, S. M. Anwar, N. Ali, H. A. Habib, M. Rashid, “A Novel Image Retrieval Based on a Combination of Local and Global Histograms of Visual Words”, Mathematical Problems in Engineering, Article ID 8217250, 12 pages, June 2016. (Impact Factor: 0.802)
- M. M. Iqbal, H. Parvez and M. Rashid, “Multi-Circuit: Automatic Generation of an Application Specific Configurable Core for Known Set of Application Circuits, Journal of Circuits, Systems and Computers”, Vol. 25, No. 09, May 2016. (Impact Factor: 0.481)
- M. Rashid, M. W. Anwar, A. M. Khan, “Towards the Tools Selection in Model Based System Engineering for Embedded Systems - A Systematic Literature Review”, Journal of Systems and Software, Volume 106, Pages 150-163, May 2015. (Impact Factor: 2.444)
- S. Zahid, F. Hussain, M. Rashid, M. H. Yousaf, and H. A. Habib, “Optimized Audio Classification and Segmentation Algorithm by using Ensemble Methods”, Mathematical Problems in Engineering, Vol. 2015, Article ID 209814, 11 pages, April 2015. (Impact Factor:0.802)
- M. Rashid, “System Level Approach for Computer Engineering Education”, International Journal of Engineering Education, Vol. 31, no. 1, pp. 141-153, January 2015. (Impact Factor: 0.609)
- M. Rashid and I. A. Tasadduq, “Holistic Development of Computer Engineering Curricula Using Y-Chart Methodology”, IEEE Trans. on Education, Vol. 57, no. 3, August 2014. (Impact Factor: 1.727)

Mohammed Hussein Sinky

Education – degree, discipline, institution, year:

- Ph.D. in CE, Corvallis, Oregon, USA, 2015
- M.S. in CE, Corvallis, Oregon, USA, 2004
- B.S. in CE, Corvallis, Oregon, USA, 2001

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Umm Al-Qura University (2015-Present)
- Teaching Assistant, Oregon State University (2006-2015)
- Lecturer, Umm Al-Qura University (2004-2006)
- Teaching Assistant, Oregon State University (2001-2004)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Project Leader, Agilent Technologies (2000-2001)

Honors and awards:

- Best Paper Award ICSNC (2015)

Service activities (within and outside of the institution):

- Chairman of Student Advising Committee
- Member of Summer Training Committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Mohammad Al-Turkistany

Education – degree, discipline, institution, year:

- Ph.D. in CE, University of Florida, Gainesville, USA, 2006
- M.S. in CE, University of Florida, Gainesville, USA, 2002
- B.S. in EE, King Saud University, Riyadh, Saudi Arabia, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Umm Al-Qura University (2006-2018)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electrical Engineer, Saudi Aramco (1996-1996)

Service activities (within and outside of the institution):

- Chairman of Computer Engineering department
- Chairman of Computer Science department

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Muhammad Yousuf Irfan Zia

Education – degree, discipline, institution, year:

- M.S. in CE, NED UET of Engg. & Tech., Karachi, Pakistan, 2002
- B.S. in EE, SSUET of Engg. & Tech., Karachi, Pakistan, 1999

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, UQU (2011-Present)
- Lecturer, National University FAST, Karachi, Pakistan (2005-2010)
- Lecturer, SSUET of Engg. & Tech., Karachi, Pakistan (2001-2004)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electronic Engineer, Advance Electronics International, Karachi, Pakistan (1999-2000)

Certifications or professional registrations:

- LABVIEW Core I and II Certificate

Service activities (within and outside of the institution):

- Member, Capstone Project Committee
- Member, Assessment & Evaluation Committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Anwar, M.W., Kashif, M., Khan, A., Aziz, M.W., Zia, Y.I., Jafri, A.R. and Rashid, M., Design and Verification of Safety Critical Systems‖. Technical Report Number 13-INF761-10-Final, NSTIP Saudi Arabia, 2018. DOI: 10.13140/RG. 2.2. 15008.07681/1.

Omar Sonbul

Education – degree, discipline, institution, year:

- Ph.D. in CE, The University of Nottingham, UK, 2012
- M.S. in CE, The University of Nottingham, UK, 2008
- B.S. in CE, Umm Al-Qura University, 2003

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant professor, Umm Al-Qura University (2012-Present)
- Teaching Assistant, Umm Al-Qura University (2004-2012)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Electrical Engineer, Saudi Electricity company (2003-2004)

Certifications or professional registrations:

- Saudi Council of Engineers

Service activities (within and outside of the institution):

- chair steering committee
- member in advising committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

-

Conferences/Presentations:

-

Briefly list the most recent professional development activities:

Saleh Basalamah

Education – degree, discipline, institution, year:

- Ph.D. in Bioengineering, Imperial College London, UK, 2005.
- M.Sc. in Communications and Signal Processing, University of Bristol, UK, 2000.
- B.S. in Electrical Engineering, King Abdulaziz University, Jeddah, 1999.

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Associate Professor, Computer Engineering, Umm Al-Qura University, KSA, (2013)
- Co-Founder and Deputy Director, KACST Technology Innovation Center on GIS, Umm Al-Qura University, Saudi Arabia (2012-2014).
- Dean, College of Computing, Umm Al-Qura University, (2009-2012)
- Vice Dean for Academic Development, College of Computing, Umm Al-Qura University, (2008-2009)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2006-2013)

Current membership in professional organizations:

- Senior Member, IEEE
- Member, ACM

Honors and awards:

- Over 20 research grants
- Over 10 Patents
- Founder of 3 Spinoffs

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- Imad Afyouni, Faizan Ur Rehman, Ahmad Muaz Qamar, Sohaib Ghani, Syed Osama Hussain, Bilal Sadiq, Mohamed Abdur Rahman, Abdullah Murad, Saleh M. Basalamah, "A therapy-driven gamification framework for hand rehabilitation", User Model. User-Adapt. Interact. 27(2): 215-265 (2017)
- Sultan Daud Khan, Stefania Bandini, Saleh M. Basalamah, Giuseppe Vizzari, "Analyzing crowd behavior in naturalistic conditions: Identifying sources and sinks and characterizing main flows", Neurocomputing 177: 543-563 (2016)
- Imad Afyouni, Faizan Ur Rehman, Ahmad M. Qamar, Akhlaq Ahmad, Mohamed Abdur Rahman, Sohaib Ghani, Saleh M. Basalamah, "Gamifying hand physical therapy with intelligent 3D navigation" SIGSPATIAL Special 8(1): 42-49 (2016)

Conferences/Presentations:

- Faizan Ur Rehman, Imad Afyouni, Ahmed Lbath, Sohaib Khan, Saleh M. Basalamah, Mohamed F. Mokbel, "Building Multi-Resolution Event-Enriched Maps From Social Data". EDBT 2017: 594-597.
- Ahmed S. Abdelhamid, MingJie Tang, Ahmed M. Aly, Ahmed R. Mahmood, Thamir Qadah, Walid G. Aref, Saleh M. Basalamah, "Cruncher: Distributed in-memory processing for location-based services. ICDE 2016: 1406-1409

Turki Al-Somani

Education – degree, discipline, institution, year:

- Ph.D. in CE, KFUPM, Dhahran, Saudi Arabia, 2006
- M.S. in CE, King Abulaziz University, Jeddah, Saudi Arabia, 2000
- B.S. in ECE, King Abulaziz University, Jeddah, Saudi Arabia, 1997

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Professor, Comp. Eng. Dept., Umm al-Qura University, Makkah, 2017 – Now.
- Associate Professor, Comp. Eng. Dept., Umm al-Qura University, Makkah, 2011 – 2016.
- Dean, Faculty of Engineering, Al-Baha University, Al-Baha, Saudi Arabia, 2010 – 2011.
- Assistant Professor, Comp. Eng. Dept., Umm al-Qura University, Makkah, 2006 – 2010.
- Adjunct Assistant Professor, Dept, of Electrical and Computer Engineering, University of Victoria, Victoria, Canada, 2009 – 2012.
- Supervised 4 Graduate Theses 2 PhDs, 2 Masters and Currently 4 Master students.

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Senior Consultant, Ministry of Hajj, Makkah, 2016.
- Senior IT Consultant, Holy Makkah Municipality, 2007 – 2014.
- IT Director, ITC, Umm Al-Qura University, Makkah, Saudi Arabia, 2007 – 2010.
- Product Manager, ICT – Voice & Data Networks, SIEMENS, 2000 – 2001.

Certifications or professional registrations:

- Cisco CCDA, CCNA and Microsoft MCSE.

Current membership in professional organizations:

- IEEE, ACM, IEICE and IACR.

Honors and awards:

- Elected to the grade of *IEEE Senior Member* in June 2009.
- PI in the following funded projects:
    - King Abdul Aziz City for Science and Technology (KACST):
        - A Novel framework for Secure Cryptosystems, (2015 – 2017).
        - Low-Power, High-Speed ECC Coprocessor, (2015 – 2017).
        - Parallel Hardware/Software Co-Design of ECC on FPGAs, (2008 – 2010).
    - Saudi Basic Industries Corporation (SABIC):
        - Efficient Parallel Elliptic Curve Cryptoprocessor, (2008).
        - Efficient Elliptic Curve Cryptoprocessor with Resistance Against Simple Power Analysis Attacks, (2007).

Service activities (within and outside of the institution):

- Founder & Director of Advanced Trends in Information Security & Technology Expert House, Entrepreneurship Center, Umm Al-Qura University, 2011 - Now.
- Member of the following university committees:
    - Students Rights Committee.
    - Students Punishment Committee.
- Member of the following department committees:
    - ABET Steering Committee.
    - Curriculum Committee.

    - External Advisory Board (Chair).
    - Strategic Planning Committee (Chair).
- Reviewer for many local and international journals and conferences.

Briefly list the most important publications from the past <u>FIVE YEARS</u> – title, co-authors if any, where published, date of publication or presentation:

<u>Patents:</u>

- Hilal Hussain and Turki F. Al-Somani, Method for Efficiently Protecting Elliptic Curve Cryptography against Simple Power Attacks, U.S. 9,565,017 B2, 2017.
- Turki F. Al-Somani and Hilal Hussain, Method and apparatus for scalar multiplication secure against differential power attacks, US 9,419,789 B2, 2016.
- Turki F. Al-Somani, System and Method for Securing Scalar Multiplication against Simple Power Attacks, US 8,861,721 B2, 2014.
- Turki F. Al-Somani, System and Method for Securing Scalar Multiplication aganist Differential Power Attacks US 8,804,952 B2, 2014.
- Turki F. Al-Somani and M. K. Ibrahim, Method for Generic-Point Parallel Scalar Multiplication without Precomputations, US 8,755,517 B2, 2014.

<u>Journals/Books/Book Chapters:</u>

- Ibrahim, A.; Al-Somani, T.F. ; Gebali, F., "New Systolic Array Architecture for Finite Field Inversion", to appear soon in the Canadian Journal of Electrical and Computer Engineering, Vol. 40, No. 1, 2017.
- Ibrahim, A.; Al-Somani, T.F. ; Gebali, F., "Efficient Scalable Digit-Serial Inverter Over GF(2m) for Ultra-Low Power Devices", IEEE Access, Vol. 4, pp. 9758-9762, 2016.
- Turki F. Al-Somani "Very efficient point multiplication on Koblitz curves", IEICE Electronics Express, Vol. 13, No. 9, pp. 1-6, 2016.

<u>Conferences/Presentations:</u>

- Ibrahim, A.; Al-Somani, T.F.; Gebali, F., "New Scalable Digit-Serial Inverter Over GF(2m) for Embedded Applications", In the proc. of the International Conference on Advances in Electrical, Electronic and System Engineering (ICAEES), November 14-16, 2016, Putrajaya, Malaysia, pp. 536 – 539, 2016.
- Turki F. Al-Somani, "Interleaved Generic-Point Parallel Scalar Multiplication", In the Proc. of the IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, August 24-26, 2015, University of Victoria, Victoria, B.C., Canada, pp. 96 – 100, 2015.

Briefly list the most recent professional development activities:

- The first workshop on Cryptosystems in Saudi Arabia 2015.

Waleed Alasmary

Education – degree, discipline, institution, year:

- Ph.D. in ECE, University of Toronto, Toronto, ON, Canada, 2015
- M.S. in ECE, University of Waterloo, Waterloo, ON, Canada, 2010
- B.S. in CE, Umm Al-Qura University, Makkah, Saudi Arabia, 2005

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, CE, UQU (2015-present)
- Teaching Assistant, University of Toronto (2012-2014)

Honors and awards:

- Fulbright Award (2016)

Service activities (within and outside of the institution):

- Member of Capstone Project Committee
- Member of Summer Training Committee

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Journals/Books/Book Chapters:

- W. Alasmary, and S. Valaee, "Velocity Awareness via Sparse Recovery in Vehicular Networks", vol. 66, no.10, pp. 9421-9435, Oct. 2017. IF: 4.066.
- W. Alasmary, H. Sadeghi, and S. Valaee, "Strategic Sensing in Vehicular Sensor Networks Using Known Mobility Information," accepted at IEEE Transactions on Vehicular Technology. 2017. IF: 4.066.
- M. Alsabaan, W. Alasmary, A. Albasir, and K. Naik, "Vehicular Networks for a Greener Environment: A Survey" IEEE Communications Surveys and Tutorials, vol. 15, no. 3, pp. 1372-1388, Third Quarter 2013. IF: 4.818.

Briefly list the most recent professional development activities:

- Academic Training, MIT, Cambridge, USA Sept. 2016 - June 2017
- Fulbright Scholar, Research Scientist, in Electrical Engineering and Computer Science Department (EECS
- and CSAIL)
- Research: Advanced computer vision and machine learning, Cyber Physical Systems, Intelligent Transportation Systems
- Supervisor: Berthold Horn
- University of Toronto, Toronto, Canada Sept. 2010 - Nov. 2015
- PhD, Research and Teaching Assistant, in Electrical and Computer Engineering Department (ECE)
- Research: Analytical modeling, scheduling and optimization, and experimental evaluation of vehicular networks, Supervisor: Shahrokh Valaee

Appendix C – Equipment

Laboratory Name	Equipment Details
Logic Design Lab	• 18 National Instruments Elvis II Plus Trainers • 20 Personal Computers • 18 Jump Wire Kits • 1 Projector
Computer Networks Lab	• 22 Personal Computers • 2 Switches Data link • 10 Cisco catalyst switches 3560 series • 9 Cisco 2900 series routers • 1 Projector
Electronics Lab	• 12 National Instruments Elvis II Plus Trainers • 12 Personal Computers • 1 Projector
Digital Electronics Lab	• 24 IC-Trainer W5101 • Jump wire kits • 2 Projectors
Microprocessor Lab	• 10 Flight 8086 Experiment Boards • 10 LED Application Boards • 10 General Application Boards • 10 Personal Computers
Hardware Design Lab	• 15 All in One EEDT 6.0 Kits • 16 Personal Computers • Projector
Communication Lab	• Eight Racks of LD Diadactic GmbH Company • Frequency counter 0 – 10 MHZ • ASK / FSK / PSK Modulator • ASK / PSK Demodulator • FSK – Demodulator • Spectrum analyzer • PAM modulator • PAM demodulator • PCM demodulator • AMI / HDB3 decoder • DC power supply +- 15V / 3A • Data source / Parity generator • AMI /HDB3 coder • Display / Parity check Indicator • 8 Measuring Bridge panel (736 451) • 4 ISDN panel (734 912) • 9 DMM • 1 Star-Quad cable • 8 Function generators • 9 Oscilloscopes • 3 ISDN Phone sets • 1 ISDN Modular • 2 ISDN Test bags • 16 Personal Computers

Appendix D – Institutional Summary

A. The Institution

A-1 Name and address of the institution

Umm Al-Qura University
Abdia, Makkah-21955
Saudi Arabia

A-2 Name and title of the chief executive officer of the institution

Prof. Abdullah Omar Bafail
University Rector

A-3 Name and title of the person submitting the self-study report.

Dr. Ayman Alharbi
Chairman
Department of Computer Engineering
Umm Al-Qura University

A-4 Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations.

The University is currently in the process of institutional accreditation by the National Center for Academic Accreditation and Evaluation (NCAAA), Saudi Arabia. Whereas, some of its colleges and departments are either accredited individually or being in the process of accreditation either by international accreditation agencies or by the NCAAA.

B. Type of Control

Umm Al-Qura University (UQU) is a state institution that operates under the auspices of the Ministry of Higher Education of the Kingdom of Saudi Arabia. The UQU system is governed by the University Rector with the help of the Vice Rectors and the University Deans' Council. The Rector is usually appointed by a royal decree.

C. Educational Unit

The educational unit is the College of Computer & Information Systems. Within the College, there are four academic departments. These are:

1. Computer Engineering
2. Computer Science
3. Information Systems
4. Information Science

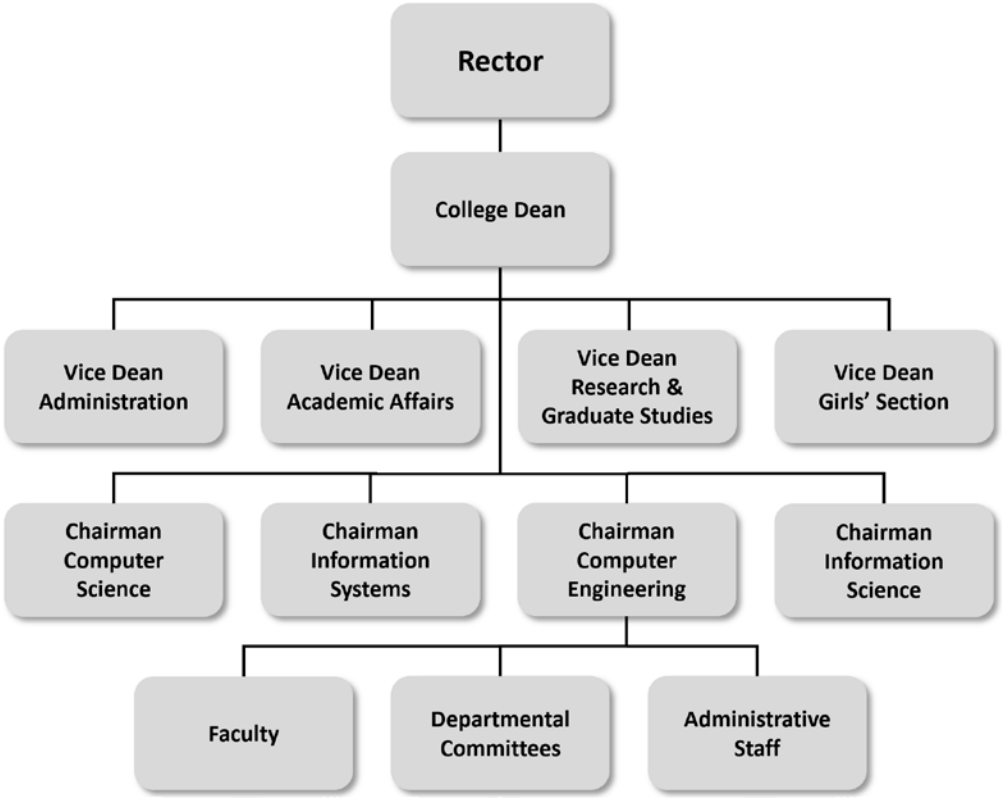
The administrative body of the College is composed of:

1. Dr. Majid Algethami, Dean
2. Dr. Wesam Sabban, Vice Dean – Administration
3. Dr. Ayman Alharbi, Vice Dean – Research and Graduate Studies
4. Dr. Ahmad Alhindi, Vice Dean – Academic Affairs
5. Dr. Sarah Al-Sherif, Vice Dean – Girls' Section

The department chairs are:

1. Dr. Ayman Alharbi, Chairman Computer Engineering Department
2. Dr. Eisa Alunaizi, Chairman Computer Science Department
3. Dr. Skandar Turki, Chairman Information Systems Department
4. Dr. Muhammad Alghamdi, Chairman Information Science Department

The organization chart of the college is shown below:



D. Academic Support Units

Support Unit	Unit Head
Computer Science	Dr. Eisa Ayed Awadh Alanazi
Mechanical Engineering	Dr. Hamzah A. Alharthi
English Language Center	Dr. Sami Muhammad Ghalib Eterji
Physics	Dr. Saleh Alluqmani
Deanship of Preparatory Year	Dr. Saad Alghamdi
Dawah and Islamic Culture	Dr. Abdulrehman Alqurashi
Chemistry	Dr. Ismail bin Ibrahim Al-Thaqafi
Arabic Language and Grammar	Dr. Abdullah bin Nasser Al-Qarni
Electrical Engineering	Dr. Mohammed Al-Alshaikh
Al-qiraat	Dr. Ahmad Bin Abdullah Alfuraih

E. Non-academic Support Units

Support Unit	Unit Head
Deanship of Admissions and Registration	Dr. Hashim bin Ahmed Alsamadani
Deanship of Library Affairs	Dr. Mohammed Mubarak D Allehaibi
Deanship of Information Technology	Dr. Fahad Aldosari
Deanship of Student Affairs	Dr. Amro Taha Alsaggaf

F. Credit Unit

Computer engineering program follows the following standard:

In one semester or quarter credit normally represents one class hour or three laboratory hours per week. One academic year normally represents at least 28 weeks of classes, exclusive of final examinations.

G. Tables

Tables D–1 and D–2 are provided in the following for the computer engineering program.

Table D–1: Program Enrollment and Degree Data

Computer Engineering

	Academic Year		Enrollment Year 1st	2nd	3rd	4th	5th	Total Undergrad	Total Grad	Degrees Awarded Associates	Bachelors	Masters	Doctorates
Current Year	2018	FT	64					284			27		
		PT											
1	2017	FT	130					230			26		
		PT											
2	2016	FT	96					224			29		
		PT											
3	2015	FT	100					221			40		
		PT											
4	2014	FT	51								36		
		PT											

Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

Table D–2: Personnel

Computer Engineering

Year[1]: 2017-18

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[3]	2	-	2
Faculty (tenure-track)	23	-	18.5
Other Faculty (excluding student Assistants)	8	-	8
Student Teaching Assistants	-		-
Student Research Assistants	-		-
Technicians/Specialists	1		1
Office/Clerical Employees	2		2
Others[5]	-	-	-

Report data for the program being evaluated.

1. Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.
2. Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.
3. For faculty members, 1 FTE equals what your institution defines as a full-time load
4. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc.
5. Specify any other category considered appropriate, or leave blank.

Signature Attesting to Compliance

By signing below, I attest to the following:

That Computer Engineering *(Name of the program(s))* has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*

Dr. Majid Al-Gethami

Dean's Name (As indicated on the RFE)

Signature

25/06/2018

Date