ABET
SELF-STUDY REPORT
(2013-2014 Review Cycle)

for

Computer Engineering Program

at

College of Computer & Information Systems

Umm Al-Qura University

Makkah

Saudi Arabia

June, 2013

CONFIDENTIAL

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BACKGROUND INFORMATION

A. Contact Information

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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. There has been no previous ABET review of the program.

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. Organizational Structure

The computer engineering (CE) program is run mainly by the computer engineering faculty. Laboratory instruction and supervision are offered by CE faculty with the help of teaching assistants. The administration of the program is the responsibility of the chairman of the department. The administrative affairs are channeled to the upper administration, represented by His Excellency the Rector and the Vice Rectors, through the Dean of the college of computer and information systems. The organizational structure is illustrated by the organizational chart shown in Figure 0–1.

Further, the chairman of the department is assisted in administering the program by a number of committees and coordinators.

E. Program Delivery Modes

There is only one mode of delivery, which is a “Day Program”. All students are full time and attend day program where they are taught by an instructor in a face-to-face mode.

F. Program Locations

The program is offered at one location only, i.e., Abdia campus in Makkah Al-Mukerrimah.

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

This is initial accreditation. No previous evaluations were done by ABET. However, two departments of College of Engineering – Electrical Engineering and Mechanical Engineering – have been accredited with ABET in the 2011-12 accreditation cycle.

H. Joint Accreditation

The program is seeking accreditation by one commission only, i.e., EAC.

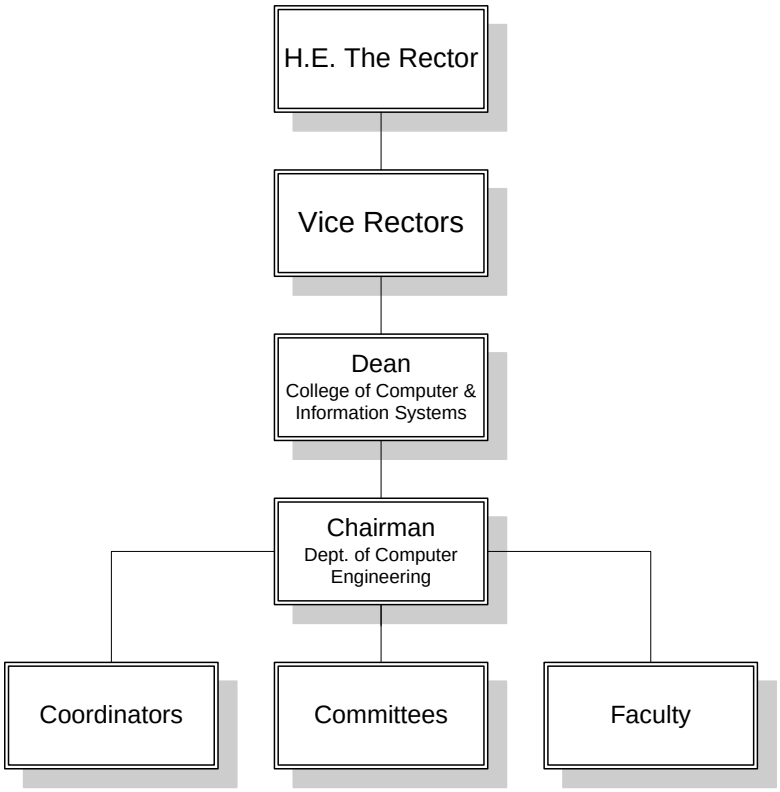


Figure 0–1: Administrative Structure of Computer Engineering Department

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 to the preparatory year. University council decides the number of admitted students for each upcoming year according to the recommendation of the faculties' councils.

An applicant for admission to an undergraduate program at Umm Al-Qura University (UQU) must satisfy the following conditions:

A. He should have earned the secondary school certificate, or its equivalent from inside or outside the Kingdom of Saudi Arabia, and majored in natural or technological sciences

B. He should have taken entrance exam that consists of an aptitude test, and a subject test administered by the National Center for Assessment in Higher Education.

   - The aptitude test has two components: Linguistics and Mathematics. The test is aimed at determining the general capabilities of students in the two areas mentioned above.

   - The subject test is a multiple-choice test given in five subjects, i.e., Mathematics, Physics, Chemistry, Biology and English. The objective of this examination is to evaluate the student's knowledge and ability in English and Science.

C. He must have a record of good conduct.

D. He must successfully pass any test or interview required by university council.

E. He must be physically fit and healthy.

F. An employed prospective student should have a written permission from his employer.

G. He must satisfy any other conditions the University may deem necessary at the time of application.

H. The applicant must submit the required documents with the University within a specified period.

For students who fulfill all the above conditions the admission will be awarded as per their marks in secondary school certificate (50%), the aptitude test (30%) and subject test (20%). A merit list is generated based upon the total score obtained by the students. Students are offered admissions in a college of their choice in the order of the merit list subject to the availability of seats. Once seats are exhausted in a particular college, the admission in that college is closed and remaining students have to make their choices from the remaining colleges.

All newly admitted students spend their first academic year in the Preparatory Year Program (PYP). The major objectives of this program are: (a) to improve students' English proficiency and thus enable them to begin the first year of undergraduate studies in English, which is the principal language of instruction; (b) to review and reinforce students' knowledge of mathematical and analytical techniques with English as the language of instruction; (c) to improve computer skills of the students (d) to develop university level study skills.

After completing the preparatory year, students are accepted to the College and placed in the computer engineering department according to three criteria: their preference, GPA from the PYP, and available seats in the department.

The Policy on Regulations of Study and Examinations is available in Arabic Language at: https://uqu.edu.sa/computer-sciences-information-en/en/93195394. The English translation of Article # 2, 3, & 4, and their Implementation Rules are documented in Appendix E.

B. Evaluating Student Performance

The maximum course load allowed to a student is 18 credit hours. Exceptions to this rule can only be allowed by the coordinator of 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. However, for a number of years, a student under certain circumstances would be allowed to take a course without a prerequisite if the college coordinator for registration sees a need for it and finds out that the prerequisite abilities have been attained by the student from other courses, training he might have taken or due to his lifelong learning ability with interest in the topics related to the prerequisite subject(s). This strictly required the approval of the instructor teaching the course. However, this practice that continued for last several years was misused and therefore has been abolished in the academic year 2011-12. Since then, no student is allowed to register a course without a prerequisite. The instructors or the academic advisors are not authorized to allow a student to do so under any circumstances. If a student somehow does get registered in a course without taking the prerequisite(s), the Deanship of Admissions and Registration cancels the registration of such a course.

The student performance is evaluated in each course by the instructor. The instructor designs the assessments for finding out the attainment of the course learning outcomes specified by the Curriculum Committee. 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. 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.

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.

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.

Table 1–1: The Grading system at UQU

Marks out of 100	Letter Grade	Description	Grade Points
95-100	A+	Excellent	4
90-less than 95	A		3.75
85-less than 90	B+	Very Good	3.5
80-less than 85	B		3.0
75-less than 80	C+	Good	2.5
70-less than 75	C		2.0
65-less than 70	D+	Poor	1.5
60-less than 65	D		1.0
Below 60	F	Failure	0
	DN	Denied	0
	IC	Incomplete	
	IP	In Progress	
	W	Withdrawal	
	S	Satisfactory	
	U	Unsatisfactory	

Table 1–2: Sample calculation of Grade Point Average

Course	Credit Hours (CH)	Assigned Course Grade	Quality Points Per Credit Hour (QP/CR)	Computed Quality Points (CH) × (QP/CR)
Course 1	2	A	4.75	9.5
Course 2	3	D	2	6
Course 3	3	C	3	9
Course 4	4	D+	2.5	10
Course 5	4	B+	4.5	18
Course 6	2	C+	3.5	7
Totals	**18**			**59.5**
Computed GPA = Quality Points / Credit Hours = 59.5 / 18 = 3.31				

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 Minimum GPA

According to the regulations of Umm Al-Qura University all students are required to maintain a grade point average of at least 1.0 out of 4.0. A student failing to maintain the GPA of 1.0 will be placed on "academic probation" and is given two semesters to improve. After this period the student may be removed from the program.

The Dean of the College of Computer and Information Systems has requested the University Council to raise the minimum GPA requirement to 2.00. However, the approval on this could not be obtained yet.

B.3 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 Appendix E.

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

Upon the approval of the Dean of the particular college that the student is transferring to, the student might be admitted into the university in accordance with the following requisites:

1. The student should have studied at a recognized college or university.
2. The student shall not be admitted into the university if he is transferring for disciplinary and/or academic reasons.
3. The student shall meet the transferring conditions specified by the College Council.
4. The number of required units the transferred student should study at Umm Al-Qura University should not be less than 60% of the total units required for the bachelor's degree by the university.
5. The College Council equates courses that the student has studied out of the university according to the recommendation of the concerned department. The equated courses are registered in student's academic record, but they are not counted towards calculation of his cumulative average.
6. If it turns out after the transfer that the student was dismissed for disciplinary or academic reasons, his registration is cancelled from the date of his transfer to the university.
7. Transferring the student occurs in any semester from one university to another in accordance with the aforementioned procedures. The dates in which the student is transferred to the university shall be in accordance with the general conditions of transfer.

The procedure for evaluating transfer applications to the College of Computer & Information Systems from outside the university is as follows:

1. Fill in the university application form
2. Upon receiving all applications, the university registrar office sends all applications that satisfy college requirements to the office of vice dean of academic affairs. The office of the vice dean prepares the applicants credentials for the dean of the college. The college dean evaluates the presented applications and makes decisions on the transfer.

3. 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.

C.2 Transfer of students within the University

Students can apply for transfer only after studying at least one semester – excluding summer semester – in the college they are transferring from. 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 (Inter-College Transfer Form).
2. Submit the form to the vice dean of academic affairs
3. Upon receiving all applications, a designated college-based committee (which consists of the vice dean and chairs of all the departments) meets and recommends on transfer applications. If the number of eligible applicants is more than the available seats, students are tentatively accepted based on their CGPA.
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 the description of the courses of study and student grades in the courses.

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.
2. Get the recommendation of the chairman of the department to be transferred to.
3. Submit the form to vice dean of academic affairs
4. Upon receiving all applications, a college-based committee that 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 more than the available seats, students are tentatively accepted based on their CGPA.
5. The tentative transfer decisions are then forwarded to the dean for final approval.
6. The academic committee of each department reviews transcripts of all tentatively accepted transfer students and decides on the equivalency of credits based on the description of the courses of study and student grades in the courses.

C.4 Transfer Credits

Students can transfer credit hours that have been studied in other universities. 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. These courses are evaluated by the Department Academic Committee and faculties who teach these courses, and approved by the department chairman. Transferred credits are not included in the GPA calculation and a pass grade is assigned to those courses. Students who want to study courses in other universities must do the following:

1. Fill in a course transfer form and submit it to the chairman of the department.
2. The chairman consults the faculty who teaches the course.

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

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

5. The student should then get the approval of the Vice Dean.

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

7. 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.

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

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, 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 maximum 20 credit hours.
- Allowed credits range between 14 and 20 based on GPA.

Students are required to follow all prerequisites as stated on the web site at: *http://uqu.edu.sa/computer-sciences-information-en/en/204416*

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 evaluate the student's study plan to ensure it will satisfy university requirements while it meets 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. Academic advising cannot, therefore, be a computer, routine matter. To fulfill this requirement, the general advising duties can be stated as follows:

- The advisor is expected to deal with students' academic, career, and personal 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.

D.4 Guidelines for Advisees

The student has to meet with his academic advisor every semester prior to his registration for the next semester. Another meeting with the academic advisor should be held during the eighth week of each semester in order to review the student progress in different courses. At any time, the student can take an appointment to meet individually with his academic advisor to discuss his overall program of study, his career plans, or any problems he encounters in the department.

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

The 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 164 credit hours. According to the University regulations, the student cumulative average should be 1.0 out of 4.0 or more at the time of graduation. As was mentioned in Section B.3, a new regulation is being approved by the University to increase the minimum GPA requirement for graduation to 2.0 out of 4.0. Further, the 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 164 credit hours is distributed amongst various components as shown in Table 1–3.

Table 1–3: Graduation requirements for the Computer Engineering program

Curriculum Component		Credit Hours
University Requirements		19
General Education		10
Mathematics and Basic Sciences		35
Computer Engineering Courses	Core Courses	87
	Electives	9
	Summer Training	4
Total		164

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.

This mission statement is available online at: *http://www.uqu.edu.sa/page/en/203*

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: *http://uqu.edu.sa/computer-sciences-information-en/en/175810*

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 leaders 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: *http://uqu.edu.sa/computer-sciences-information-en/en/175811*

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 Tables 2–1, 2–2 and 2–3.

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

1. Leadership in 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 Saudi 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

Tables 2–2 and 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 defined tasks. The PEOs of computer engineering are defined as follows:

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 objectives are documented on the department's website: *http://uqu.edu.sa/computer-sciences-information-en/en/175812*

C. Consistency of the PEOs 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.

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 for Revision of the PEOs

PEOs are broad statements describing the achievements the graduates from the computer engineering program should attain 3-5 years after graduation. The program objectives have been established after discussions in the Department Council.

The reviewing and revising process of the PEOs follows the way they were constructed and is launched every three years. It encompasses consultations with the program's stakeholders – the EAB, faculty, employers, and alumni. From these consultations the assessment committee gathers motivated proposals to modify the program objectives. These proposals are presented to the department council for discussion and decision.

The members of the External Advisory Board have been invited to review and comment on the proposed PEOs. There have been two meetings of the External Advisory Board – one in the year 2012 and one in 2013. Their feedback was used to revise the PEOs after deliberations in the Department Council.

If the modifications are approved, the department council will determine the appropriate implementation of the approved proposal whether through student outcomes' modification, and/or curriculum modification. The Assessment & Evaluation Committee will have to develop the right assessment tool to assess the new PEOs and to take them into consideration during the next PEO assessment. Figure 2–1 depicts the PEO revision process.

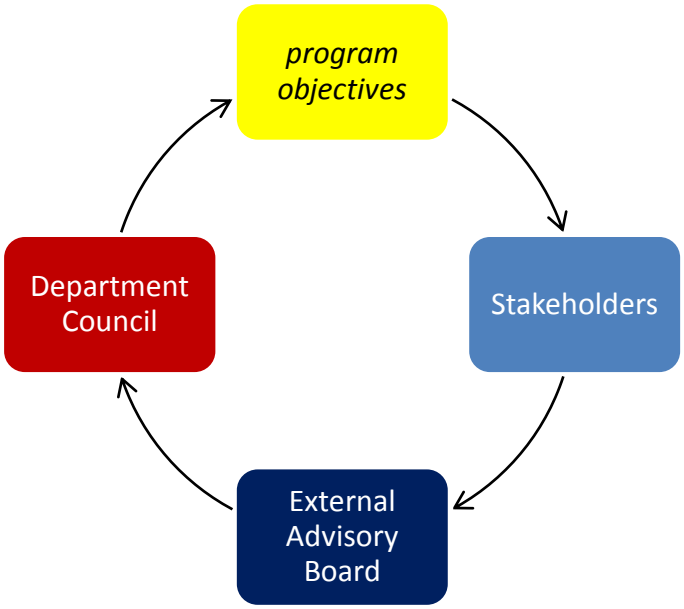


Figure 2–1: Process for revision of the PEOs

CRITERION 3: STUDENT OUTCOMES

A. Student Outcomes

The CE Student Outcomes are identical to the ABET Outcomes (a)–(k). They require that our graduate will demonstrate:

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

The curriculum has been designed to enable students to achieve these outcomes. The student outcomes for the computer engineering program are published at *http://uqu.edu.sa/computer-sciences-information-en/en/204414*.

B. Relationship of Student Outcomes to Program Educational Objectives

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 3–1 summarizes the mapping between the student outcomes and the program objectives.

Table 3–1: Mapping of Student Outcomes 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

Several processes have been implemented for regularly assessing and evaluating the student outcomes (SOs). 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 laid out as follows:

1. The essential elements of the assessment and evaluation processes are described in sub-section A-1. Knowledge of these essential elements will help the reader understand the processes described later. These essential elements include:
   a. Course Learning Outcomes (CLOs)
   b. CLO-SO map
   c. Student Outcomes
   d. Courses Used for Evaluation
   e. Course-SO map
   f. Program Satisfaction Criterion (PSC).
2. An overview of the assessment processes is given in sub-section A-2.
3. Processes listed in section A-2 are described in later sub-sections A-3 to A-9.
4. Data showing the attainment of SOs are discussed in the last sub-section A-10.

A.1 Essential Elements of SO Assessment and Evaluation

The assessment and evaluation processes are dependent upon a set of essential elements. It is necessary to describe them to make it easy for the reader to understand the whole process. These essential elements are described in the following:

A.1.1 Course Learning Outcomes

Course Learning Outcomes (CLOs) are the basis of all direct assessments of SOs. Each course has a set of outcomes called "Course Learning Outcomes" or CLOs. The CLOs of a course describe the abilities to be attained at the end of the course. The CLOs for each course are specified so that they are non-overlapping and are as few as possible still covering the specified syllabus of the course. The curriculum committee is responsible for updating and revising the CLOs based on the recommendations of the Course Coordinators. For Computer Engineering Program, the CLOs are part of the syllabus and are published for students and the faculty at:

https://uqu.edu.sa/computer-sciences-information-en/en/204416.

A typical set of CLOs is shown in Table 4–1 for the course 1403381 Numerical Analysis:

Table 4–1: Typical CLOs (1403381 Numerical Analysis)

CLO ID	CLOs
CLO 1	The ability to use Taylor Series to approximate functions and evaluate the approximation errors
CLO 2	The ability to use various algorithms to locate the roots of equations
CLO 3	The ability to solve problems involving linear algebraic equations
CLO 4	The ability to use least squares method to smooth collected engineering data and to use polynomials to interpolate engineering data or approximate a given function
CLO 5	The ability to solve numerical differentiation and integration problems
CLO 6	The ability to solve ordinary differential equations or partial differential equations

A.1.2 Linking the CLOs with SOs

For each course, the CLOs are linked to the SOs that are attained as a result of attaining the CLOs. This implies that the ability attained by a student in a particular CLO represents an ability in the relevant SOs. At this stage, we have a 0-1 logic for this linking. If a CLO *significantly* helps in attaining an ability related to an SO, we include the SO otherwise we don't include it. Since we are using a software, the effectiveness of a CLO in the attainment of a particular SO may be specified on a continuous scale or a fuzzy logic may be used. However, this improvement has been planned for the future based on the experiences of the current processes. A typical CLO-SO map for the course 1403381 Numerical Analysis is shown in Table 4–3.

Table 4–2: Typical CLO-SO map (1403381 Numerical Analysis)

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										1
2	1										1
3	1										1
4	1										1
5	1										1
6	1										1

Since SOs are linked to the CLOs of various 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. This has been elaborated in more detail in the publications [?,?]. 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 software. Figure 4–1 shows this central idea of the SO assessment process.

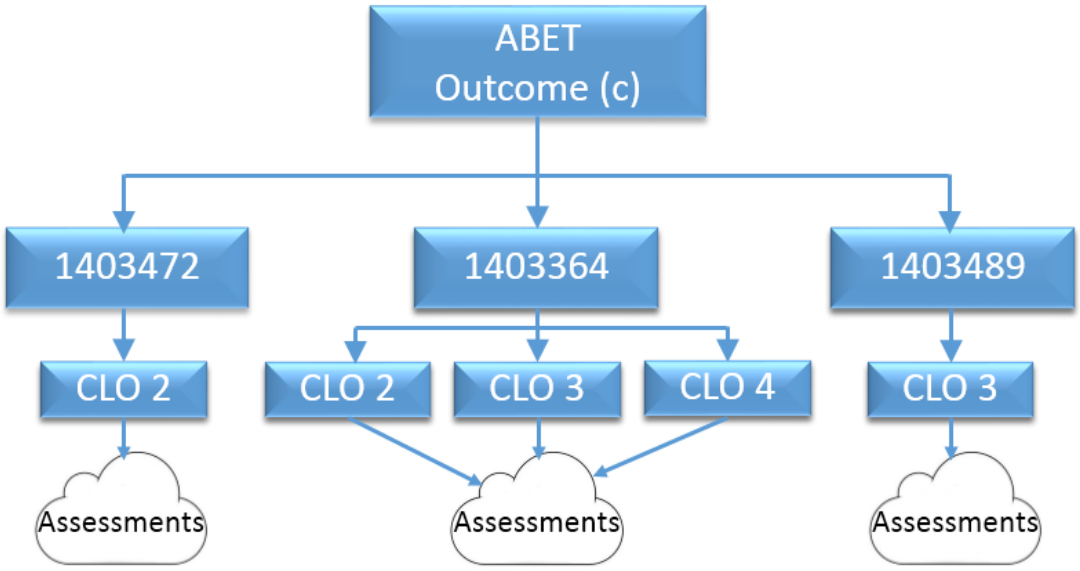


Figure 4–1: The SO assessment linked to CLO assessment

A.2 Courses Used for Evaluation

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 courses of the computer engineering program including the Graduation Project (1403499-4). These courses include core courses as well as electives. The department has full control on these courses 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 described in this chapter are the following:

- General courses to satisfy the university requirement
- Courses from other departments such as Computer Science, Mechanical Engineering and Electrical Engineering.

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 preference here to exclude the above from evaluation of the SO attainment has the following main reasons:

a. We will demonstrate that all the SOs are attained to the required satisfaction level, through the Computer Engineering courses, as mentioned above. Therefore the abilities gained through other compulsory courses represent "a plus" and are not required to be evaluated.
b. If it is demonstrated that the SOs are attained to the required satisfaction level, through the Computer Engineering courses, the abilities gained through other compulsory courses represent a plus and are not required to be evaluated.
c. These courses are not administered by the department and therefore we don't have full control on them to obtain proper satisfaction data and we might not be able to implement the improvement plans.
d. Computer engineering elective courses are administered by the department and the data from these courses are collected just like all core courses and improvement plans are also required and implemented. However, since all students do not take the same electives, the SOs attained in electives are not the same and therefore they are not representative of the abilities of all students in the program. For this reason, SO attainment in electives has been mentioned in a separate table.

The courses of the program used in the evaluation of SO attainment cover all the SOs though not equally. The list of all core courses and electives, and the relevant SOs for each course are shown in Tables 4–3 and 4–4. These tables are called Course-SO map. In these tables the SOs used for the assessments in each course are indicated. At the end of each table a summary is given that indicates how many courses contribute to a given SO.

A.3 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 represented by their percentage marks in each CLO and SO. If the satisfaction level for a CLO or SO in a course is lower than the PSC (specified by the department) it will trigger the alarm for the instructor and a "Course Continuous Improvement Plan" (CCIP) must be written and implemented by the instructor.

Computer engineering program had specified a satisfaction criterion of 60% students attaining the ability represented by 60% marks for previous academic years. It was realized that this triggered the "alarm" for CCIP in very few courses. Therefore for the current academic year and onward it was decided to raise it. The recommendation was brought forward by the Steering Committee and then approved by the Departmental Council. The target satisfaction criterion is now stated as follows:

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

Table 4–3: Course-SO Map for Core Courses

Course Code	Course Title	Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
1403201-4	Circuit Theory	1	1			1						1
1403311-4	Electronics	1	1	1								1
1403271-4	Switching Theory	1	1	1		1						
1403381-3	Numerical Analysis	1										1
1403372-4	Computer Organization	1		1		1						1
1403312-4	Digital Electronic Systems and Circuits	1	1	1		1						1
1403322-3	Computer Communication System	1				1			1		1	
1403371-4	Advanced Logic Design	1	1	1		1						1
1403401-2	Seminar				1	1	1	1	1	1	1	1
1403422-4	Computer Networks	1	1			1			1	1		1
1403489-4	Microprocessors	1	1	1		1			1	1	1	1
1403472-3	Computer Architecture	1		1		1				1	1	
1403484-3	Databases	1		1			1		1			1
1403364-3	Basics of IC Design	1		1		1		1	1	1	1	
1403450-4	Microcomputer System Design	1	1	1		1						
1403487-3	Process Control	1		1	1	1			1		1	
1403300-2	Summer Training I	1	1	1	1	1	1	1	1	1	1	1
1403400-2	Summer Training II	1	1	1	1	1	1	1	1	1	1	1
1403499-4	Project	1	1	1	1	1		1			1	
Summary of 18 Courses		17	10	13	04	15	03	04	08	06	08	11

Table 4–4: Course-SO Map for Electives

Course Code	Course Title	Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
1403464-3	Design of Integrated Circuits	1		1		1					1	1
1403446-3	Mobile Computing	1		1		1			1	1	1	1
1403478-3	Computer Vision	1	1	1		1		1				1
1403481-3	Neural Networks	1		1		1						1
1403476-3	Simulation & Modeling	1	1	1								1
1403421-3	Digital Signal Analysis	1				1						1
1403480-3	Artificial Intelligence	1	1	1		1	1	1	1		1	1
Summary of 7 Courses		7	3	6		6	1	2	2	1	3	7

It must be emphasized here that it is a target to be achieved and as a result if a course cannot attain this PSC then a CCIP 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 CCIP whenever the CLO or SO attainments fall below this PSC. The department has resolved that this target will be achieved gradually. It also must be understood that the department at the same time is trying to curb the grade inflation. Therefore the SO attainments as reported by the instructors now and in the future will appear lower than what was reported for the same actual level of attainments in the past. 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 and a crisp number PSC may not be considered as a hard and fast rule. A research proposal has been submitted by some faculty members to apply Fuzzy logic to determine the learning more realistically.

A.4 Accreditation Software

As indicated earlier, the department is using a software called CLOSO marketed by www.smart-accredit.com. The objectives in using the software package are as follows:

a) To cut down the instructor's time and effort in preparing the course file and data collection.
b) To increase the reliability of the collected data.
c) To allow error-free processing of large amount of data and thus enable the department to analyze and evaluate all courses within a week after obtaining the data files from the instructors.
d) To obtain faculty's opinions on a number of issues that may help improve the CLO and SO attainments.
e) To identify any course that has an issue and to take corrective measures.
f) To enable the chairman of the department, the ABET coordinator to re-view the SO attainments and "Loop-closing" in each semester.
g) To maintain a unified data base for syllabi of all courses.
h) To make the assessment and evaluation system highly sustainable.

The software CLOSO was licensed because it satisfied all the above requirements. The details of the software are available at the following link of the Software developer's site:

www.smart-accredit.com/CLOSO

A.5 Summary of Assessment Processes

The attainment of SOs are continually assessed and evaluated through a number of processes. The evaluation system is automated through CLOSO software package described above. The evaluation system maintains a unified database containing the syllabus, CLO-SO maps for all courses, Program Satisfaction Criterion and various other data. The evaluation system is itself being improved continually. At this time the system has reached a very stable and reliable status with a very high degree of sustainability and the department was quite successful to drastically cut 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 was not 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 "Course Learning Outcomes" (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 for proper assessment of the course CLOs. The CLOSO software converts the CLO based data to SO based data through the CLO-SO map of the course as described in Section A.1.2.

b. Due to automation, the ease and the speed available through CLOSO, in Computer Engineering Program, the "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 actually 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 actually demonstrated by the students in their Graduation Project that is the last thing they do before graduation. The graduation projects cover all the SOs. For this reason we call the assessment of the Graduation Project as "Summative Assessment".

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 4–5. Following the table, brief description of each process is given to help the reader have a quick view of the processes. The details of these processes are given in later sections.

Table 4–5: Assessment Processes

S/N	SO Assessment Process	Assessment Type	Frequency	Data Collected by	Data 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	Annual	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
8	Summer Training Survey	Indirect	Annual	Surveys Committee	Surveys Committee	Assessment Committee

A.5.1 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 committee. The details are given in Section A.3.1.

A.5.2 Summative Assessment

Three to five students work as a team on the Graduation Project over a period of two semesters under the supervision of a faculty member with good design back ground. Their tasks in each semester are defined in a document approved by the department. A CLOSO data template is available for the instructors to report the assessments of all the tasks done in 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.3.2.

A.5.3 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.3.3.

A.5.4 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.3.4.

A.5.5 Exit Survey Assessment

Exit surveys take place just before the final examinations of each semester.. All graduating students fill in a survey form. In this survey the 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 & Evaluation Committee. It is discussed in Section A.3.5.

A.5.6 Alumni Survey Assessment

Alumni survey is done at an interval of three years. The survey has other purposes but one of the objectives 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.3.6.

A.5.7 Employer Surveys

Employer survey is done 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.3.7.

A.6 Details of Assessment Processes

A.6.1 Formative Assessment

Since all data processing is done by CLOSO software which has been thoroughly checked by comparing with calculations done manually in two different departments of the university, 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.6.1.1 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. Tables 4–6, 4–7 and 4–8 show the choices available to the instructor for three different aspects of the SO assessment plan. Fig. 4–2 shows a typical instructor's input in CLOSO software.

Table 4–6: 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 4–7: SO check on students awareness - 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 4–8: 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)

Here the instructor enters the plan of SO evaluation. The questions and the possible answers are shown in the screen snapshot in Fig. 4–2. 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 Committee to resolve any issues concerning the satisfaction of SO attainment.

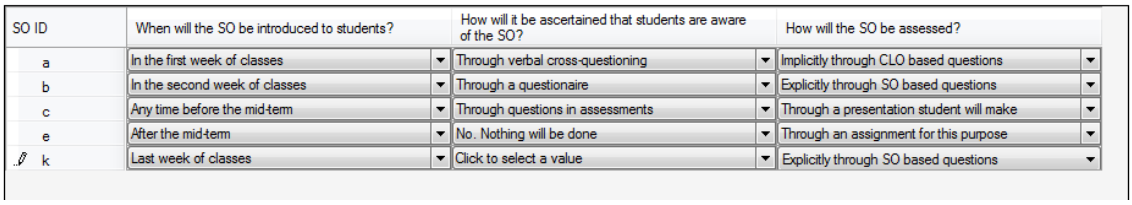


Fig. 4–2: An Example of SO Assessment Plan Input

A.6.1.2 Assessment Contribution Data

For the purpose of data input to CLOSO software, an assessment is characterized by 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) Actual marks out of 100 that the assessment contributes to the final grade

An example is shown in Table 4–9. It is worth noting that data shown in Table 4–9 is typically maintained by all instructors universally and therefore it is no additional burden on the instructor.

Table 4–9: 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: (must add up to 100)	100

A.6.1.3 CLO Marks Allocation Data

It is common in final examinations and other periodic examinations such as “Mid-term” examination that an assessment has questions belonging to different CLOs. On the other hand, a quiz or homework on a given topic or chapter of text book usually belongs to a single CLO, though there may be several questions. If an assessment has all questions belonging to the same CLO, it makes things simple because keeping track of the students’ marks for the assessment is enough. In such cases, marks obtained by students in each question of the assessment are not required. However, if the questions belong to different CLOs, it is required that marks of students for all questions belonging each CLO be recorded. In such cases, the data collection is a little burdensome on the instructor but there is no other way to determine how the students are performing in a particular CLO that in turn provides their performance in the respective SOs. An example of the data collected by the instructor for this purpose is shown in Table 4–10. In this table the data shown is for Assessment 6 which is Mid-Term contributing 10 marks to the final grade. Out of 10 questions, the first two belong to CLO 1 of the course and will be graded out of 20 marks. Questions 3 to 5 belong to CLO 2 and will be graded out of 30 marks. Questions 6 to 10 belong to CLO 3 and will be graded out of 50 marks. The CLOSO screen snapshot for entering the data is shown in Fig. 4–3.

Table 4–10: Example of CLO Allocation Data for an Assessment

Assessment Info			**S/N**	**Questions**	**Raw Marks (Used for grading the questions)**	**CLO ID**
ID:	**6**					
Name:	**Mid-Term**					
Marks it contributes to the final grade		**10**	1	1-2	20	CLO 1
			2	3-5	30	CLO 2
			3	6-10	50	CLO 3

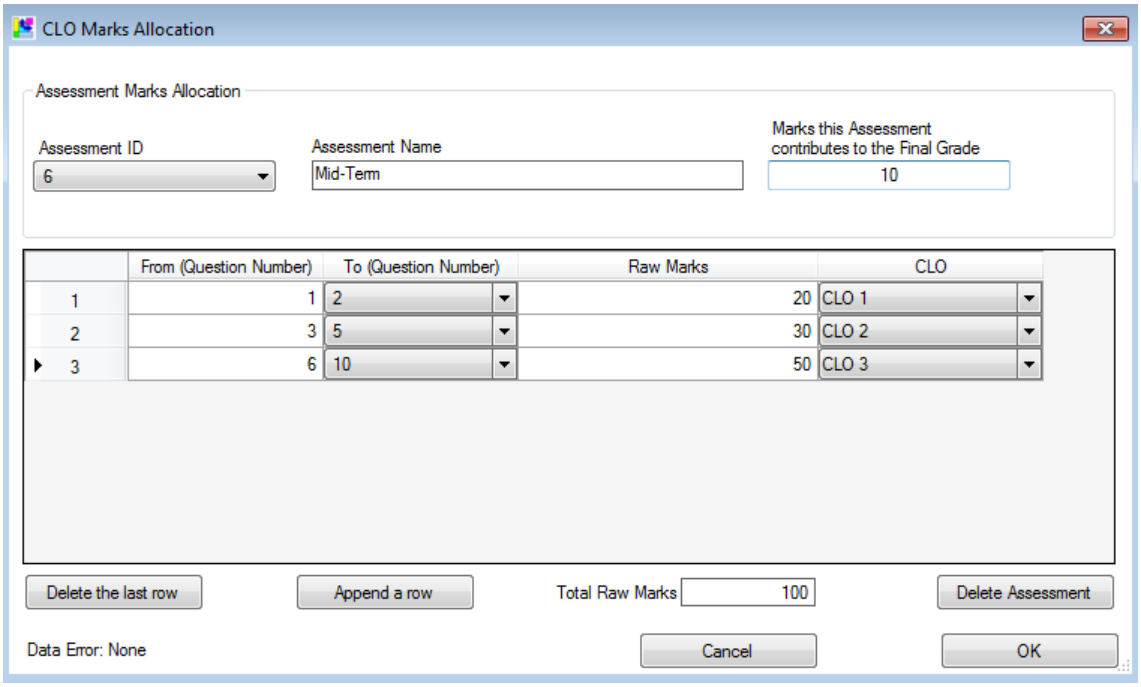


Fig. 4–3: CLOSO input window for CLO allocation data

A.6.1.4 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 CLO-wise. 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 do not 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	CLO 1 (Marks Out of 20)	CLO 2 (Marks Out of 30)	CLO 3 (Marks Out of 50)	Non CLO Marks
1	17	20	45	0
2	16	22	43	0
3	10	25	30	0
4	17	26	39	0
5	15	23	38	0
6	14	19	37	0
….	….	….	….	….

Fig 4–4 shows the data input window for assessment data. It is interesting to note that analysis of two types is 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. The two types of analyses shown in the data input window are described in the following:

a) *Bar chart for each CLO:* For each CLO in each assessment a bar chart shows the grade distribution. The instructor may display the distribution for the total of all CLOs for a given assessment or the total of all assessments for a given CLO. Final grades distribution i.e., the total of all assessments for the total of all CLOs may also be displayed.
b) In the right bottom part of the window, the percentage of students satisfying a criterion is displayed for each CLO for varying satisfaction criterion ranging from 60% to 95% marks. For example, in the screen snapshot shown in Fig. 4–4, the analysis indicates that for CLO 1 in Assessment 6, 95% students get more than 60% marks, 90% students get more than 65% marks, 85% get more than 70% marks and so on.

The above two analyses are sufficient for an instructor to evaluate the students' performances continuously as the semester progresses and take necessary steps to strengthen the areas which are weak.

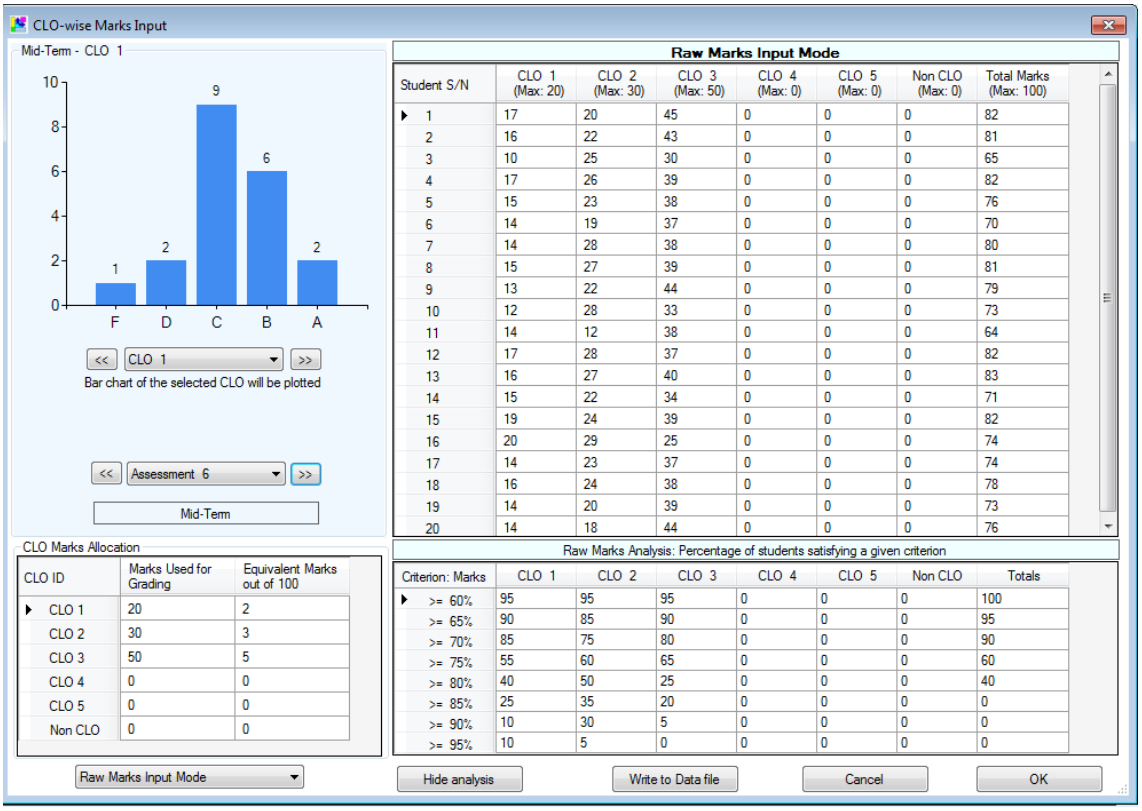
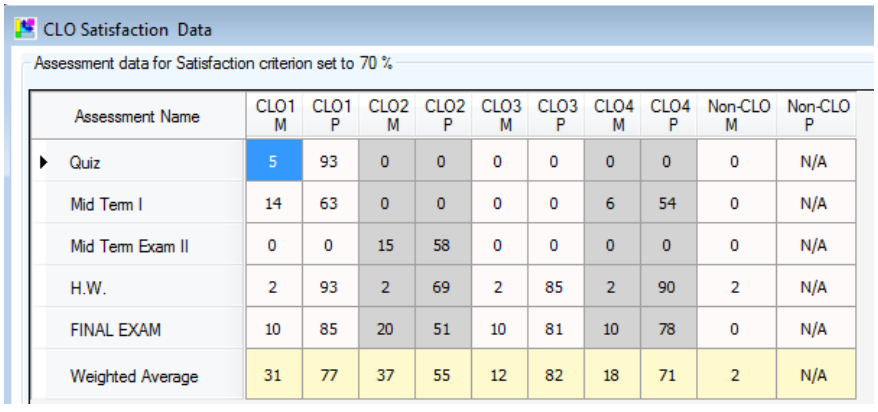


Fig. 4–4: Assessment data input and analysis window of CLOSO

A.6.1.5 Evaluation of SO Attainment through Courses

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

1. *CLO Satisfaction Analysis:* CLOSO software analyses and determines the percentage of students satisfying the program satisfaction criterion for each assessment. Then a weighted average is calculated for each CLO. An example of CLOSO display of CLO Satisfaction Data is shown in Fig. 4–5.



Assessment Name	CLO1 M	CLO1 P	CLO2 M	CLO2 P	CLO3 M	CLO3 P	CLO4 M	CLO4 P	Non-CLO M	Non-CLO P
Quiz	5	93	0	0	0	0	0	0	0	N/A
Mid Term I	14	63	0	0	0	0	6	54	0	N/A
Mid Term Exam II	0	0	15	58	0	0	0	0	0	N/A
H.W.	2	93	2	69	2	85	2	90	2	N/A
FINAL EXAM	10	85	20	51	10	81	10	78	0	N/A
Weighted Average	31	77	37	55	12	82	18	71	2	N/A

Fig. 4–5: Typical CLO satisfaction data

2. *SO Satisfaction Analysis:* SO Satisfaction Results: 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 Fig. 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 is important. It gives the cumulative sum of all assessments done for the course. In this example, 42.5% marks are allocated to assessments related to SO (a) and the percentage of students getting more than 70% marks is 70%. For SO (e), 9.2% marks are shown allocated and the percentage of students getting marks greater than 70% is 71%.

Assessment data for Satisfaction: 60% students get 70% marks)

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
Quizzes	5	67			3.3	70			1.7	60												
Midterm	12.5	70			5	67			7.5	73												
Lab			12.5	93																	12.5	93
Final	25	70			10	47																
Attendance			2.5	60																	2.5	60
Assessment 6																						
Assessment 7																						
Cumulative Sum (Out of 100)	42.5	70	15	88	18.3	56			9.2	71											15	88

Fig. 4–6: Typical SO satisfaction data

A.6.2 Graduation Project Assessment

In addition to a brief orientation in a semester prior to the start of the project, 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/computer-sciences-information-en/en/93195852.

The document is distributed to the faculty and the students and is considered as a guide for both the students and the faculty. 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.

A.6.2.1 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 Fig. 4–7.

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.

A.6.2.2 Graduation Project Assessment Data Collection

For the graduation project, the project advisor submits the assessment data using CLOSO software. There is a template CLOSO file available to the faculty to report the collected assessment data. The project advisor has just to enter the marks obtained by the students in the project group for each task.

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

	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

Fig. 4–7: Graduation project first semester CLO-SO map

Table 4–13 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 4–13 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.

Table 4–13: Graduation Project Main Semester 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**	

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.3.1 and therefore are not repeated here.

A.6.3 Course-wise Student Survey

Indirect assessment 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 students' 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 Fig. 4–8.

Umm Al-Qura University
College of Computer & Information System
Computer Engineering Department

Instructor: Turki Faisal Al-Somani

1403372- Computer Organization; Class Section 1; Fall 2012-13

Indirect Assessment of CLOs

(Student Survey)

Score Scale

1	2	3	4	5
Less than 60%	60% to 69%	70% to 79%	80% to 89%	90% to 100%

Respond to each of the following statements by giving a "Score" (1,2,3,4 or 5) using the scale given above. Your answer will not affect your actual grade in any way. The data will be used to improve the teaching in the future. If you think that your abilities in the CLO are worth an A grade give a score of 5, if you think that your abilities in the CLO are worth a B grade give a score of 4, if you think that your abilities in the CLO are worth a C grade give a score of 3, if you think that your abilities in the CLO are worth a D grade give a score of 2, if you think you learned almost nothing then give a score of 1:

S/N	Course Learning Outcome (CLO)	Score
1	An ability to evaluate and analyze computer performance	
2	An ability to understand computer instruction set architecture	
3	An understanding of basic computer arithmetic algorithms	
4	An ability to write assembly language programs using MIPS assembly language *	
5	An ability to understand memory hierarchy	

Following is optional: If your estimation of learning outcome is different from your actual grade, this information will be used to find a way to minimize such anomalies.

Student's Name (Optional):	Signature (Optional):

Fig. 4–8: Typical student survey form

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 Fig. 4–8. In the analysis produced by CLOSO, the percentages in the columns for 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 Fig. 4–9. 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).

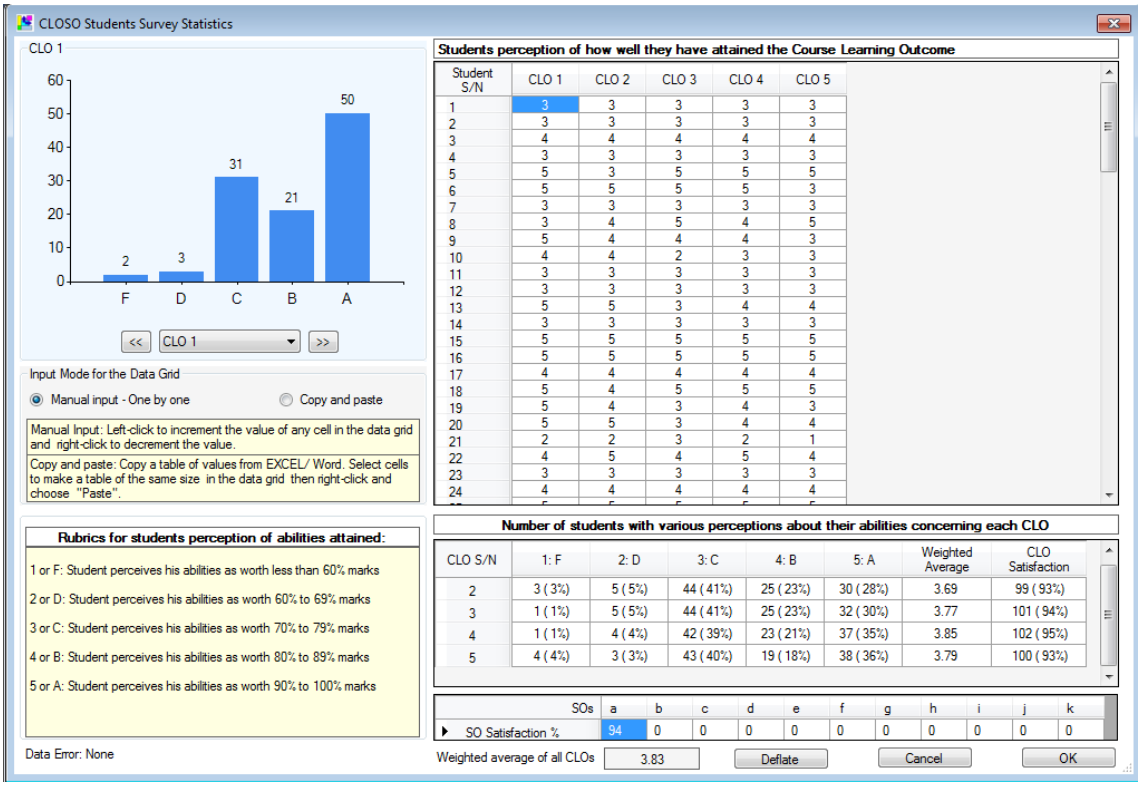


Fig. 4–9: Typical student survey data and analysis

A.6.4 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 mostly about the same as reflected by 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.

The indirect assessment based on faculty survey shows the perception the instructor has about the students. The instructor just has to indicate for each CLO, his opinion about the real abilities attained. 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. Fig. 4–10 shows a 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 1: Unsatisfactory, 2: Progressing (meaning progressing towards satisfaction), 3: Satisfactory (i.e., 70% students are attaining the abilities to a level of C grade), 4: Excellent and 5: Exemplary. Of course, a score less than 3 world mean an improvement plan is written to rectify the low attainment.

CLOSO converts the CLO Satisfaction data to SO satisfaction data. Fig. 4–11 shows the converted data for a number of courses. This is presented here as an example. Faculty survey analysis is done for numerous input from the faculty. The one shown in Fig. 4–10 is for SO attainment. For each course, CLOSO produces data for the relevant SOs. It displays the marks allocated to the particular SO and the percentage of students getting more than 70 % marks i.e., attaining the program satisfaction criterion. For example, the SO (a) has two columns namely M(a) and P(a). M(a) is the marks that were allocated to questions used in the assessment of SO (a), and P(a) is the percentage of students satisfying the criterion in these questions

of the assessments. In addition to this information, the first few columns give the Course ID, Sections, the credit hours (CH) and the number of students (NS).

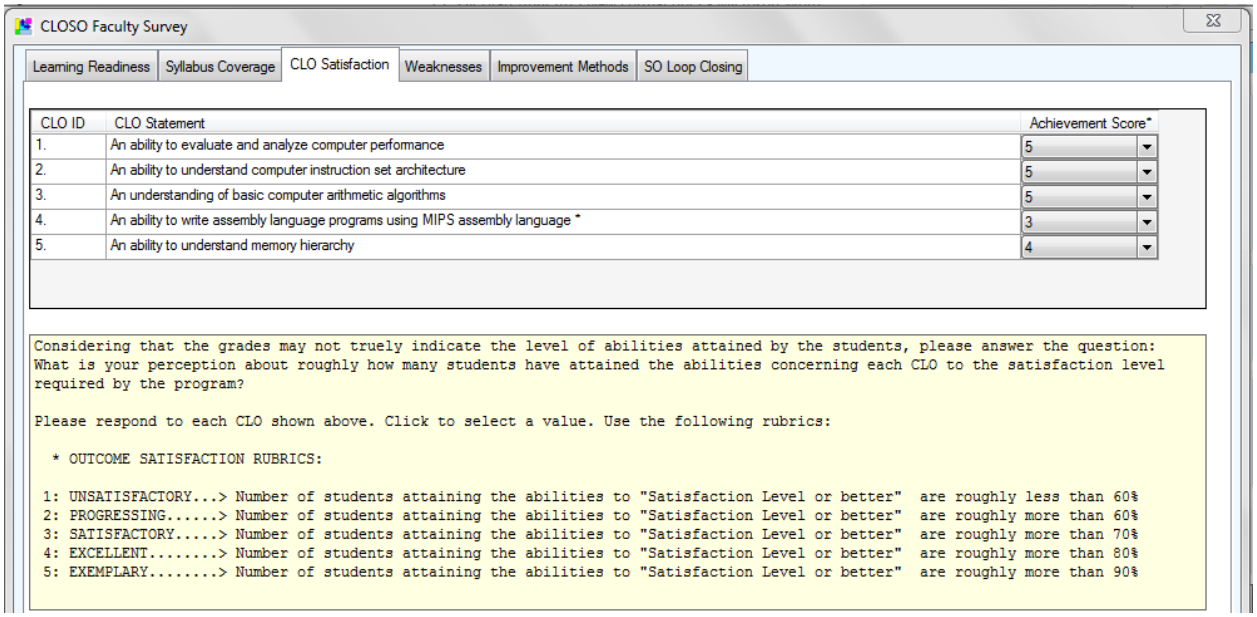
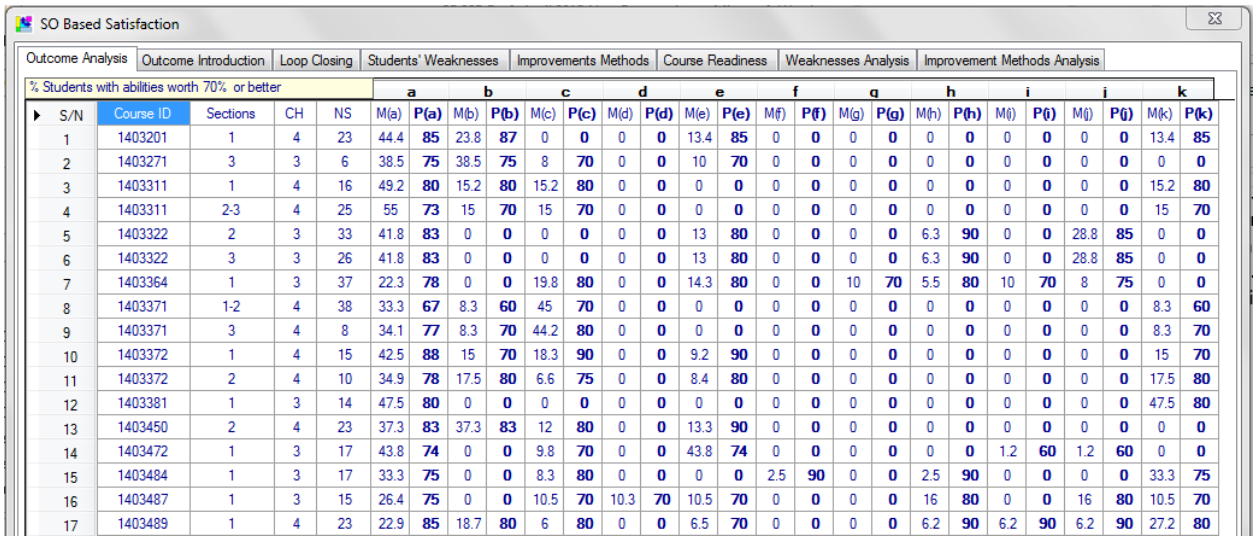


Fig. 4–10: Typical faculty survey data for CLO Satisfaction



					a		b		c		d		e		f		g		h		i		j		k	
S/N	Course ID	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	23	44.4	85	23.8	87	0	0	0	0	13.4	85	0	0	0	0	0	0	0	0	0	0	13.4	85
2	1403271	3	3	6	38.5	75	38.5	75	8	70	0	0	10	70	0	0	0	0	0	0	0	0	0	0	0	0
3	1403311	1	4	16	49.2	80	15.2	80	15.2	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.2	80
4	1403311	2-3	4	25	55	73	15	70	15	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	70
5	1403322	2	3	33	41.8	83	0	0	0	0	0	0	13	80	0	0	0	0	6.3	90	0	0	28.8	85	0	0
6	1403322	3	3	26	41.8	83	0	0	0	0	0	0	13	80	0	0	0	0	6.3	90	0	0	28.8	85	0	0
7	1403364	1	3	37	22.3	78	0	0	19.8	80	0	0	14.3	80	0	0	10	70	5.5	80	10	70	8	75	0	0
8	1403371	1-2	4	38	33.3	67	8.3	60	45	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.3	60
9	1403371	3	4	8	34.1	77	8.3	70	44.2	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.3	70
10	1403372	1	4	15	42.5	88	15	70	18.3	90	0	0	9.2	90	0	0	0	0	0	0	0	0	0	0	15	70
11	1403372	2	4	10	34.9	78	17.5	80	6.6	75	0	0	8.4	80	0	0	0	0	0	0	0	0	0	0	17.5	80
12	1403381	1	3	14	47.5	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47.5	80
13	1403450	2	4	23	37.3	83	37.3	83	12	80	0	0	13.3	90	0	0	0	0	0	0	0	0	0	0	0	0
14	1403472	1	3	17	43.8	74	0	0	9.8	70	0	0	43.8	74	0	0	0	0	0	0	1.2	60	1.2	60	0	0
15	1403484	1	3	17	33.3	75	0	0	8.3	80	0	0	0	0	2.5	90	0	0	2.5	90	0	0	0	0	33.3	75
16	1403487	1	3	15	26.4	75	0	0	10.5	70	10.3	70	10.5	70	0	0	0	0	16	80	0	0	16	80	10.5	70
17	1403489	1	4	23	22.9	85	18.7	80	6	80	0	0	6.5	70	0	0	0	0	6.2	90	6.2	90	6.2	90	27.2	80

Fig. 4–11: Example of SO satisfaction based on faculty survey data

A.6.5 Exit Survey

In each semester, all graduating students are required to fill in a survey form and may go through an exit interview by the Surveys Committee of the department. The survey form is shown in Table 4–14.

An example of the data that is collected through the Exit Survey is shown in Table 4–15. Such data are useful in seeing immediately that the disagreement is high or low. Always a high disagreement will trigger the improvement process as explained in the section on improvement.

A.6.6 Alumni Survey

Alumni survey is done at an interval of 3 years. A questionnaire is sent to a set of randomly selected alumni. 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.

Table 4–14: 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					

Table 4–15: Example of SO Attainment Obtained from Exit Survey

S/N	SO	Excellent	Very Good	Good	Poor	Very Poor	Weighted Avg. (%)
1	(a)	6 (26.09%)	7 (30.43%)	10 (43.48%)	0 (0%)	0 (0%)	76.5
2	(b)	7 (30.43%)	8 (34.78%)	8 (34.78%)	0 (0%)	0 (0%)	79.1
3	(c)	3 (13.04%)	9 (39.13%)	11 (47.83%)	0 (0%)	0 (0%)	73.0
4	(d)	5 (21.74%)	11 (47.83%)	7 (30.43%)	0 (0%)	0 (0%)	78.3
5	(e)	4 (17.39%)	13 (56.52%)	6 (26.09%)	0 (0%)	0 (0%)	78.3
6	(f)	6 (26.09%)	11 (47.83%)	4 (17.39%)	2 (8.7%)	0 (0%)	78.3
7	(g)	5 (21.74%)	7 (30.43%)	10 (43.48%)	1 (4.35%)	0 (0%)	73.9
8	(h)	7 (30.43%)	8 (34.78%)	6 (26.09%)	2 (8.7%)	0 (0%)	77.4
9	(i)	5 (21.74%)	7 (30.43%)	9 (39.13%)	2 (8.7%)	0 (0%)	73.0
10	(j)	6 (26.09%)	6 (26.09%)	11 (47.83%)	0 (0%)	0 (0%)	75.7
11	(k)	6 (26.09%)	9 (39.13%)	5 (21.74%)	2 (8.7%)	1 (4.35%)	74.8

A.6.7 Employer Survey

Employer survey is also done at an interval of 3 years. A set of randomly selected employers are sent a questionnaire. 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.

A.6.8 Summer Training Survey

This survey is done annually by students who complete their Summer Trainings. The survey form is similar to what has been shown in Table 4–14 for Exit Survey.

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.7 SO Attainment Indicated by Formative Assessments

This section presents data showing the attainment of the SOs from various assessment processes described in the previous sections. Before presenting the data a brief discussion of how the data is obtained using the CLOSO software is given.

A.7.1 Extracting SO Attainment Data from CLOSO

SO attainments indicated by Formative Assessments, Summative Assessments and Student Surveys are evaluated by CLOSO software Admin Panel. The ABET coordinator of the department is authorized to use the Admin Panel of CLOSO. Since the authorization for CLOSO Admin Panel enables the user to modify the database including the syllabus and customization data, only one person in the department (currently the ABET coordinator) has such authorization. The chairman of the Assessment & Evaluation Committee collects the CLOSO assessment files each semester from all instructors and stores them in a single folder. The folder is sent to the ABET coordinator for analysis and evaluation using CLOSO Admin Panel.

CLOSO Admin Panel opens with an interface screen shown in Fig. 4–12. Among other controls, it has a button labeled “Evaluation”. Clicking this button opens a dialog for the user to specify the folder that contains the course files (i.e., CLOSO data files).

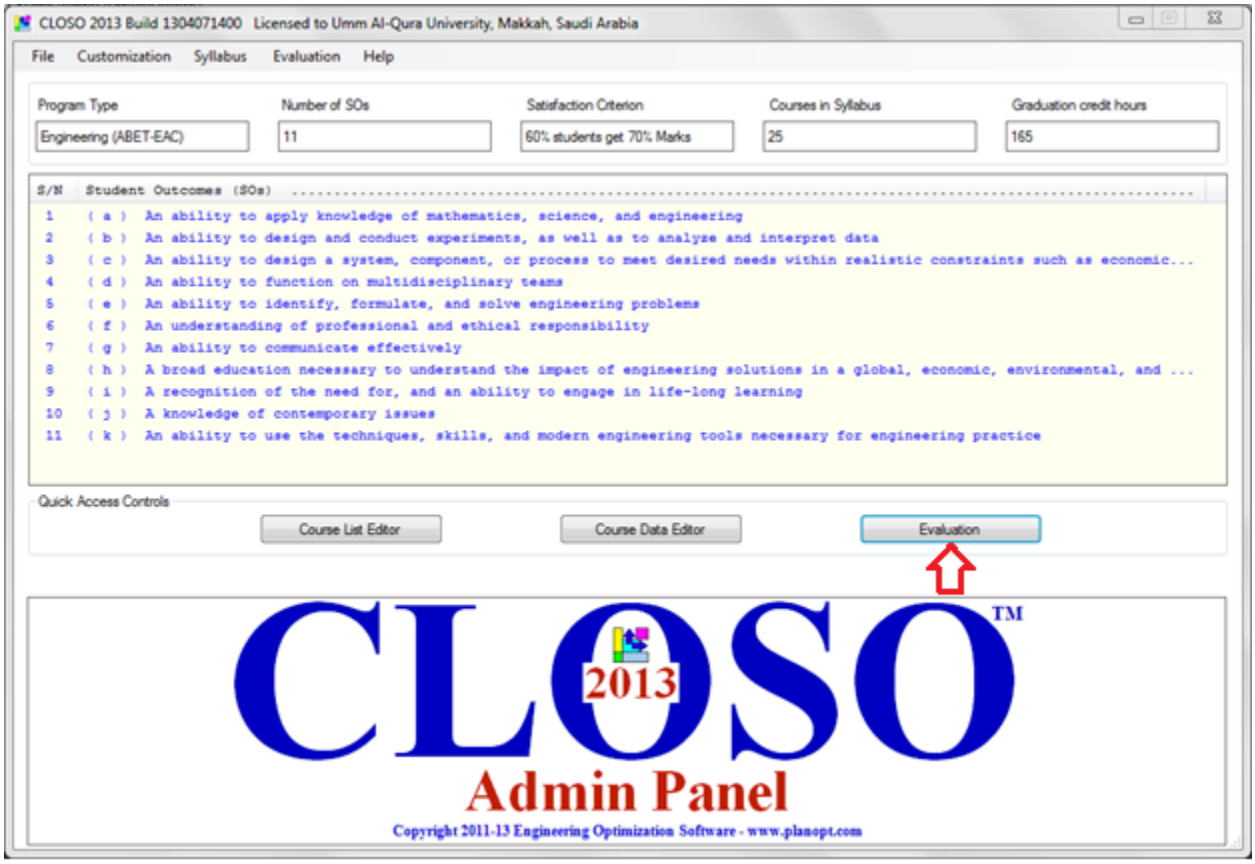


Fig 4–12: CLOSO Admin Panel

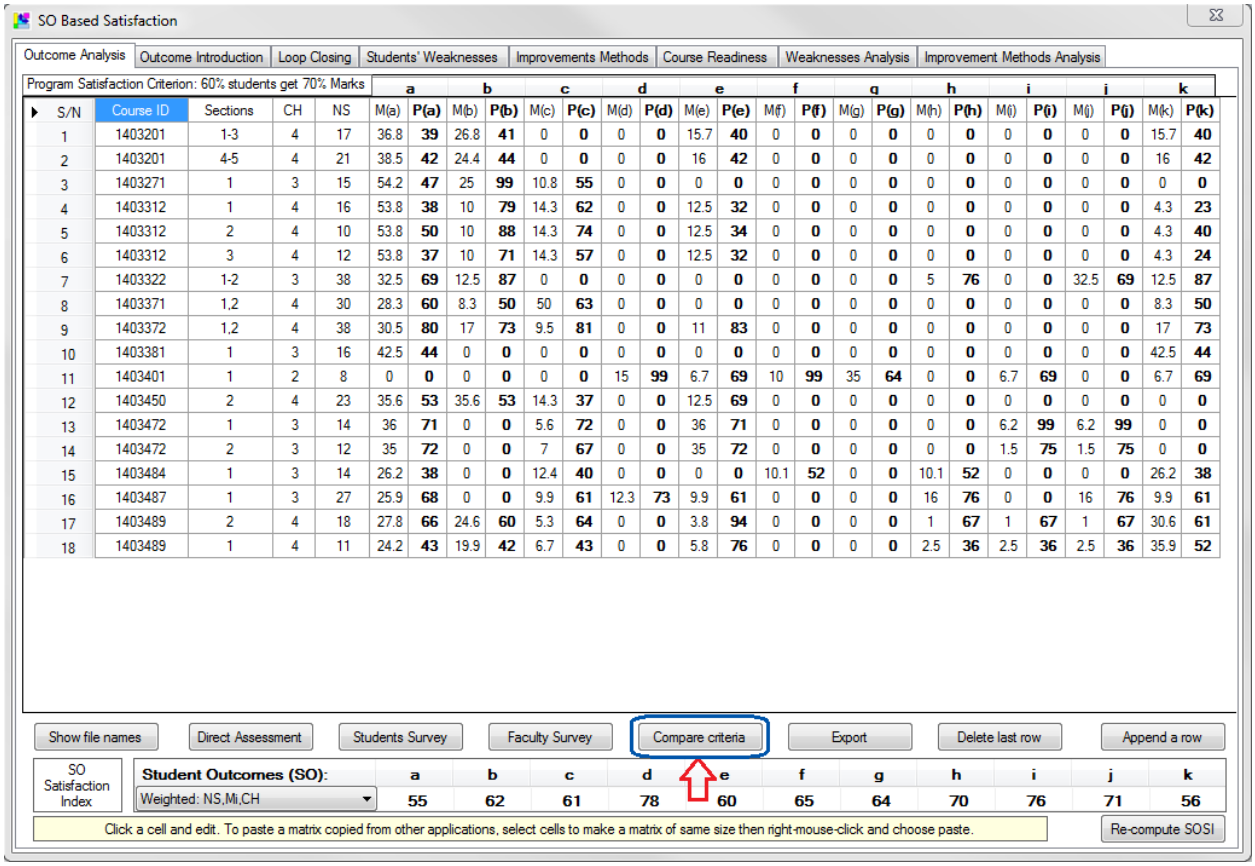
When the button "Evaluation" is clicked, data from all files in the specified folder are input by CLOSO. CLOSO reads the data from each file and performs the required data processing to obtain the "SO Satisfaction Data". The SO Satisfaction Data are displayed in a window labeled "SO Based Satisfaction" as shown in Fig. 4–13. The displayed data shows the attainment of SOs for each course. The numbers in the columns for each SO (a) to (k) indicate the percentage of students attaining the target Program Satisfaction Criterion (PSC) which is currently 60% (60% students attaining 70% marks is considered satisfactory). As mentioned earlier, there are faculty members with a high standard who turn out to be tough graders whereas there are some who are too soft and the grades are inflated. While the department is continuously trying to minimize this variation and curb the grade inflation and increase the reliability of assessments, the issue of variation of grading criterion from instructor to instructor will always remain in a University where faculty members are free to teach the courses the way they like. Therefore, the SO attainment in a particular course is not a true indicator. The average of SO attainments of all courses is therefore considered as a reasonable indicator of SO attainments and will be used.

The columns of data displayed in "SO Based Satisfaction Window" (Fig. 4–13) need some explanation to understand the data and therefore are briefly described in the following:

1) Column 1 shows the serial number of the course in the folder of CLOSO Course Files.
2) Column 2 displays the course IDs as specified in the curriculum.
3) Column 3 gives the sections of the course that the same instructor was teaching.
4) Column 4 has the header CH. It indicates the credit hours for the course.
5) Column 5 has the header NS. It shows the number of students registered in the course.
6) Columns 6 and 7 have the header (a) and sub headers M(a) and P(a). This means that columns 6 and 7 are displaying the data for the SO (a). Column 6 with header M(a) shows the marks allocated to the

questions related to SO (a). Column 7 has the header P(a). It shows the percentage of students getting marks 70% or higher.

7) The same is repeated for SOs (b) to (k) in the subsequent columns.
8) In the bottom of the screen the weighted averages are displayed. The user may display the simple averages or the weighted averages based on NS, CH and marks allocated to the SO.
9) The data may be exported to EXCEL by clicking the button EXPORT.

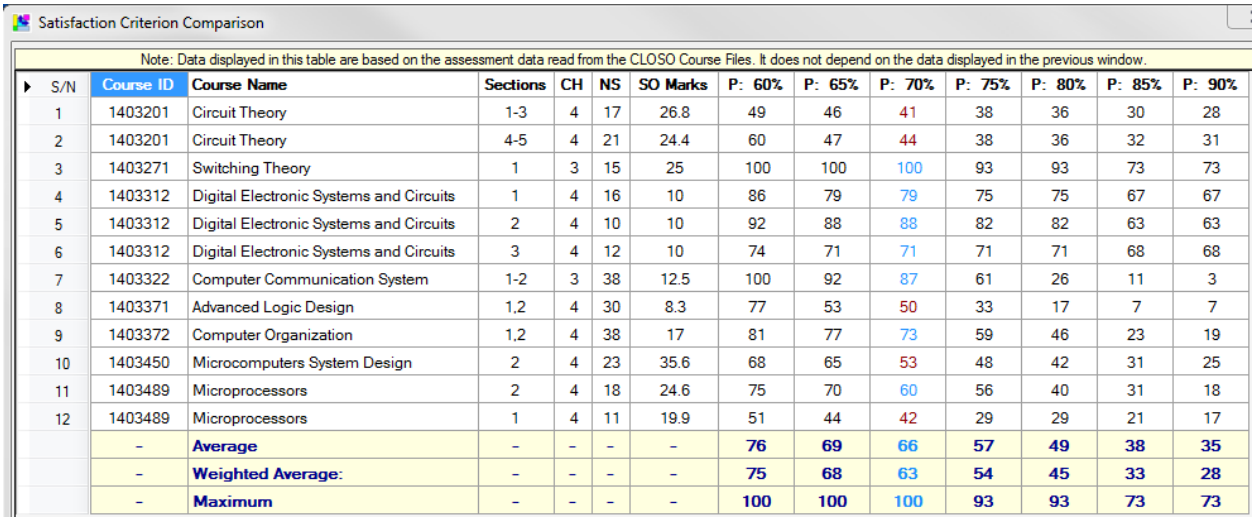


S/N	Course ID	Sections	CH	NS	M(a)	P(a)	M(b)	P(b)	M(c)	P(c)	M(d)	P(d)	M(e)	P(e)	M(f)	P(f)	M(g)	P(g)	M(h)	P(h)	M(i)	P(i)	M(j)	P(j)	M(k)	P(k)
1	1403201	1-3	4	17	36.8	39	26.8	41	0	0	0	0	15.7	40	0	0	0	0	0	0	0	0	0	0	15.7	40
2	1403201	4-5	4	21	38.5	42	24.4	44	0	0	0	0	16	42	0	0	0	0	0	0	0	0	0	0	16	42
3	1403271	1	3	15	54.2	47	25	99	10.8	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1403312	1	4	16	53.8	38	10	79	14.3	62	0	0	12.5	32	0	0	0	0	0	0	0	0	0	0	4.3	23
5	1403312	2	4	10	53.8	50	10	88	14.3	74	0	0	12.5	34	0	0	0	0	0	0	0	0	0	0	4.3	40
6	1403312	3	4	12	53.8	37	10	71	14.3	57	0	0	12.5	32	0	0	0	0	0	0	0	0	0	0	4.3	24
7	1403322	1-2	3	38	32.5	69	12.5	87	0	0	0	0	0	0	0	0	0	0	5	76	0	0	32.5	69	12.5	87
8	1403371	1,2	4	30	28.3	60	8.3	50	50	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.3	50
9	1403372	1,2	4	38	30.5	80	17	73	9.5	81	0	0	11	83	0	0	0	0	0	0	0	0	0	0	17	73
10	1403381	1	3	16	42.5	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42.5	44
11	1403401	1	2	8	0	0	0	0	0	0	15	99	6.7	69	10	99	35	64	0	0	6.7	69	0	0	6.7	69
12	1403450	2	4	23	35.6	53	35.6	53	14.3	37	0	0	12.5	69	0	0	0	0	0	0	0	0	0	0	0	0
13	1403472	1	3	14	36	71	0	0	5.6	72	0	0	36	71	0	0	0	0	0	0	6.2	99	6.2	99	0	0
14	1403472	2	3	12	35	72	0	0	7	67	0	0	35	72	0	0	0	0	0	0	1.5	75	1.5	75	0	0
15	1403484	1	3	14	26.2	38	0	0	12.4	40	0	0	0	0	10.1	52	0	0	10.1	52	0	0	0	0	26.2	38
16	1403487	1	3	27	25.9	68	0	0	9.9	61	12.3	73	9.9	61	0	0	0	0	16	76	0	0	16	76	9.9	61
17	1403489	2	4	18	27.8	66	24.6	60	5.3	64	0	0	3.8	94	0	0	0	0	1	67	1	67	1	67	30.6	61
18	1403489	1	4	11	24.2	43	19.9	42	6.7	43	0	0	5.8	76	0	0	0	0	2.5	36	2.5	36	2.5	36	35.9	52

Fig 4–13: An example of SO attainment data display by CLOSO Admin Panel

A.7.2 Comparing SO Attainment for Varying Satisfaction Criteria

The data shown in Fig. 4–13 indicates whether the target PSC of SO attainments has been achieved. However, for decision making, a question always arises: If the percentage marks specified for the satisfaction of SO attainments are raised or lowered then what percentage of students will be achieving the satisfaction. For this purpose CLOSO produces comparative data for varying satisfaction criteria. The comparative data can be displayed for each SO by clicking the button "Compare criteria" shown highlighted with an arrow in Fig. 4–13. When this button is clicked, a window opens with the display as shown in the screen snapshot of Fig. 4–14. This window is called "Satisfaction Criterion Comparison" window.



Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1-3	4	17	26.8	49	46	41	38	36	30	28
2	1403201	Circuit Theory	4-5	4	21	24.4	60	47	44	38	36	32	31
3	1403271	Switching Theory	1	3	15	25	100	100	100	93	93	73	73
4	1403312	Digital Electronic Systems and Circuits	1	4	16	10	86	79	79	75	75	67	67
5	1403312	Digital Electronic Systems and Circuits	2	4	10	10	92	88	88	82	82	63	63
6	1403312	Digital Electronic Systems and Circuits	3	4	12	10	74	71	71	71	71	68	68
7	1403322	Computer Communication System	1-2	3	38	12.5	100	92	87	61	26	11	3
8	1403371	Advanced Logic Design	1,2	4	30	8.3	77	53	50	33	17	7	7
9	1403372	Computer Organization	1,2	4	38	17	81	77	73	59	46	23	19
10	1403450	Microcomputers System Design	2	4	23	35.6	68	65	53	48	42	31	25
11	1403489	Microprocessors	2	4	18	24.6	75	70	60	56	40	31	18
12	1403489	Microprocessors	1	4	11	19.9	51	44	42	29	29	21	17
	-	**Average**	-	-	-	-	**76**	**69**	**66**	**57**	**49**	**38**	**35**
	-	**Weighted Average:**	-	-	-	-	**75**	**68**	**63**	**54**	**45**	**33**	**28**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**93**	**93**	**73**	**73**

Fig. 4–14: An example of SO Satisfaction Criteria Comparison for SO (b)

The data shown in Fig. 4–14 are for the selected SO (b) for Spring 2013. CLOSO Admin Panel user may choose any of the SOs and display the data. The columns are described as follows:

1) Column 1 shows the serial number of the course in the folder of CLOSO Course Files.

2) Column 2 displays the course IDs as specified in the curriculum.

3) Column 3 displays the course name.

4) Column 4 gives the sections of the course that the same instructor was teaching.

5) Column 5 has the header CH. It indicates the credit hours for the course.

6) Column 6 has the header NS. It shows the number of students registered in the course.

7) Column 7 gives the marks used in the assessment of the selected SO.

8) Column 8 has the percentage of students getting 60% or higher (P: 60%)

9) Columns 9 to 14 show the percentage of students getting 65%, 70%, and so on to 90%.

The CLOSO display shown in Fig. 4–14, shows the column with the specified PSC highlighted with red and blue color text. Blue means the criterion is satisfied and the red means the criterion is not satisfied. For example in the case of Circuit Theory (the first row), for P: 70% which is the specified PSC, percentage of students getting 70% or higher is 41%. Since the specified PSC requires 60% students get to the level of SO attainment of 70%, 41% has been highlighted with red color. Similarly, Advanced Logic Design, Microcomputer System Design and Microprocessors have low satisfaction and are shown in red color. The average, however, is 66% which is satisfactory but the weighted average is slightly low (63%). The maximum is also shown in the last row which is 100% for P: 70%. It means that in at least one course the SO attainment reached to the level of 100%. It is interesting to note that for P: 60%, only two courses show less than 60% satisfaction while all other courses got to the SO attainment of 60% or higher. This indicates that the SO attainment is progressing from the 60% to 70% and therefore the overall picture is promising.

A.7.3 SO Attainment Data for Fall 2012

In Figures 4–15 to 4–25, SO attainment data is presented for Fall 2012 as obtained from CLOSO software. However, it must be noted that in some cases there are issues with the course files submitted or the course files are not submitted. Therefore, not all courses are included in the evaluation data presented

here. Nevertheless, the averages and specially the weighted averages and the maximum are very good indicators based on 80% of the course files. Just non-submission of course files from some instructors will not affect the average SO attainment. 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 for the next academic year.

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1	4	23	44.4	52	43	41	38	33	26	21
2	1403271	Switching Theory	3	3	6	38.5	63	56	51	46	36	29	26
3	1403311	Electronics	1	4	16	49.2	58	47	43	38	38	27	22
4	1403311	Electronics	2-3	4	25	55	40	25	18	8	4	3	3
5	1403322	Computer Communication System	2	3	33	41.8	60	57	51	42	38	25	15
6	1403322	Computer Communication System	3	3	26	41.8	65	56	45	42	32	28	17
7	1403364	Basics of Integrated Circuits Design	1	3	37	22.3	81	69	67	55	51	33	27
8	1403371	Advanced Logic Design	1-2	4	38	33.3	72	66	60	55	52	44	40
9	1403371	Advanced Logic Design	3	4	8	34.1	49	43	42	35	28	25	25
10	1403372	Computer Organization	1	4	15	42.5	87	78	70	56	54	47	36
11	1403372	Computer Organization	2	4	10	34.9	52	47	38	34	30	26	24
12	1403381	Numerical Analysis	1	3	14	47.5	75	64	60	55	45	39	37
13	1403450	Microcomputers System Design	2	4	23	37.3	79	77	73	65	63	48	46
14	1403472	Computer Architecture	1	3	17	43.8	65	59	55	48	43	30	22
15	1403484	Databases	1	3	17	33.3	25	19	19	10	9	0	0
16	1403487	Process Control	1	3	15	26.4	76	68	64	51	48	42	31
17	1403489	Microprocessors	1	4	23	22.9	78	74	72	66	61	48	36
	-	**Average**	-	-	-	-	**63**	**56**	**51**	**44**	**39**	**31**	**25**
	-	**Weighted Average:**	-	-	-	-	**63**	**55**	**50**	**43**	**38**	**30**	**24**
	-	**Maximum**	-	-	-	-	**87**	**78**	**73**	**66**	**63**	**48**	**46**

Fig. 4–15: SO Attainment Data for SO (a) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1	4	23	23.8	55	46	45	40	36	27	19
2	1403271	Switching Theory	3	3	6	38.5	63	56	51	46	36	29	26
3	1403311	Electronics	1	4	16	15.2	65	57	55	52	52	36	26
4	1403311	Electronics	2-3	4	25	15	55	39	28	15	7	5	5
5	1403371	Advanced Logic Design	1-2	4	38	8.3	47	32	29	21	16	8	3
6	1403371	Advanced Logic Design	3	4	8	8.3	25	12	12	12	0	0	0
7	1403372	Computer Organization	1	4	15	15	94	88	88	82	71	42	42
8	1403372	Computer Organization	2	4	10	17.5	63	56	54	30	23	9	8
9	1403450	Microcomputers System Design	2	4	23	37.3	79	77	73	65	63	48	46
10	1403489	Microprocessors	1	4	23	18.7	67	63	61	56	51	39	26
	-	**Average**	-	-	-	-	**61**	**53**	**50**	**42**	**36**	**24**	**20**
	-	**Weighted Average:**	-	-	-	-	**65**	**58**	**54**	**47**	**42**	**30**	**25**
	-	**Maximum**	-	-	-	-	**94**	**88**	**88**	**82**	**71**	**48**	**46**

Fig. 4–16: SO Attainment Data for SO (b) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403271	Switching Theory	3	3	6	8	67	67	67	67	67	67	50
2	1403311	Electronics	1	4	16	15.2	65	57	55	52	52	36	26
3	1403311	Electronics	2-3	4	25	15	55	39	28	15	7	5	5
4	1403364	Basics of Integrated Circuits Design	1	3	37	19.8	80	68	66	53	48	33	27
5	1403371	Advanced Logic Design	1-2	4	38	45	81	78	73	67	65	55	48
6	1403371	Advanced Logic Design	3	4	8	44.2	61	58	57	48	45	41	41
7	1403372	Computer Organization	1	4	15	18.3	78	64	56	39	36	28	24
8	1403372	Computer Organization	2	4	10	6.6	44	41	38	35	27	27	27
9	1403450	Microcomputers System Design	2	4	23	12	81	79	79	64	60	55	48
10	1403472	Computer Architecture	1	3	17	9.8	68	62	55	47	38	32	29
11	1403484	Databases	1	3	17	8.3	12	6	6	6	0	0	0
12	1403487	Process Control	1	3	15	10.5	68	61	55	43	42	40	26
13	1403489	Microprocessors	1	4	23	6	59	59	51	51	41	26	22
	-	**Average**	-	-	-	-	**63**	**57**	**53**	**45**	**41**	**34**	**29**
	-	**Weighted Average:**	-	-	-	-	**72**	**66**	**61**	**52**	**49**	**40**	**34**
	-	**Maximum**	-	-	-	-	**81**	**79**	**79**	**67**	**67**	**67**	**50**

Fig. 4–17: SO Attainment Data for SO (c) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403487	Process Control	1	3	15	10.3	86	84	76	74	74	69	69
	-	**Average**	-	-	-	-	**86**	**84**	**76**	**74**	**74**	**69**	**69**
	-	**Weighted Average:**	-	-	-	-	**86**	**84**	**76**	**74**	**74**	**69**	**69**
	-	**Maximum**	-	-	-	-	**86**	**84**	**76**	**74**	**74**	**69**	**69**

Fig. 4–18: SO Attainment Data for SO (d) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1	4	23	13.4	53	45	45	42	35	31	22
2	1403271	Switching Theory	3	3	6	10	83	67	67	67	67	33	33
3	1403322	Computer Communication System	2	3	33	13	63	60	54	45	42	25	16
4	1403322	Computer Communication System	3	3	26	13	65	54	43	43	32	32	17
5	1403364	Basics of Integrated Circuits Design	1	3	37	14.3	79	71	67	55	47	32	26
6	1403372	Computer Organization	1	4	15	9.2	93	87	71	55	55	49	33
7	1403372	Computer Organization	2	4	10	8.4	60	58	41	30	24	19	19
8	1403450	Microcomputers System Design	2	4	23	13.3	86	85	83	78	78	56	54
9	1403472	Computer Architecture	1	3	17	43.8	65	59	55	48	43	30	22
10	1403487	Process Control	1	3	15	10.5	68	61	55	43	42	40	26
11	1403489	Microprocessors	1	4	23	6.5	67	59	59	48	42	24	15
	-	**Average**	-	-	-	-	**71**	**64**	**58**	**50**	**46**	**34**	**26**
	-	**Weighted Average:**	-	-	-	-	**69**	**63**	**58**	**50**	**45**	**33**	**25**
	-	**Maximum**	-	-	-	-	**93**	**87**	**83**	**78**	**78**	**56**	**54**

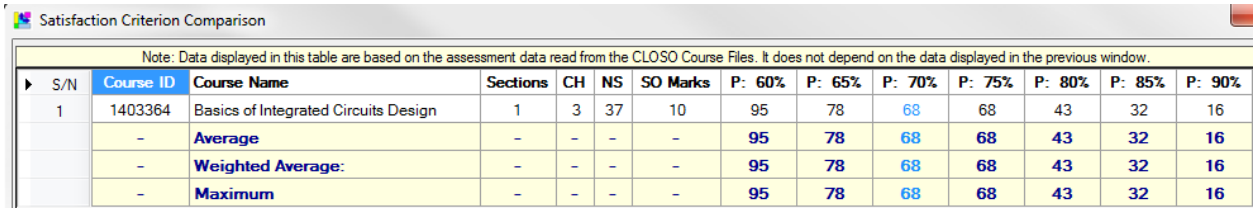
Fig. 4–19: SO Attainment Data for SO (e) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403484	Databases	1	3	17	2.5	94	82	82	82	82	12	12
	-	**Average**	-	-	-	-	**94**	**82**	**82**	**82**	**82**	**12**	**12**
	-	**Weighted Average:**	-	-	-	-	**94**	**82**	**82**	**82**	**82**	**12**	**12**
	-	**Maximum**	-	-	-	-	**94**	**82**	**82**	**82**	**82**	**12**	**12**

Fig. 4–20: SO Attainment Data for SO (f) – Fall 2012

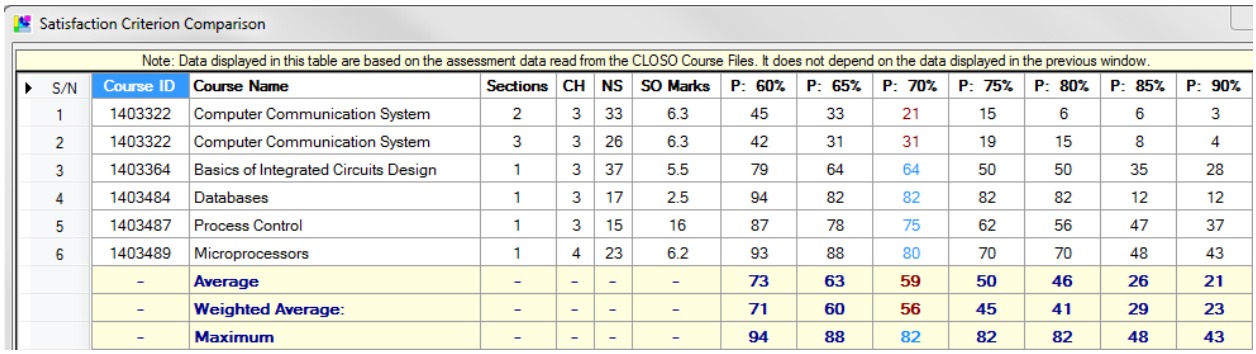


Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403364	Basics of Integrated Circuits Design	1	3	37	10	95	78	68	68	43	32	16
	-	**Average**	-	-	-	-	**95**	**78**	**68**	**68**	**43**	**32**	**16**
	-	**Weighted Average:**	-	-	-	-	**95**	**78**	**68**	**68**	**43**	**32**	**16**
	-	**Maximum**	-	-	-	-	**95**	**78**	**68**	**68**	**43**	**32**	**16**

Fig. 4–21: SO Attainment Data for SO (g) – Fall 2012

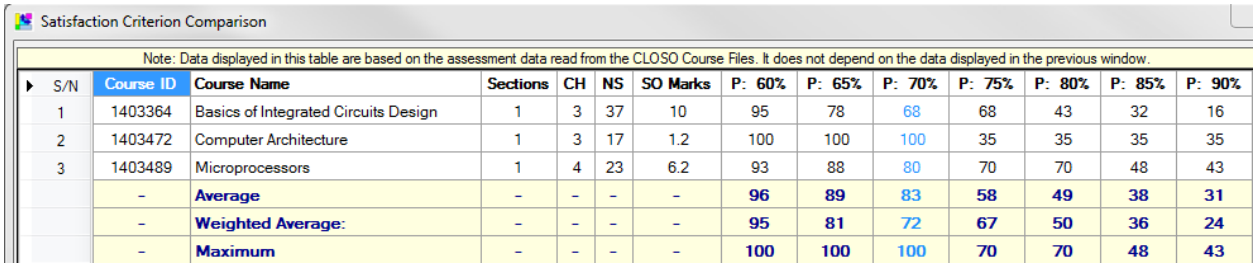


Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403322	Computer Communication System	2	3	33	6.3	45	33	21	15	6	6	3
2	1403322	Computer Communication System	3	3	26	6.3	42	31	31	19	15	8	4
3	1403364	Basics of Integrated Circuits Design	1	3	37	5.5	79	64	64	50	50	35	28
4	1403484	Databases	1	3	17	2.5	94	82	82	82	82	12	12
5	1403487	Process Control	1	3	15	16	87	78	75	62	56	47	37
6	1403489	Microprocessors	1	4	23	6.2	93	88	80	70	70	48	43
	-	**Average**	-	-	-	-	**73**	**63**	**59**	**50**	**46**	**26**	**21**
	-	**Weighted Average:**	-	-	-	-	**71**	**60**	**56**	**45**	**41**	**29**	**23**
	-	**Maximum**	-	-	-	-	**94**	**88**	**82**	**82**	**82**	**48**	**43**

Fig. 4–22: SO Attainment Data for SO (h) – Fall 2012

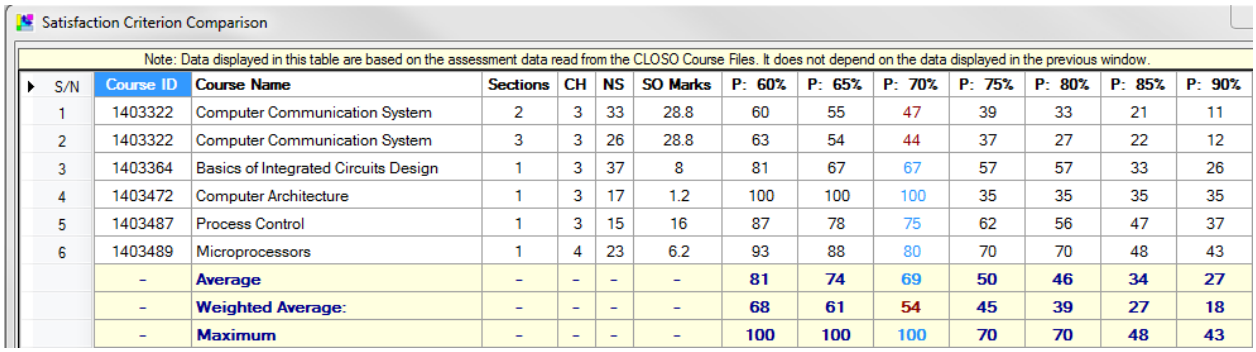


Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403364	Basics of Integrated Circuits Design	1	3	37	10	95	78	68	68	43	32	16
2	1403472	Computer Architecture	1	3	17	1.2	100	100	100	35	35	35	35
3	1403489	Microprocessors	1	4	23	6.2	93	88	80	70	70	48	43
	-	**Average**	-	-	-	-	**96**	**89**	**83**	**58**	**49**	**38**	**31**
	-	**Weighted Average:**	-	-	-	-	**95**	**81**	**72**	**67**	**50**	**36**	**24**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**70**	**70**	**48**	**43**

Fig. 4–23: SO Attainment Data for SO (i) – Fall 2012



Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403322	Computer Communication System	2	3	33	28.8	60	55	47	39	33	21	11
2	1403322	Computer Communication System	3	3	26	28.8	63	54	44	37	27	22	12
3	1403364	Basics of Integrated Circuits Design	1	3	37	8	81	67	67	57	57	33	26
4	1403472	Computer Architecture	1	3	17	1.2	100	100	100	35	35	35	35
5	1403487	Process Control	1	3	15	16	87	78	75	62	56	47	37
6	1403489	Microprocessors	1	4	23	6.2	93	88	80	70	70	48	43
	-	**Average**	-	-	-	-	**81**	**74**	**69**	**50**	**46**	**34**	**27**
	-	**Weighted Average:**	-	-	-	-	**68**	**61**	**54**	**45**	**39**	**27**	**18**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**70**	**70**	**48**	**43**

Fig. 4–24: SO Attainment Data for SO (j) – Fall 2012

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1	4	23	13.4	53	45	45	42	35	31	22
2	1403311	Electronics	1	4	16	15.2	65	57	55	52	52	36	26
3	1403311	Electronics	2-3	4	25	15	55	39	28	15	7	5	5
4	1403371	Advanced Logic Design	1-2	4	38	8.3	47	32	29	21	16	8	3
5	1403371	Advanced Logic Design	3	4	8	8.3	25	12	12	12	0	0	0
6	1403372	Computer Organization	1	4	15	15	94	88	88	82	71	42	42
7	1403372	Computer Organization	2	4	10	17.5	63	56	54	30	23	9	8
8	1403381	Numerical Analysis	1	3	14	47.5	75	64	60	55	45	39	37
9	1403484	Databases	1	3	17	33.3	25	19	19	10	9	0	0
10	1403487	Process Control	1	3	15	10.5	68	61	55	43	42	40	26
11	1403489	Microprocessors	1	4	23	27.2	66	64	53	50	42	34	25
	-	**Average**	-	-	-	-	**58**	**49**	**45**	**37**	**31**	**22**	**18**
	-	**Weighted Average:**	-	-	-	-	**59**	**50**	**46**	**38**	**32**	**23**	**19**
	-	**Maximum**	-	-	-	-	**94**	**88**	**88**	**82**	**71**	**42**	**42**

Fig. 4–25: SO Attainment Data for SO (k) – Fall 2012

A.7.4 SO Attainment Data for Spring 2013

In Figures 4–26 to 4–36, SO attainment data for Spring 2013 are presented. Again all the course files have not been submitted but will be received in due course and the evaluation for all course files together will be available at the time of the visit. In any case, as mentioned earlier, since most of the course files have been submitted, the averages will not change much and the data we present now will be quite representative of the overall picture.

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1-3	4	17	36.8	45	42	39	37	35	30	29
2	1403201	Circuit Theory	4-5	4	21	38.5	57	44	42	35	33	29	28
3	1403271	Switching Theory	1	3	15	54.2	62	55	47	41	41	28	26
4	1403312	Digital Electronic Systems and Circuits	1	4	16	53.8	56	51	38	37	35	31	31
5	1403312	Digital Electronic Systems and Circuits	2	4	10	53.8	59	57	50	49	44	38	38
6	1403312	Digital Electronic Systems and Circuits	3	4	12	53.8	54	53	37	37	34	29	29
7	1403322	Computer Communication System	1-2	3	38	32.5	89	82	69	54	45	31	22
8	1403371	Advanced Logic Design	1,2	4	30	28.3	70	63	60	46	38	14	7
9	1403372	Computer Organization	1,2	4	38	30.5	82	81	80	61	55	28	28
10	1403381	Numerical Analysis	1	3	16	42.5	53	48	44	42	39	28	24
11	1403450	Microcomputers System Design	2	4	23	35.6	68	65	53	48	42	31	25
12	1403472	Computer Architecture	1	3	14	36	74	73	71	70	70	51	40
13	1403472	Computer Architecture	2	3	12	35	85	79	72	62	54	34	15
14	1403484	Databases	1	3	14	26.2	64	47	38	23	20	12	10
15	1403487	Process Control	1	3	27	25.9	77	70	68	66	63	60	53
16	1403489	Microprocessors	2	4	18	27.8	85	73	66	62	44	34	22
17	1403489	Microprocessors	1	4	11	24.2	52	45	43	36	34	22	20
	-	**Average**	-	-	-	-	**67**	**60**	**54**	**47**	**43**	**31**	**26**
	-	**Weighted Average:**	-	-	-	-	**68**	**62**	**55**	**48**	**43**	**31**	**27**
	-	**Maximum**	-	-	-	-	**89**	**82**	**80**	**70**	**70**	**60**	**53**

Fig. 4–26: SO Attainment Data for SO (a) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1-3	4	17	26.8	49	46	41	38	36	30	28
2	1403201	Circuit Theory	4-5	4	21	24.4	60	47	44	38	36	32	31
3	1403271	Switching Theory	1	3	15	25	100	100	100	93	93	73	73
4	1403312	Digital Electronic Systems and Circuits	1	4	16	10	86	79	79	75	75	67	67
5	1403312	Digital Electronic Systems and Circuits	2	4	10	10	92	88	88	82	82	63	63
6	1403312	Digital Electronic Systems and Circuits	3	4	12	10	74	71	71	71	71	68	68
7	1403322	Computer Communication System	1-2	3	38	12.5	100	92	87	61	26	11	3
8	1403371	Advanced Logic Design	1,2	4	30	8.3	77	53	50	33	17	7	7
9	1403372	Computer Organization	1,2	4	38	17	81	77	73	59	46	23	19
10	1403450	Microcomputers System Design	2	4	23	35.6	68	65	53	48	42	31	25
11	1403489	Microprocessors	2	4	18	24.6	75	70	60	56	40	31	18
12	1403489	Microprocessors	1	4	11	19.9	51	44	42	29	29	21	17
	-	**Average**	-	-	-	-	**76**	**69**	**66**	**57**	**49**	**38**	**35**
	-	**Weighted Average:**	-	-	-	-	**75**	**68**	**63**	**54**	**45**	**33**	**28**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**93**	**93**	**73**	**73**

Fig. 4–27: SO Attainment Data for SO (b) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403271	Switching Theory	1	3	15	10.8	59	55	55	43	43	24	24
2	1403312	Digital Electronic Systems and Circuits	1	4	16	14.3	75	70	62	59	59	53	53
3	1403312	Digital Electronic Systems and Circuits	2	4	10	14.3	83	80	74	69	69	55	55
4	1403312	Digital Electronic Systems and Circuits	3	4	12	14.3	68	66	57	57	57	54	54
5	1403371	Advanced Logic Design	1,2	4	30	50	65	64	63	43	39	16	10
6	1403372	Computer Organization	1,2	4	38	9.5	83	81	81	66	60	29	29
7	1403450	Microcomputers System Design	2	4	23	14.3	50	44	37	26	24	19	13
8	1403472	Computer Architecture	1	3	14	5.6	73	72	72	72	72	71	64
9	1403472	Computer Architecture	2	3	12	7	83	67	67	44	39	39	8
10	1403484	Databases	1	3	14	12.4	61	49	40	36	34	21	16
11	1403487	Process Control	1	3	27	9.9	72	64	61	59	56	53	48
12	1403489	Microprocessors	2	4	18	5.3	71	67	64	64	51	37	37
13	1403489	Microprocessors	1	4	11	6.7	55	51	43	16	16	11	7
	-	**Average**	-	-	-	-	**69**	**64**	**60**	**50**	**48**	**37**	**32**
	-	**Weighted Average:**	-	-	-	-	**68**	**64**	**61**	**48**	**45**	**29**	**24**
	-	**Maximum**	-	-	-	-	**83**	**81**	**81**	**72**	**72**	**71**	**64**

Fig. 4–28: SO Attainment Data for SO (c) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403401	Seminar	1	2	8	15	100	100	100	100	38	0	0
2	1403487	Process Control	1	3	27	12.3	81	81	73	68	62	60	52
	-	**Average**	-	-	-	-	**90**	**90**	**86**	**84**	**50**	**30**	**26**
	-	**Weighted Average:**	-	-	-	-	**86**	**86**	**80**	**77**	**56**	**44**	**38**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**62**	**60**	**52**

Fig. 4–29: SO Attainment Data for SO (d) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1-3	4	17	15.7	46	45	40	36	33	31	28
2	1403201	Circuit Theory	4-5	4	21	16	54	45	42	35	31	27	25
3	1403312	Digital Electronic Systems and Circuits	1	4	16	12.5	42	40	32	32	32	28	28
4	1403312	Digital Electronic Systems and Circuits	2	4	10	12.5	34	34	34	34	34	34	34
5	1403312	Digital Electronic Systems and Circuits	3	4	12	12.5	41	41	32	32	32	18	18
6	1403372	Computer Organization	1,2	4	38	11	84	84	83	65	55	36	36
7	1403401	Seminar	1	2	8	6.7	75	69	69	69	69	62	62
8	1403450	Microcomputers System Design	2	4	23	12.5	77	76	69	60	44	39	32
9	1403472	Computer Architecture	1	3	14	36	74	73	71	70	70	51	40
10	1403472	Computer Architecture	2	3	12	35	85	79	72	62	54	34	15
11	1403487	Process Control	1	3	27	9.9	72	64	61	59	56	53	48
12	1403489	Microprocessors	2	4	18	3.8	100	100	94	89	89	67	6
13	1403489	Microprocessors	1	4	11	5.8	88	76	76	64	64	47	40
	-	**Average**	-	-	-	-	**67**	**64**	**60**	**54**	**51**	**41**	**32**
	-	**Weighted Average:**	-	-	-	-	**68**	**65**	**61**	**55**	**50**	**38**	**31**
	-	**Maximum**	-	-	-	-	**100**	**100**	**94**	**89**	**89**	**67**	**62**

Fig. 4–30: SO Attainment Data for SO (e) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403401	Seminar	1	2	8	10	100	100	100	100	100	100	100
2	1403484	Databases	1	3	14	10.1	61	53	52	45	45	27	27
	-	**Average**	-	-	-	-	**80**	**76**	**76**	**72**	**72**	**64**	**64**
	-	**Weighted Average:**	-	-	-	-	**75**	**70**	**69**	**65**	**65**	**54**	**54**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–31: SO Attainment Data for SO (f) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403401	Seminar	1	2	8	35	79	64	64	64	38	0	0
	-	**Average**	-	-	-	-	**79**	**64**	**64**	**64**	**38**	**0**	**0**
	-	**Weighted Average:**	-	-	-	-	**79**	**64**	**64**	**64**	**38**	**0**	**0**
	-	**Maximum**	-	-	-	-	**79**	**64**	**64**	**64**	**38**	**0**	**0**

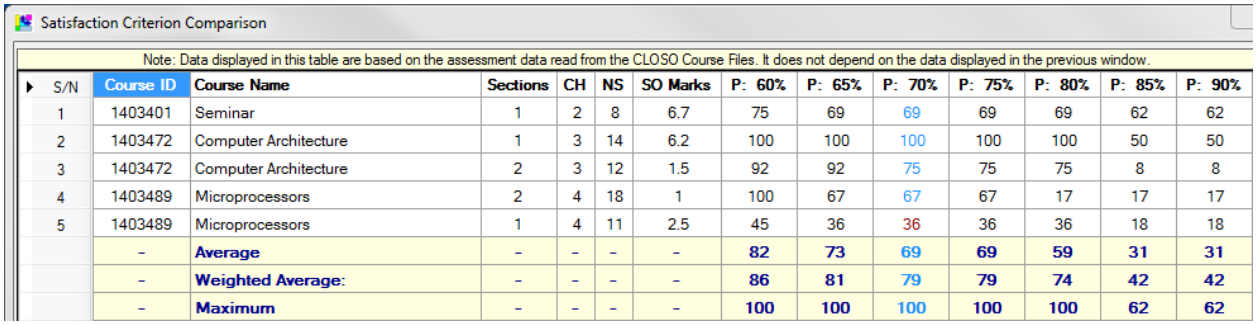
Fig. 4–32: SO Attainment Data for SO (g) – Spring 2013

Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403322	Computer Communication System	1-2	3	38	5	97	95	76	53	39	32	21
2	1403484	Databases	1	3	14	10.1	61	53	52	45	45	27	27
3	1403487	Process Control	1	3	27	16	81	76	76	73	71	66	59
4	1403489	Microprocessors	2	4	18	1	100	67	67	67	17	17	17
5	1403489	Microprocessors	1	4	11	2.5	45	36	36	36	36	18	18
	-	**Average**	-	-	-	-	**77**	**65**	**61**	**55**	**42**	**32**	**28**
	-	**Weighted Average:**	-	-	-	-	**81**	**75**	**71**	**62**	**57**	**49**	**42**
	-	**Maximum**	-	-	-	-	**100**	**95**	**76**	**73**	**71**	**66**	**59**

Fig. 4–33: SO Attainment Data for SO (h) – Spring 2013

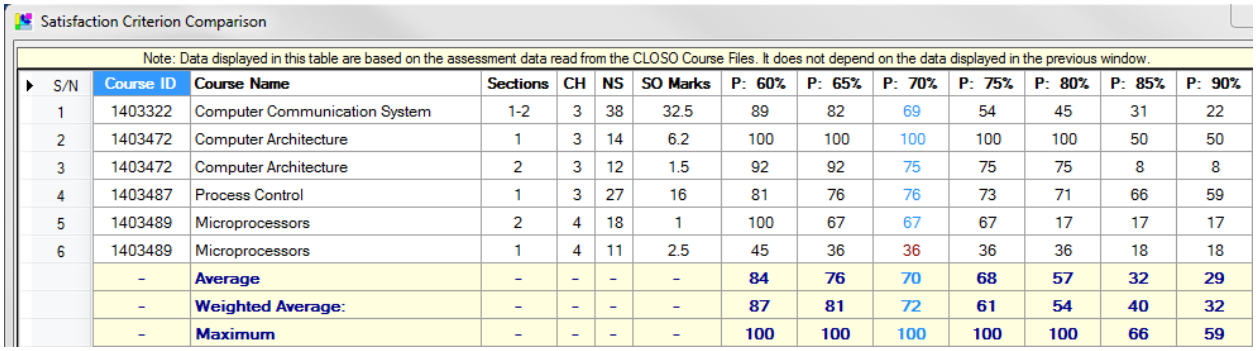


Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403401	Seminar	1	2	8	6.7	75	69	69	69	69	62	62
2	1403472	Computer Architecture	1	3	14	6.2	100	100	100	100	100	50	50
3	1403472	Computer Architecture	2	3	12	1.5	92	92	75	75	75	8	8
4	1403489	Microprocessors	2	4	18	1	100	67	67	67	17	17	17
5	1403489	Microprocessors	1	4	11	2.5	45	36	36	36	36	18	18
	-	**Average**	-	-	-	-	**82**	**73**	**69**	**69**	**59**	**31**	**31**
	-	**Weighted Average:**	-	-	-	-	**86**	**81**	**79**	**79**	**74**	**42**	**42**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**62**	**62**

Fig. 4–34: SO Attainment Data for SO (i) – Spring 2013

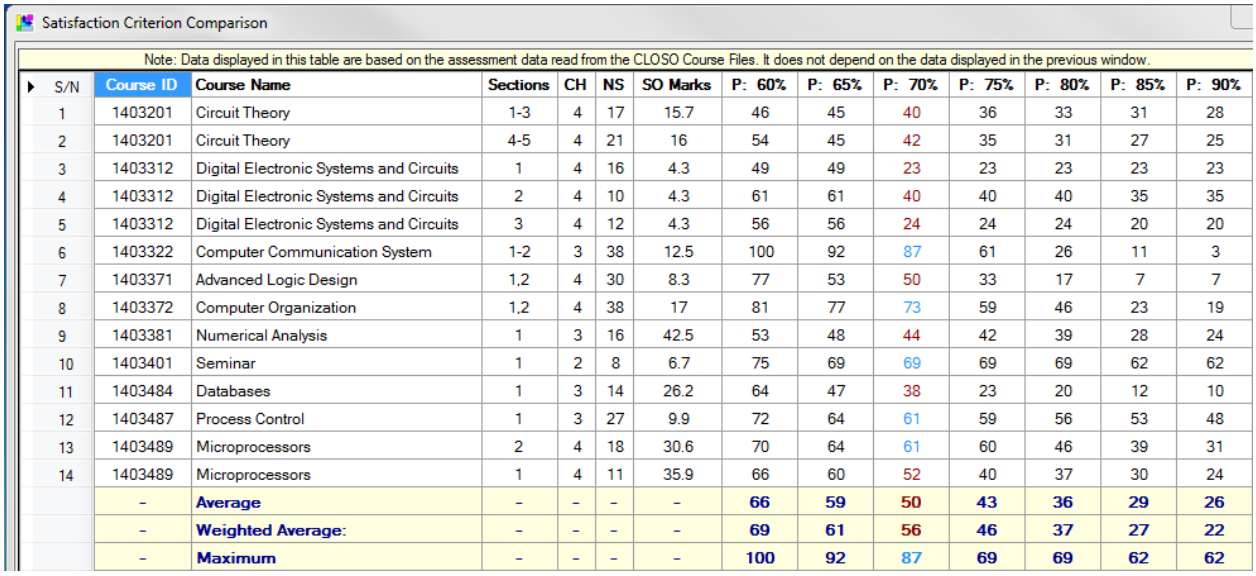


Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403322	Computer Communication System	1-2	3	38	32.5	89	82	69	54	45	31	22
2	1403472	Computer Architecture	1	3	14	6.2	100	100	100	100	100	50	50
3	1403472	Computer Architecture	2	3	12	1.5	92	92	75	75	75	8	8
4	1403487	Process Control	1	3	27	16	81	76	76	73	71	66	59
5	1403489	Microprocessors	2	4	18	1	100	67	67	67	17	17	17
6	1403489	Microprocessors	1	4	11	2.5	45	36	36	36	36	18	18
	-	**Average**	-	-	-	-	**84**	**76**	**70**	**68**	**57**	**32**	**29**
	-	**Weighted Average:**	-	-	-	-	**87**	**81**	**72**	**61**	**54**	**40**	**32**
	-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**66**	**59**

Fig. 4–35: SO Attainment Data for SO (j) – Spring 2013



Satisfaction Criterion Comparison

Note: Data displayed in this table are based on the assessment data read from the CLOSO Course Files. It does not depend on the data displayed in the previous window.

S/N	Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1	1403201	Circuit Theory	1-3	4	17	15.7	46	45	40	36	33	31	28
2	1403201	Circuit Theory	4-5	4	21	16	54	45	42	35	31	27	25
3	1403312	Digital Electronic Systems and Circuits	1	4	16	4.3	49	49	23	23	23	23	23
4	1403312	Digital Electronic Systems and Circuits	2	4	10	4.3	61	61	40	40	40	35	35
5	1403312	Digital Electronic Systems and Circuits	3	4	12	4.3	56	56	24	24	24	20	20
6	1403322	Computer Communication System	1-2	3	38	12.5	100	92	87	61	26	11	3
7	1403371	Advanced Logic Design	1,2	4	30	8.3	77	53	50	33	17	7	7
8	1403372	Computer Organization	1,2	4	38	17	81	77	73	59	46	23	19
9	1403381	Numerical Analysis	1	3	16	42.5	53	48	44	42	39	28	24
10	1403401	Seminar	1	2	8	6.7	75	69	69	69	69	62	62
11	1403484	Databases	1	3	14	26.2	64	47	38	23	20	12	10
12	1403487	Process Control	1	3	27	9.9	72	64	61	59	56	53	48
13	1403489	Microprocessors	2	4	18	30.6	70	64	61	60	46	39	31
14	1403489	Microprocessors	1	4	11	35.9	66	60	52	40	37	30	24
	-	**Average**	-	-	-	-	**66**	**59**	**50**	**43**	**36**	**29**	**26**
	-	**Weighted Average:**	-	-	-	-	**69**	**61**	**56**	**46**	**37**	**27**	**22**
	-	**Maximum**	-	-	-	-	**100**	**92**	**87**	**69**	**69**	**62**	**62**

Fig. 4–36: SO Attainment Data for SO (k) – Spring 2013

A.7.5 SO Attainment Summary and Comparison for Formative Assessments

A summary of SO attainment for Fall 2012 for core courses only is shown in Table 4–17. The data is for the PSC raised to students getting 70% marks. It is obvious that SO (k) is the weakest and ways to improve it must be explored. The Assessment & Evaluation Committee looked into the matter and asked the instructors to come up with a Continuous Improvement Plan. The results improved in Spring 2013 as will be obvious from the attainment data of Spring 2013. Also, it is worth noting that the data presented are for Formative Assessments. Graduation Project assessment methods were revised and implemented in Fall 2012. It must be noted that 60% students getting 70% marks is the target to be achieved over a period of two years. However, the program is very close to reach the target PSC. If we consider the previous PSC i.e., 60% students getting 60% marks, then from the data in Figures 4–15 to 4–25, it is obvious that the

PSC is satisfied in many cases. Therefore, in Fall 2012, we had a situation of satisfaction in most SOs and "progressing towards satisfaction" in some SOs but all above the P:60% level. A summary of SO attainment for Spring 2013 is shown in Table 4–18.

Table 4–17: SO Attainment for P: 70% (Fall 2012 – Core Courses)

Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
Simple Averages (%)	51	50	53	76	58	82	68	59	82	69	45
Weighted Averages (%)	50	54	61	76	58	82	68	56	73	54	46
Maximum (%)	73	88	79	76	83	82	68	82	99	99	88

Table 4–18: SO Attainment for P: 70% (Spring 2013 – Core Courses)

Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
Simple Averages (%)	54	66	60	86	60	76	64	61	69	70	50
Weighted Averages (%)	55	62	61	78	60	65	64	70	76	71	56
Maximum (%)	80	99	81	99	94	99	64	76	99	99	87

A comparison is shown in Fig. 4–37. As expected, the SO attainment has improved in Spring 2013 as compared to Fall 2012. The issues are in SOs (f) and (g). Their attainment went down in Spring as compared to Fall. This issue will be investigated in the Assessment & Evaluation Committee and the causes of degradation and recommendations for improvement will be discussed. One of the causes could be the efforts of the department to curb grade inflation that was recognized by the faculty in Spring 2013 as an important issue and they were more careful in grading.

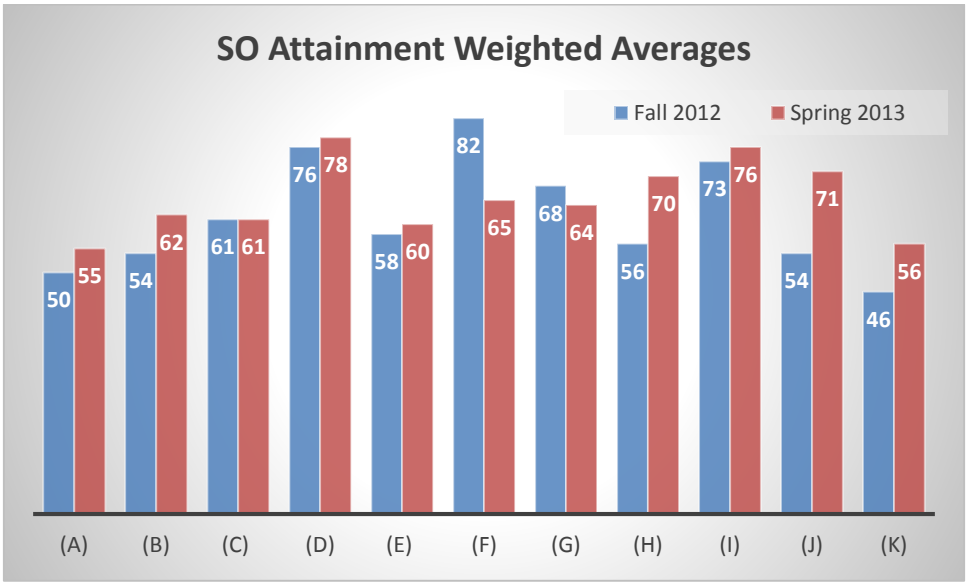


Fig. 4–37: SO Attainment Data for the year 2012-13

A summary of SO attainment in elective courses for Fall 2012 and Spring 2013 is shown in Tables 4–19 and 4–20 respectively for the same PSC as was used for core courses. Although, all the electives are not taken by all the students and the electives do not cover all the SOs, still, every student has to take three electives as program requirement. Hence, the satisfaction data obtained in electives serves as an additional indicator of SO attainment. In electives also, the satisfaction has improved in almost all the SOs in Spring 2013 as compared to Fall 2012.

Table 4–19: SO Attainment for P: 70% (Fall 2012 – Electives)

Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
Simple Averages (%)	57	78	44		48		74				67
Weighted Averages (%)	58	65	54		52		74				55
Maximum (%)	68	99	61		61		74				99

Table 4–20: SO Attainment for P: 70% (Spring 2013 – Electives)

Student Outcomes (SO):	a	b	c	d	e	f	g	h	i	j	k
Simple Averages (%)	65	59	60	41	58		66	86	92	86	59
Weighted Averages (%)	60	51	61	41	54		96	86	92	86	58
Maximum (%)	84	84	92	41	70		99	86	92	86	84

A.8 SO Attainment Indicated by Summative Assessments

As described earlier in Section A.6.2 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 graduation. 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. Since the grade inflation has been too high with the Graduation Projects, the implementation of the new Graduation Project Assessment and Control system brought down the grade inflation to some extent. Figures 4–38 to 4–48 show the SO attainment data for all SOs for Fall 2012 while Figures 4–49 to 4–59 show the SO attainment data for Spring 2013. Again, all raw assessment data was collected by the instructors and was input to CLOSO. CLOSO performed all the required data processing and generated these tables.

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	9.5	92	92	92	75	40	18	18
1403499	Project	2	4	5	9.5	100	100	100	100	100	92	92
1403499	Project	3	4	3	9.5	100	94	87	62	47	12	12
1403499	Project	4	4	3	9.5	100	100	92	92	92	75	18
1403499	Project	5	4	3	9.5	100	94	94	94	94	81	81
-	**Average**	-	-	-	-	**98**	**96**	**93**	**85**	**75**	**56**	**44**
-	**Weighted Average:**	-	-	-	-	**99**	**97**	**94**	**87**	**80**	**62**	**52**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**92**	**92**

Fig. 4–38: Graduation Project SO Attainment Data for SO (a) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	8.8	100	100	100	81	24	0	0
1403499	Project	2	4	5	8.8	100	100	100	100	100	100	100
1403499	Project	3	4	3	8.8	100	100	100	67	50	0	0
1403499	Project	4	4	3	8.8	100	100	100	100	100	100	38
1403499	Project	5	4	3	8.8	100	100	100	100	100	92	92
-	**Average**	-	-	-	-	**100**	**100**	**100**	**90**	**75**	**58**	**46**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**91**	**81**	**67**	**56**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–39: Graduation Project SO Attainment Data for SO (b) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	6.2	88	88	88	88	35	0	0
1403499	Project	2	4	5	6.2	100	100	100	100	100	88	88
1403499	Project	3	4	3	6.2	100	100	88	59	36	0	0
1403499	Project	4	4	3	6.2	100	100	88	88	88	88	0
1403499	Project	5	4	3	6.2	100	100	100	100	100	88	88
-	**Average**	-	-	-	-	**98**	**98**	**93**	**87**	**72**	**53**	**35**
-	**Weighted Average:**	-	-	-	-	**98**	**98**	**94**	**89**	**78**	**60**	**44**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**88**	**88**

Fig. 4–40: Graduation Project SO Attainment Data for SO (c) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	20	100	100	100	100	50	50	50
1403499	Project	2	4	5	20	100	100	100	100	100	100	100
1403499	Project	3	4	3	20	67	67	67	67	67	67	67
1403499	Project	4	4	3	20	100	100	100	100	100	100	100
1403499	Project	5	4	3	20	100	67	67	67	67	67	67
-	**Average**	-	-	-	-	**93**	**87**	**87**	**87**	**77**	**77**	**77**
-	**Weighted Average:**	-	-	-	-	**94**	**88**	**88**	**88**	**81**	**81**	**81**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–41: Graduation Project SO Attainment Data for SO (d) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	6.2	88	88	88	62	62	27	27
1403499	Project	2	4	5	6.2	100	100	100	100	100	88	88
1403499	Project	3	4	3	6.2	100	91	79	59	36	18	18
1403499	Project	4	4	3	6.2	100	100	88	88	88	62	27
1403499	Project	5	4	3	6.2	100	91	91	91	91	71	71
-	**Average**	-	-	-	-	**98**	**94**	**89**	**80**	**75**	**53**	**46**
-	**Weighted Average:**	-	-	-	-	**98**	**95**	**91**	**84**	**79**	**59**	**53**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**88**	**88**

Fig. 4–42: Graduation Project SO Attainment Data for SO (e) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	10.7	93	93	47	47	47	47	47
1403499	Project	2	4	5	10.7	100	100	100	100	53	47	47
1403499	Project	3	4	3	10.7	84	84	78	31	31	0	0
1403499	Project	4	4	3	10.7	100	100	93	93	93	47	0
1403499	Project	5	4	3	10.7	100	100	100	100	100	100	84
-	**Average**	-	-	-	-	**95**	**95**	**84**	**74**	**65**	**48**	**36**
-	**Weighted Average:**	-	-	-	-	**96**	**96**	**88**	**79**	**64**	**48**	**36**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**84**

Fig. 4–43: Graduation Project SO Attainment Data for SO (f) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	10	100	100	50	50	50	50	50
1403499	Project	2	4	5	10	100	100	100	100	50	50	50
1403499	Project	3	4	3	10	83	83	83	33	33	0	0
1403499	Project	4	4	3	10	100	100	100	100	100	50	0
1403499	Project	5	4	3	10	100	100	100	100	100	100	83
-	**Average**	-	-	-	-	**97**	**97**	**87**	**77**	**67**	**50**	**37**
-	**Weighted Average:**	-	-	-	-	**97**	**97**	**91**	**81**	**66**	**50**	**37**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**83**

Fig. 4–44: Graduation Project SO Attainment Data for SO (g) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	5.5	100	100	100	100	39	0	0
1403499	Project	2	4	5	5.5	100	100	100	100	100	100	100
1403499	Project	3	4	3	5.5	100	100	100	67	41	0	0
1403499	Project	4	4	3	5.5	100	100	100	100	100	100	0
1403499	Project	5	4	3	5.5	100	100	100	100	100	87	87
-	**Average**	-	-	-	-	**100**	**100**	**100**	**93**	**76**	**57**	**37**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**94**	**81**	**66**	**48**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–45: Graduation Project SO Attainment Data for SO (h) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	4	82	82	82	41	41	41	41
1403499	Project	2	4	5	4	100	100	100	100	100	82	82
1403499	Project	3	4	3	4	100	86	69	55	55	27	27
1403499	Project	4	4	3	4	100	100	82	82	82	41	41
1403499	Project	5	4	3	4	100	86	86	86	86	73	73
-	**Average**	-	-	-	-	**96**	**91**	**84**	**73**	**73**	**53**	**53**
-	**Weighted Average:**	-	-	-	-	**98**	**92**	**86**	**78**	**78**	**57**	**57**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**82**	**82**

Fig. 4–46: Graduation Project SO Attainment Data for SO (i) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	9.5	92	92	92	75	22	0	0
1403499	Project	2	4	5	9.5	100	100	100	100	100	92	92
1403499	Project	3	4	3	9.5	100	100	92	62	47	0	0
1403499	Project	4	4	3	9.5	100	100	92	92	92	92	35
1403499	Project	5	4	3	9.5	100	100	100	100	100	92	92
-	**Average**	-	-	-	-	**98**	**98**	**95**	**86**	**72**	**55**	**44**
-	**Weighted Average:**	-	-	-	-	**99**	**99**	**96**	**88**	**79**	**63**	**53**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**92**	**92**

Fig. 4–47: Graduation Project SO Attainment Data for SO (j) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	2	9.5	92	92	92	75	22	0	0
1403499	Project	2	4	5	9.5	100	100	100	100	100	92	92
1403499	Project	3	4	3	9.5	100	100	92	62	47	0	0
1403499	Project	4	4	3	9.5	100	100	92	92	92	92	35
1403499	Project	5	4	3	9.5	100	100	100	100	100	92	92
-	**Average**	-	-	-	-	**98**	**98**	**95**	**86**	**72**	**55**	**44**
-	**Weighted Average:**	-	-	-	-	**99**	**99**	**96**	**88**	**79**	**63**	**53**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**92**	**92**

Fig. 4–48: Graduation Project SO Attainment Data for SO (k) – Fall 2012

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	9.5	100	100	100	100	100	85	40
1403499	Project	2	4	4	9.5	100	100	100	100	100	100	66
1403499	Project	4	4	5	9.5	100	100	100	100	100	100	34
1403499	Project	5	4	4	9.5	100	100	100	100	100	88	52
1403499	Project	6	4	3	9.5	100	100	100	94	94	31	6
1403499	Project	7	4	6	9.5	100	100	100	100	100	100	90
1403499	Project	8	4	3	9.5	100	100	100	100	100	85	70
-	**Average**	-	-	-	-	**100**	**100**	**100**	**99**	**99**	**84**	**51**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**99**	**99**	**88**	**54**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**90**

Fig. 4–49: Graduation Project SO Attainment Data for SO (a) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	8.8	100	100	100	100	100	91	62
1403499	Project	2	4	4	8.8	100	100	100	100	100	100	81
1403499	Project	4	4	5	8.8	100	100	100	100	100	100	20
1403499	Project	5	4	4	8.8	100	100	100	100	100	91	47
1403499	Project	6	4	3	8.8	100	100	100	100	100	38	0
1403499	Project	7	4	6	8.8	100	100	100	100	100	100	90
1403499	Project	8	4	3	8.8	100	100	100	100	100	84	38
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**86**	**48**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**89**	**52**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**90**

Fig. 4–50: Graduation Project SO Attainment Data for SO (b) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	6.2	100	100	100	100	100	84	35
1403499	Project	2	4	4	6.2	100	100	100	100	100	100	62
1403499	Project	4	4	5	6.2	100	100	100	100	100	100	20
1403499	Project	5	4	4	6.2	100	100	100	100	100	81	39
1403499	Project	6	4	3	6.2	100	100	100	100	100	12	0
1403499	Project	7	4	6	6.2	100	100	100	100	100	100	85
1403499	Project	8	4	3	6.2	100	100	100	100	100	77	54
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**79**	**42**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**84**	**45**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**85**

Fig. 4–51: Graduation Project SO Attainment Data for SO (c) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	20	100	100	100	100	100	100	75
1403499	Project	2	4	4	20	100	100	100	100	100	100	100
1403499	Project	4	4	5	20	100	100	100	100	100	100	100
1403499	Project	5	4	4	20	100	100	100	100	100	100	100
1403499	Project	6	4	3	20	100	100	100	67	67	33	33
1403499	Project	7	4	6	20	100	100	100	100	100	100	100
1403499	Project	8	4	3	20	100	100	100	100	100	33	33
-	**Average**	-	-	-	-	**100**	**100**	**100**	**95**	**95**	**81**	**77**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**97**	**97**	**86**	**83**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–52: Graduation Project SO Attainment Data for SO (d) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	6.2	100	100	100	100	100	90	62
1403499	Project	2	4	4	6.2	100	100	100	100	100	100	75
1403499	Project	4	4	5	6.2	100	100	100	100	100	100	42
1403499	Project	5	4	4	6.2	100	100	100	100	100	94	66
1403499	Project	6	4	3	6.2	100	100	100	91	91	47	9
1403499	Project	7	4	6	6.2	100	100	100	100	100	100	94
1403499	Project	8	4	3	6.2	100	100	100	100	100	77	54
-	**Average**	-	-	-	-	**100**	**100**	**100**	**99**	**99**	**87**	**57**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**99**	**99**	**90**	**61**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**94**

Fig. 4–53: Graduation Project SO Attainment Data for SO (e) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	10.7	100	100	100	100	100	98	35
1403499	Project	2	4	4	10.7	100	100	100	100	100	100	23
1403499	Project	4	4	5	10.7	100	100	100	100	100	53	48
1403499	Project	5	4	4	10.7	100	100	100	100	100	38	23
1403499	Project	6	4	3	10.7	100	100	100	100	69	53	31
1403499	Project	7	4	6	10.7	100	100	100	100	100	100	84
1403499	Project	8	4	3	10.7	100	100	100	100	100	100	16
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**96**	**77**	**37**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**97**	**78**	**42**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**84**

Fig. 4–54: Graduation Project SO Attainment Data for SO (f) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	10	100	100	100	100	100	100	38
1403499	Project	2	4	4	10	100	100	100	100	100	100	25
1403499	Project	4	4	5	10	100	100	100	100	100	50	50
1403499	Project	5	4	4	10	100	100	100	100	100	38	25
1403499	Project	6	4	3	10	100	100	100	100	67	50	33
1403499	Project	7	4	6	10	100	100	100	100	100	100	83
1403499	Project	8	4	3	10	100	100	100	100	100	100	17
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**95**	**77**	**39**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**97**	**78**	**43**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**83**

Fig. 4–55: Graduation Project SO Attainment Data for SO (g) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	5.5	100	100	100	100	100	85	39
1403499	Project	2	4	4	5.5	100	100	100	100	100	100	70
1403499	Project	4	4	5	5.5	100	100	100	100	100	100	20
1403499	Project	5	4	4	5.5	100	100	100	100	100	85	45
1403499	Project	6	4	3	5.5	100	100	100	100	100	0	0
1403499	Project	7	4	6	5.5	100	100	100	100	100	100	83
1403499	Project	8	4	3	5.5	100	100	100	100	100	74	61
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**78**	**45**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**83**	**48**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**83**

Fig. 4–56: Graduation Project SO Attainment Data for SO (h) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	4	100	100	100	100	100	85	41
1403499	Project	2	4	4	4	100	100	100	100	100	100	62
1403499	Project	4	4	5	4	100	100	100	100	100	100	53
1403499	Project	5	4	4	4	100	100	100	100	100	91	62
1403499	Project	6	4	3	4	100	100	100	86	86	73	14
1403499	Project	7	4	6	4	100	100	100	100	100	100	100
1403499	Project	8	4	3	4	100	100	100	100	100	100	82
-	**Average**	-	-	-	-	**100**	**100**	**100**	**98**	**98**	**93**	**59**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**99**	**99**	**94**	**63**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Fig. 4–57: Graduation Project SO Attainment Data for SO (i) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	9.5	100	100	100	100	100	89	57
1403499	Project	2	4	4	9.5	100	100	100	100	100	100	75
1403499	Project	4	4	5	9.5	100	100	100	100	100	100	20
1403499	Project	5	4	4	9.5	100	100	100	100	100	88	43
1403499	Project	6	4	3	9.5	100	100	100	100	100	42	0
1403499	Project	7	4	6	9.5	100	100	100	100	100	100	90
1403499	Project	8	4	3	9.5	100	100	100	100	100	85	35
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**86**	**46**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**89**	**50**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**90**

Fig. 4–58: Graduation Project SO Attainment Data for SO (j) – Spring 2013

Course ID	Course Name	Sections	CH	NS	SO Marks	P: 60%	P: 65%	P: 70%	P: 75%	P: 80%	P: 85%	P: 90%
1403499	Project	1	4	4	9.5	100	100	100	100	100	89	57
1403499	Project	2	4	4	9.5	100	100	100	100	100	100	75
1403499	Project	4	4	5	9.5	100	100	100	100	100	100	20
1403499	Project	5	4	4	9.5	100	100	100	100	100	88	43
1403499	Project	6	4	3	9.5	100	100	100	100	100	42	0
1403499	Project	7	4	6	9.5	100	100	100	100	100	100	90
1403499	Project	8	4	3	9.5	100	100	100	100	100	85	35
-	**Average**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**86**	**46**
-	**Weighted Average:**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**89**	**50**
-	**Maximum**	-	-	-	-	**100**	**100**	**100**	**100**	**100**	**100**	**90**

Fig. 4–59: Graduation Project SO Attainment Data for SO (k) – Spring 2013

A summary of SO attainment indicated by the Graduation Projects is shown in Tables 4–21 and 4–22.

A.9 SO Attainment Indicated by Course-wise Student Survey

As described earlier, CLOSO analyses the student survey data. Students' opinions are based on their learning as they perceive 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. Almost for all SOs in various courses, 90% 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. The data shown in Table 4–23 are student survey results for Fall and Spring semesters of 2012-13. These are weighted averages for all the core courses not including the Graduation Projects. Similar data has been observed in the past years. Basically, the data reveals that about 1 to 7 % of the students believed that their abilities in the course related student outcomes were below 70%. Student survey becomes useful when the students strongly disagree with the notion that they have achieved the abilities and the satisfaction goes below 70%. In such special cases, the department looks into the matter on recommendation of the Assessment & Evaluation Committee and corrective measures are taken though the averages indicate 70% or higher satisfaction.

A.10 SO Attainment 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 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 academic year 2012-13 are shown in Table 4–24. These are weighted averages for all the core courses 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.

Table 4–21: Graduation Projects SO attainment Summary (Fall 2012)

SO ID	Percentage of students with various satisfaction criteria				
	70% marks	75% marks	80% marks	85% marks	90% marks
(a)	93	85	75	56	44
(b)	100	90	75	58	46
(c)	93	87	72	53	35
(d)	87	87	77	77	77
(e)	89	80	75	53	46
(f)	84	74	65	48	36
(g)	87	77	67	50	37
(h)	100	93	76	57	37
(i)	84	73	73	53	53
(j)	95	86	72	55	44
(k)	95	86	72	55	44

Table 4–22: Graduation Projects SO attainment Summary (Spring 2013)

SO ID	Percentage of students with various satisfaction criteria				
	70% marks	75% marks	80% marks	85% marks	90% marks
(a)	100	99	99	81	51
(b)	100	100	100	84	56
(c)	100	100	100	75	44
(d)	100	93	93	87	82
(e)	100	98	98	86	61
(f)	100	100	94	78	39
(g)	100	100	93	78	41
(h)	100	100	100	74	47
(i)	100	97	97	90	56
(j)	100	100	100	84	53
(k)	100	100	100	84	53

Table 4–23: Student Survey SO Attainment Weighted Averages (Year 2012-13)

	a	b	c	d	e	f	g	h	i	j	k
Fall	94	84	96	93	92	99	99	98	95	96	84
Spring	91	86	96	98	92	96	92	93	91	92	84

Table 4–24: Faculty Survey SO Attainment (Year 2012-13)

	a	b	c	d	e	f	g	h	i	j	k
Fall	78	76	77	70	79	90	70	87	73	79	74
Spring	74	75	76	80	77	70	57	76	73	77	72

A.11 SO Attainment Indicated by Exit Surveys

As described earlier, in the exit surveys indirect assessments of the SOs are targeted. Exit surveys represent the graduating students' perception of their abilities at the time of graduation. The data obtained for Spring 2010-11, Spring 2011-12 and Spring 2013 are shown graphically in Fig. 4–60. 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%. Whenever this average is unsatisfactory, a continuous improvement plan is required. For this, the issue is discussed in the Assessment & Evaluation Committee to come up with an improvement plan. The proposed improvement is then presented in the department council for approval. From these graphs it is concluded that the SO

attainments are satisfactory and progressing. Detailed analysis of the results is available at https://uqu.edu.sa/computer-sciences-information-en/en/195012.

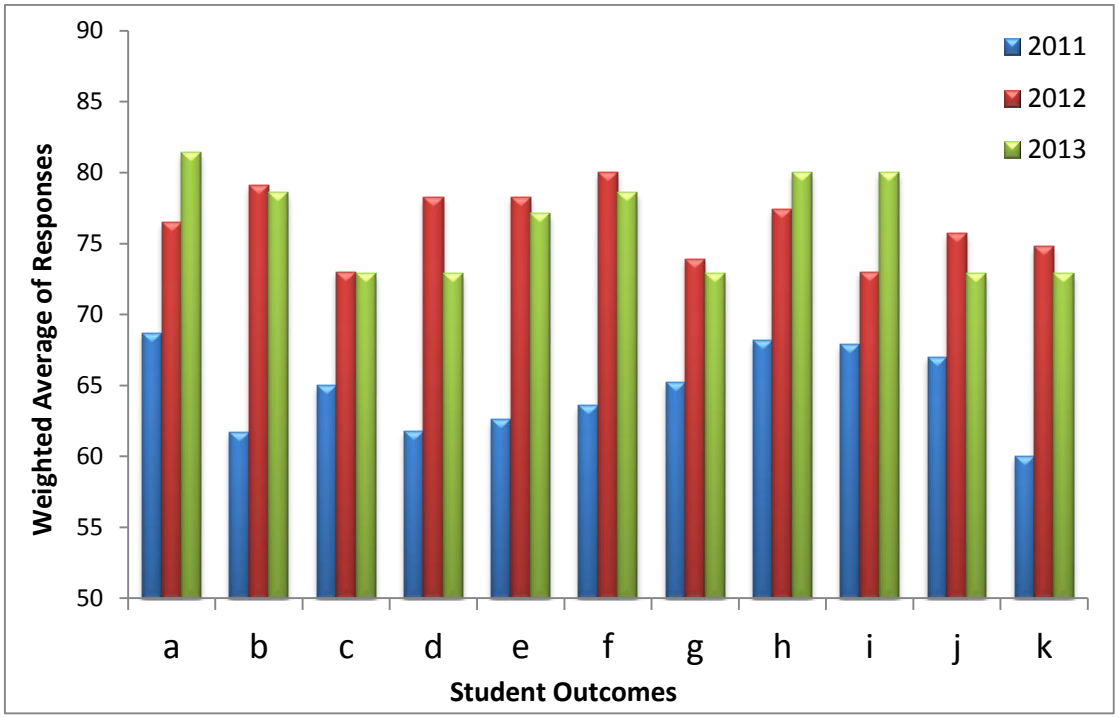


Fig. 4–60: Exit Survey Results for Attainment of SOs

A.12 SO Attainment through Alumni Surveys

The process of Alumni Survey has been described earlier in section A.6.6. Here the data is presented based on a random sample of 22 alumni. 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 and ways to resolve the issue will be determined. The data shown in Table 4–25 indicates that except for SO (h), all SOs indicate satisfaction. SOs (j) and (k) are slightly less than the target of 60% and can be considered as progressing towards satisfaction. Detailed analysis of the results is available at https://uqu.edu.sa/computer-sciences-information-en/en/195012.

Table 4–25: Alumni Survey Data for SO Attainment

SO ID	Excellent	Very Good	Good	Poor	Very Poor	Weighted Average
(a)	5 (22.7%)	6 (27.3%)	9 (40.9%)	2 (9.1%)	0 (0.0%)	72.7%
(b)	2 (9.1%)	6 (27.3%)	10 (45.5%)	4 (18.2%)	0 (0.0%)	65.5%
(c)	0 (0.0%)	8 (36.4%)	7 (31.8%)	6 (27.3%)	1 (4.5%)	60.0%
(d)	2 (9.1%)	9 (40.9%)	9 (40.9%)	2 (9.1%)	0 (0.0%)	70.0%
(e)	2 (9.1%)	7 (31.8%)	12 (54.5%)	1 (4.5%)	0 (0.0%)	69.1%
(f)	2 (9.1%)	8 (36.4%)	8 (36.4%)	3 (13.6%)	1 (4.5%)	66.4%
(g)	0 (0.0%)	8 (36.4%)	12 (54.5%)	1 (4.5%)	1 (4.5%)	64.5%
(h)	0 (0.0%)	1 (4.5%)	13 (59.1%)	7 (31.8%)	1 (4.5%)	52.7%♦
(i)	2 (9.1%)	4 (18.2%)	11 (50.0%)	5 (22.7%)	0 (0.0%)	62.7%
(j)	0 (0.0%)	3 (13.6%)	16 (72.7%)	2 (9.1%)	1 (4.5%)	59.1%♦
(k)	1 (4.5%)	3 (13.6%)	12 (54.5%)	6 (27.3%)	0 (0.0%)	59.1%♦

A.13 SO Attainment Indicated by Employer Surveys

The process of Employer Survey has been described earlier in section A.6.7. Here the data is presented based on a random sample of 15 employers. 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 4–26 indicates that only the software skills are in the state of "progressing towards satisfaction" (highlighted by red diamond) and all other SOs are in satisfactory state.

Table 4–26: Employer Survey Data for SO Attainment

Skills/Abilities*	Excellent	Very Good	Good	Poor	Very Poor	Weighted Average
1	2 (13.3%)	5 (33.3%)	6 (40.0%)	2 (13.3%)	0 (0.0%)	69.3%
2	3 (20.0%)	3 (20.0%)	6 (40.0%)	3 (20.0%)	0 (0.0%)	68.0%
3	0 (0.0%)	4 (26.7%)	8 (53.3%)	1 (6.7%)	2 (13.3%)	58.7% ♦
4	4 (26.7%)	4 (26.7%)	5 (33.3%)	2 (13.3%)	0 (0.0%)	73.3%
5	3 (20.0%)	6 (40.0%)	3 (20.0%)	2 (13.3%)	1 (6.7%)	70.7%
6	2 (13.3%)	5 (33.3%)	5 (33.3%)	2 (13.3%)	1 (6.7%)	66.7%
7	1 (6.7%)	6 (40.0%)	7 (46.7%)	1 (6.7%)	0 (0.0%)	69.3%
8	2 (13.3%)	5 (33.3%)	6 (40.0%)	1 (6.7%)	1 (6.7%)	68.0%
9	1 (6.7%)	4 (26.7%)	7 (46.7%)	2 (13.3%)	1 (6.7%)	62.7%
10	2 (13.3%)	5 (33.3%)	4 (26.7%)	4 (26.7%)	0 (0.0%)	66.7%
11	1 (6.7%)	6 (40.0%)	5 (33.3%)	2 (13.3%)	1 (6.7%)	65.3%
12	4 (26.7%)	7 (46.7%)	1 (6.7%)	3 (20.0%)	0 (0.0%)	76.0%
13	3 (20.0%)	8 (53.3%)	3 (20.0%)	0 (0.0%)	1 (6.7%)	76.0%

***Skills/Abilities:**

1. Communication skills
2. Problem solving
3. Software skills
4. Ability to work in teams
5. Structured thinking
6. Creative thinking
7. Hardware skills
8. Ability to apply appropriate engineering skills in the job
9. Ability to apply appropriate mathematical skills in the job
10. Ability to analyze a problem, and identify and define the engineering requirements appropriate to its solution
11. Ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs
12. Be ethically, socially and professionally responsible
13. Be lifelong learners and strive to continuous improvement

Detailed analysis of the results is available at https://uqu.edu.sa/computer-sciences-information-en/en/195012.

A.14 SO Attainment Indicated by Summer Training Surveys

As described earlier, in summer training surveys indirect assessments of the SOs are targeted. These surveys represent the students' perception of their abilities at the completion of their trainings. The data obtained for the Summers of 2011 and 2012 are shown Tables 4–27 and 4–28. Since the satisfaction

criterion is 60%, we consider the attainment satisfactory if the weighted average is greater than or equal to 60%. Whenever this average is unsatisfactory, a continuous improvement plan is required. For this, the issue is discussed in the Assessment & Evaluation Committee to come up with an improvement plan. The proposed improvement is then presented in the department council for approval. From these graphs it is concluded that the SO attainments are satisfactory. Detailed analysis of the results is available at https://uqu.edu.sa/computer-sciences-information-en/en/195012.

Table 4–27: Summer Training Survey Data for SO Attainment (2011)

SO ID	Excellent	Very Good	Good	Poor	Very Poor	Weighted Average
(a)	18 (20.9%)	20 (23.3%)	43 (50.0%)	3 (3.5%)	2 (2.3%)	71.4%
(b)	17 (24.3%)	23 (32.9%)	22 (31.4%)	5 (7.1%)	3 (4.3%)	73.1%
(c)	17 (24.3%)	20 (28.6%)	19 (27.1%)	9 (12.9%)	5 (7.1%)	70.0%
(d)	14 (20.3%)	25 (36.2%)	23 (33.3%)	7 (10.1%)	0 (0.0%)	73.3%
(e)	22 (31.9%)	17 (24.6%)	16 (23.2%)	12 (17.4%)	2 (2.9%)	73.0%
(f)	17 (24.3%)	29 (41.4%)	15 (21.4%)	8 (11.4%)	1 (1.4%)	75.1%
(g)	19 (27.5%)	22 (31.9%)	22 (31.9%)	5 (7.2%)	1 (1.4%)	75.4%
(h)	16 (23.2%)	18 (26.1%)	27 (39.1%)	7 (10.1%)	1 (1.4%)	71.9%
(i)	18 (26.5%)	18 (26.5%)	28 (41.2%)	4 (5.9%)	0 (0.0%)	74.7%
(j)	14 (20.3%)	17 (24.6%)	27 (39.1%)	10 (14.5%)	1 (1.4%)	69.6%
(k)	25 (35.7%)	16 (22.9%)	19 (27.1%)	9 (12.9%)	1 (1.4%)	75.7%

Table 4–28: Summer Training Survey Data for SO Attainment (2012)

SO ID	Excellent	Very Good	Good	Poor	Very Poor	Weighted Average
(a)	0 (0.0%)	4 (50.0%)	3 (37.5%)	1 (12.5%)	0 (0.0%)	67.5%
(b)	4 (44.4%)	1 (11.1%)	4 (44.4%)	0 (0.0%)	0 (0.0%)	80.0%
(c)	2 (22.2%)	3 (33.3%)	4 (44.4%)	0 (0.0%)	0 (0.0%)	75.6%
(d)	2 (22.2%)	4 (44.4%)	2 (22.2%)	1 (11.1%)	0 (0.0%)	75.6%
(e)	1 (12.5%)	4 (50.0%)	3 (37.5%)	0 (0.0%)	0 (0.0%)	75.0%
(f)	1 (12.5%)	3 (37.5%)	4 (50.0%)	0 (0.0%)	0 (0.0%)	72.5%
(g)	1 (12.5%)	1 (12.5%)	6 (75.0%)	0 (0.0%)	0 (0.0%)	67.5%
(h)	0 (0.0%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	0 (0.0%)	62.5%
(i)	0 (0.0%)	5 (55.6%)	4 (44.4%)	0 (0.0%)	0 (0.0%)	71.1%
(j)	0 (0.0%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	0 (0.0%)	62.5%
(k)	2 (22.2%)	3 (33.3%)	3 (33.3%)	1 (11.1%)	0 (0.0%)	73.3%

Detailed analysis of the results is available at https://uqu.edu.sa/computer-sciences-information-en/en/195012.

B. Continuous Improvement

Continuous improvement is something very significant in the Computer Engineering Program. For the last five years, there have been continuous improvements on numerous fronts including the curriculum, the assessment processes, academic advisement, career advisement, 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. The processes used for evaluating the Student Outcomes were described in Section A.2. In this section, we discuss the following:

a) Using SO evaluations in continuous improvement of the program.
b) Results of changes made to the program.
c) Future program improvement plans based on recent evaluations.

B.1 Microscopic Continuous Improvement Process

The first and probably the most important part of our continuous improvement plan is a "*microscopic*" continuous improvement that deals with an instructor's teaching and assessment plan. We believe that improvements at microscopic level to improve the CLOs of the courses contribute the most to the continuous improvement of the program. This process is described as follows:

B.1.1 Course Continuous Improvement Plan (CCIP)

In this process, the instructor identifies the weak CLO or SO and then comes up with changes in his teaching plan that he alone can do to improve the learning outcome. The instructor treats the weakness in a particular CLO or a related SO by suggesting changes in the teaching plan to be implemented next time the course is taught. A typical example of a CCIP is shown in Fig. 4–61. Some examples of the changes 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 or weak SOs after giving them an opportunity to learn
d) Holding extra classes/tutorials to remove the weakness in particular CLOs or SOs
e) Increasing the number of quizzes or assignments in particular CLOs or SOs
f) Providing students with solutions of problems related to particular topics in which students face difficulty
g) Suggesting ways to increase the students' interest in topics related to weak CLOs or SOs
h) Arranging group discussions among the students
i) Ensuring that the students know about the nature of questions in the assessments in advance before the assessment
j) Re-designing the teaching plan to have more lectures or lab sessions for the weak CLOs and SOs

It will be again emphasized that in this type of "Course Continuous Improvement Plan" (CCIP), the focus is only on what an instructor can do without asking for things that the department can do or 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 the data, the instructors can easily identify the CLOs and the SOs for the course with satisfaction level lower than the specified satisfaction criterion. If in a course, all CLOs and the relevant SOs are satisfied (i.e., 60% of the students or more obtain 70% marks or better) no CCIP is required, though an instructor may try to improve the learning outcome(s) even further. If the satisfaction in any of the CLOs or the relevant SOs is less than the satisfaction criterion, then the department requires a CCIP to be submitted by the instructor.

All the CCIPs 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 in a meeting called by the relevant course coordinators. The instructors then implement the improvement plans. Once the CCIPs 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.

We introduced this system first time in Fall 2012. It reflects actually an improvement in our continuous improvement plan for the program. Tables 4–29 and 4–30 summarize the results of CCIPs. In the fourth column of Table 4–29, the CLOs that were below satisfaction are shown. The table shows the "Weak CLOs" for each subject, their satisfaction percentage before improvement in Fall 2012 and their satisfaction after implementing the CCIP in Spring 2013. It however does not include the CCIPs that did not result in any improvements.

1 BASIC COURSE INFORMATION

Course Information

Instructor's Name: Fahd M Aldosari

Course Number and Name: 1403489-4 (3, 1, 4) Microprocessors

Academic Year: 2012-13

Semester: 1-Fall

Class Section: 1

No. of students: 23

No. of Assessments: 6

Satisfaction Criterion: 60% students get 70% marks.

CLO-SO Map

Student Outcome (SOs)

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

CLO ID	Course Learning Outcome (CLOs) for Microprocessors
1	Knowledge of microprocessor architecture, types, components. *
2	Familiarity of assembly language instructions and their usage.
3	Knowledge of designing interface circuits of memory and I/O devices. *
4	Ability to analyze and sketch microprocessor bus timing.
5	Ability to write assembly language programs to conduct experiments in Lab. *
6	Overview of different microprocessor- based applications systems.

2 CLO SATISFACTION DATA

Assessment data for Satisfaction criterion set to 70 %

Assessment Name	CLO1 M	CLO1 P	CLO2 M	CLO2 P	CLO3 M	CLO3 P	CLO4 M	CLO4 P	CLO5 M	CLO5 P	CLO6 M	CLO6 P	Non-CLO M	Non-CLO P
Research Report	0	0	0	0	0	0	0	0	0	0	10	96	0	N/A
Quiz1	2.9	4	0.7	30	1.4	0	0	0	0	0	0	0	0	N/A
Midterm Exam	2.5	74	4	4	4.5	39	4	78	0	0	0	0	0	N/A
Quiz2	0	0	3	70	0	0	0	0	2	83	0	0	0	N/A
Lab	0	0	0	0	0	0	0	0	10	87	15	70	0	N/A
Final Exam	7	100	3	30	12	61	4	74	14	35	0	0	0	N/A
Weighted Average	12.4	73	10.7	32	17.9	51	8	76	26	59	25	80	0	N/A

3 SO SATISFACTION DATA

Assessment data for Satisfaction: 60% students get 70% marks)

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
Research Report	2.5	96													2.5	96	2.5	96	2.5	96		
Quiz1	1.4	4	1.9	2	0.5	0															1.2	15
Midterm Exam	3.2	76	2.8																		7.5	41
Quiz2	0.5	83	0.5	83					0.5	83											3.5	76
Lab	6.2	78	2.5	87					2.5	87					3.8	70	3.8	70	3.8	70	2.5	87
Final Exam	9	70	11	65	4	61			3.5	35											12.5	50
Cumulative Sum (Out of 100)	22.9	72	18.7	61	6	51			6.5	59					6.2	80	6.2	80	6.2	80	27.2	53

Marks attributed to SO 'b' in assessment Quiz1

4 ANALYZE

It can be seen from the CLO satisfaction data table that CLO_2 (Familiarity of assembly language instructions and their usage) is very weak. Although this CLO was assessed in multiple assessments, it shows that only 32% students got 70% or higher marks. CLO_3 (Knowledge of designing interface circuits of memory and I/O devices) is weak too. It shows that 51% of students got 70% or higher marks. CLO_5 (Ability to write assembly language programs to conduct experiments in Lab) does not satisfy the pass criterion; however, it shows better attainment than the previous other CLOs. Although this CLO is mainly for labs, its weakness resulted from the final exam indicating the students do not relate the practical part with the theoretical part of the course.

For SO satisfaction, weakness is noted in 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) and SO "k" (an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice). Since SO "c" is related only to CLO_3 as noted in the CLO-SO mapping for this course, the weakness of SO "c" is resulted from the weakness of CLO_3. Moreover, SO "k" is related to CLO_2, CLO_3, CLO_4 and CLO_5. All those CLOs, except CLO_4, show weaknesses, which is reflected on this SO. It is obvious, that improving the weak CLOs will definitely improve the SOs at the end.

5 IMPROVEMENT PLAN

The following improvements may be considered:

1) For CLO_2, solving the assembly language questions after each assessment should be done to show the students their mistakes. Conducting help sessions before each written assessment should be considered to prepare the students to the assembly questions.
2) For CLO_3, the more interface design (memory and I/O) questions should be given to the students before the midterm exam.
3) For CLO_5, the lab instructors and the course instructors should work together to relate the theoretical materials to the practical experiments conducted in labs.
4) Students are generally weak in programming, especially assembly language. Offering a stand-alone assembly language course will help improving the programming skills for the students.

Fig. 4–61: An example of a CCIP

Table 4–29 CLO Improvement Loop-closing

Course No.	Course Name	Instructor	Weak CLOs	Satisfaction (%)	
				Before Improvement	After Improvement
1403322	Computer Comm. Systems	M Al-Rawi	CLO 1	21	76
			CLO 2	55	67
1403371	Advanced Logic Design	M Rashid	CLO 3	47	70
			CLO 4	29	50
1403372	Computer Organization	T Somani	CLO 3	51	84
1403450	Microcomputers System Design	A Semeia	CLO 1	52	56
1403472	Computer Architecture	A Basalamah	CLO 2	55	72
			CLO 3	32	93
1403489	Microprocessors	F Aldosari	CLO 2	32	39
			CLO 5	59	94

Similar data are given in Table 4–30 for SOs. In this table, the SOs that were below satisfaction are shown in the fourth column. The table shows the "Weak SOs" for each subject, their satisfaction percentage before improvement in Fall 2012 and their satisfaction after implementing the CCIP in Spring 2013.

Table 4–30 SO Improvement Loop-closing

Course No.	Course Name	Instructor	Weak SOs	Satisfaction (%)	
				Before Improvement	After Improvement
1403322	Computer Comm. Systems	M Al-Rawi	(a)	51	69
			(h)	21	76
			(j)	47	69
1403371	Advanced Logic Design	M Rashid	(b)	29	50
			(k)	29	50
1403372	Computer Organization	T Somani	(c)	56	81
1403472	Computer Architecture	A Basalamah	(a)	55	71
			(c)	55	72
			(e)	55	71
1403489	Microprocessors	F Aldosari	(c)	51	64
			(k)	53	61

B.2 Loop-closing

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 4–31 shows the choices available to the instructors for the questions asked by the CLOSO.

B.2.1 Loop-closing Data Entry

The Loop-closing data as entered by an instructor in CLOSO software is shown in Fig. 4–62 that shows a typical instructor's input in CLOSO software. This information is gathered from all instructors for all the courses and is fed to the software for processing. The instructor provides the Loop-closing data for the SOs as described above. CLOSO displays the data. An example of the Loop-closing data input is shown in Fig. 4–62 for all SOs relevant to the course.

Table 4–31: Improvement plan existence for relevant SOs

Questions	Possible Answers
Was an improvement plan available for implementation for this SO from the experience of previous year/semester?	No
	Yes
	Not Applicable
Who was responsible for improvement plan?	Instructor
	Department
	Instructor and Department
	Not Applicable
Was the improvement plan implemented?	Yes, all parts implemented
	Only instructor's part implemented
	Only department's part implemented
	No, nothing was done
	Not Applicable
Was the improvement plan effective?	Yes, the satisfaction criterion was met
	Yes, but improvement was not enough
	Yes, but improvement was insignificant
	No, was not at all effective
	No, the outcome went down
	Not Applicable
Was the loop closed?	Yes
	No

	M	P	Was an improvement plan available for implementation for this SO from the experience of previous year/semester?	Who was reponsible for improvement plan?	Was the improvement plan implemented?	Was the improvement plan effective?	Loop Closed?
a	42	70	Yes	Instructor	Only instructor's part impleme...	Yes, the Satisfaction criterion was met.	☑
b	15	88	No	Not Applicable	Not Applicable	Not applicable	☐
c	18	56	Yes	Department	Only department's part imple...	No, was not at all effective	☐
e	9	71	No	Not Applicable	Not Applicable	Not applicable	☐
k	15	88	No	Not Applicable	Not Applicable	Not applicable	☐

Fig. 4–62: SO Loop-closing data input

B.2.2 Loop-closing Data Analysis Example

The Loop-closing data collected as described above, is analyzed by CLOSO to enable the department to make decisions for any possible improvement plans for the future. An example of the Loop-closing analysis results is shown in Fig. 4–63 for SO (a). The loop closing data shown in Fig 4–63 is based on 17 course files of Fall 2012 that addressed SO (a). In this Figure, data collected by the instructors are shown on the top and the statistical analyses are shown in the bottom. The data analysis for Loop-closing for example is shown in the table on the extreme right in the bottom. It indicates that out of 17 courses addressing SO (a), the loop was closed in eight and for the rest of nine course files, following are the three possibilities:

1. Although, no improvement plan was available or implemented but the satisfaction criterion was met in the concerned SO
2. The improvement did not take place to the required level.
3. Either no improvement plan was available or no plan was implemented.

These statistics are discussed by the Assessment and Evaluation Committee for resolving any issues and recommending future actions to be taken. It is worth mentioning here that the process of decision making based on such data is planned to be done every three years because enough data that indicate trends are required to make decisions.

SO ID: a

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed
1	1403201 - Circuit Theory - Abdulbasit Abid	No	N/R	N/R	N/R	False
2	1403201 - Circuit Theory - Omar Sonbul	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, but improvement was not en...	True
3	1403271 - Switching Theory - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
4	1403312 - Digital Electronic Systems and Circuits - kadry monta...	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	False
5	1403312 - Digital Electronic Systems and Circuits - kadry monta...	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
6	1403312 - Digital Electronic Systems and Circuits - kadry monta...	N/R	N/R	N/R	N/R	False
7	1403322 - Computer Communication System - Momen Al-Rawi	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
8	1403371 - Advanced Logic Design - Muhammad Rashid	No	N/A	N/A	N/A	False
9	1403372 - Computer Organization - Maher Elshakankiri	N/R	N/R	N/R	N/R	False
10	1403381 - Numerical Analysis - Khaled Almotairi	Yes	Instructor	Yes, all parts implemented.	No, was not at all effective	False
11	1403450 - Microcomputers System Design - Abdellatif Moustafa	No	Instructor & departm...	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	False
12	1403472 - Computer Architecture - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
13	1403472 - Computer Architecture - Maher Elshakankiri	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
14	1403484 - Databases - Khaled Almotairi	Yes	Instructor & departm...	Nothing was implemented	N/A	False
15	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
16	1403489 - Microprocessors - Maher Rajab	N/A	N/A	N/A	N/A	False
17	1403489 - Microprocessors - Abdellatif MOUSTAFA	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	2
2	No	3
3	Yes	11
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	3
2	Instructor	8
3	Department	0
4	Instructor & depa...	4
5	N/A	2

Implementation Statistics

S/N	Response	Count
1	N/R	3
2	Yes, all parts implemented.	7
3	Only instructor's part implemented	4
4	Only department's part implemented	0
5	Nothing was implemented	1
6	N/A	2

Effectiveness Statistics

S/N	Response	Count
1	N/R	3
2	Yes, the Satisfaction criterion was met.	7
3	Yes, but improvement was not enough.	3
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	3

Loop Closure Statistics

S/N	Resp...	Count
1	True	8
2	False	9

Fig. 4–63: CLOSO loop-closing analysis example for SO (a)

B.3 Loop Closing Data for Spring 2013

The loop-closing data produced by CLOSO for all SOs in Spring 2013 are presented here by copying the screen snapshots for each SO. The bottom right corner of each screen snapshot gives the data indicating how many instructors reported loop-closing was true and how many reported that the loop-closing was false.

B.3.1 SO (a) Loop-closing

Loop-closing data for SO (a) is shown in Fig. 4–63 and was discussed in Section B.2.2.

B.3.2 SO (b) Loop-closing

SO ID: b

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed
1	1403201 - Circuit Theory - Abdulbasit Abid	No	N/R	N/R	N/R	False
2	1403201 - Circuit Theory - Omar Sonbul	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, but improvement was not en...	True
3	1403271 - Switching Theory - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
4	1403312 - Digital Electronic Systems and Circuits - kadry monta...	No	N/A	N/A	N/A	False
5	1403312 - Digital Electronic Systems and Circuits - kadry monta...	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
6	1403312 - Digital Electronic Systems and Circuits - kadry monta...	N/R	N/R	N/R	N/R	False
7	1403322 - Computer Communication System - Momen Al-Rawi	No	N/A	N/A	N/A	False
8	1403371 - Advanced Logic Design - Muhammad Rashid	Yes	Instructor & departm...	Only instructor's part implemented	Yes, but improvement was not en...	False
9	1403372 - Computer Organization - Maher Elshakankiri	N/R	N/R	N/R	N/R	False
10	1403450 - Microcomputers System Design - Abdellatif Moustafa	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	False
11	1403489 - Microprocessors - Maher Rajab	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
12	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Instructor	Nothing was implemented	No, was not at all effective	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	2
2	No	4
3	Yes	6
4	N/A	0

Responsibility Statistics

S/N	Response	Count
1	N/R	3
2	Instructor	5
3	Department	0
4	Instructor & depa...	2
5	N/A	2

Implementation Statistics

S/N	Response	Count
1	N/R	3
2	Yes, all parts implemented.	3
3	Only instructor's part implemented	3
4	Only department's part implemented	0
5	Nothing was implemented	1
6	N/A	2

Effectiveness Statistics

S/N	Response	Count
1	N/R	3
2	Yes, the Satisfaction criterion was met.	3
3	Yes, but improvement was not enough.	3
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	2

Loop Closure Statistics

S/N	Resp...	Count
1	True	5
2	False	7

Fig. 4–64: SO (b) loop-closing data for Spring 2013

B.3.3 SO (c) Loop-closing

SO ID: c

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed
1	1403271 - Switching Theory - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
2	1403312 - Digital Electronic Systems and Circuits - kadry monta...	No	N/A	N/A	N/A	False
3	1403312 - Digital Electronic Systems and Circuits - kadry monta...	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
4	1403312 - Digital Electronic Systems and Circuits - kadry monta...	N/R	N/R	N/R	N/R	False
5	1403371 - Advanced Logic Design - Muhammad Rashid	No	N/A	N/A	N/A	False
6	1403372 - Computer Organization - Maher Elshakankiri	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
7	1403450 - Microcomputers System Design - Abdellatif Moustafa	No	Instructor & departm...	Only instructor's part implemented	Yes, the Satisfaction criterion was...	False
8	1403472 - Computer Architecture - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
9	1403472 - Computer Architecture - Maher Elshakankiri	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
10	1403484 - Databases - Khaled Almotairi	Yes	Instructor & departm...	Nothing was implemented	N/A	False
11	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
12	1403489 - Microprocessors - Maher Rajab	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
13	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Department	Nothing was implemented	No, was not at all effective	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	1
2	No	4
3	Yes	8
4	N/A	0

Responsibility Statistics

S/N	Response	Count
1	N/R	1
2	Instructor	6
3	Department	1
4	Instructor & depa...	3
5	N/A	2

Implementation Statistics

S/N	Response	Count
1	N/R	1
2	Yes, all parts implemented.	5
3	Only instructor's part implemented	3
4	Only department's part implemented	0
5	Nothing was implemented	2
6	N/A	2

Effectiveness Statistics

S/N	Response	Count
1	N/R	1
2	Yes, the Satisfaction criterion was met.	8
3	Yes, but improvement was not enough.	0
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	3

Loop Closure Statistics

S/N	Resp...	Count
1	True	8
2	False	5

Fig. 4–65: SO (c) Loop-closing data for Spring 2013

B.3.4 SO (d) Loop-closing

SO ID: d

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed
1	1403401 - Seminar - Khaled Almotairi	No	Instructor	Nothing was implemented	N/A	False
2	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	0
2	No	1
3	Yes	1
4	N/A	0

Responsibility Statistics

S/N	Response	Count
1	N/R	0
2	Instructor	2
3	Department	0
4	Instructor & depa...	0
5	N/A	0

Implementation Statistics

S/N	Response	Count
1	N/R	0
2	Yes, all parts implemented.	1
3	Only instructor's part implemented	0
4	Only department's part implemented	0
5	Nothing was implemented	1
6	N/A	0

Effectiveness Statistics

S/N	Response	Count
1	N/R	0
2	Yes, the Satisfaction criterion was met.	1
3	Yes, but improvement was not enough.	0
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	0
6	No, the outcome went down.	0
7	N/A	1

Loop Closure Statistics

S/N	Resp...	Count
1	True	1
2	False	1

Fig. 4–66: SO (d) loop-closing data for Spring 2013

B.3.5 SO (e) Loop-closing

SO ID: e

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	1403201 - Circuit Theory - Abdulbasit Abid	No	N/R	N/R	N/R	False
2	1403201 - Circuit Theory - Omar Sonbul	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, but improvement was not en...	True
3	1403312 - Digital Electronic Systems and Circuits - kadry m...	Yes	Instructor	Yes, all parts implemented.	Yes, but improvement was insignif...	False
4	1403312 - Digital Electronic Systems and Circuits - kadry m...	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	False
5	1403312 - Digital Electronic Systems and Circuits - kadry m...	N/R	N/R	N/R	N/R	False
6	1403322 - Computer Communication System - Momen Al-R...	Yes	Instructor	Nothing was implemented	N/A	False
7	1403372 - Computer Organization - Maher Elshakankiri	N/R	N/R	N/R	N/R	False
8	1403401 - Seminar - Khaled Almotairi	No	Instructor	Nothing was implemented	N/A	False
9	1403450 - Microcomputers System Design - Abdellatif Mou...	Yes	Instructor	Yes, all parts implemented.	Yes, but improvement was not en...	False
10	1403472 - Computer Architecture - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
11	1403472 - Computer Architecture - Maher Elshakankiri	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
12	1403487 - Process Control - Esam Khan	Yes	Instructor	Nothing was implemented	Yes, the Satisfaction criterion was...	True
13	1403489 - Microprocessors - Maher Rajab	N/A	N/A	N/A	N/A	False
14	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Instructor & departm...	Only instructor's part implemented	Yes, but improvement was insignif...	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	2
2	No	3
3	Yes	8
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	3
2	Instructor	7
3	Department	0
4	Instructor & depa...	3
5	N/A	1

Implementation Statistics

S/N	Response	Count
1	N/R	3
2	Yes, all parts implemented.	5
3	Only instructor's part implemented	2
4	Only department's part implemented	0
5	Nothing was implemented	3
6	N/A	1

Effectiveness Statistics

S/N	Response	Count
1	N/R	3
2	Yes, the Satisfaction criterion was met.	3
3	Yes, but improvement was not enough.	3
4	Yes, but improvement was insignificant.	2
5	No, was not at all effective	0
6	No, the outcome went down.	0
7	N/A	3

Loop Closure Statistics

S/N	Resp...	Count
1	True	5
2	False	9

Fig. 4–67: SO (e) loop-closing data for Spring 2013

B.3.6 SO (f) Loop-closing

SO ID: f

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	803151 - Computer Aided Drawing (CAD) - Moussa Elbisy	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
2	803452 - Reinforced Concrete Design I - Kehlan Salman	Yes	Instructor	Only instructor's part implemented	No, the outcome went down.	False
3	803455 - Reinforced Concrete Design II - Ayman Abdel-Ra...	N/R	N/R	N/R	N/R	False
4	803455 - Reinforced Concrete Design II - Kehlan Salman	Yes	Instructor	Yes, all parts implemented.	Yes, but improvement was not en...	False
5	803459 - Design of Steel Structures - MOHAMMED ALSAB...	N/A	N/A	N/A	N/A	False
6	803464 - Highway Engineering - Imtiaz Said Ahmed	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
7	803483 - Contracts and Specifications - ABDULAZIZ ALFI	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	1
2	No	0
3	Yes	5
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	1
2	Instructor	5
3	Department	0
4	Instructor & depa...	0
5	N/A	1

Implementation Statistics

S/N	Response	Count
1	N/R	1
2	Yes, all parts implemented.	2
3	Only instructor's part implemented	3
4	Only department's part implemented	0
5	Nothing was implemented	0
6	N/A	1

Effectiveness Statistics

S/N	Response	Count
1	N/R	1
2	Yes, the Satisfaction criterion was met.	2
3	Yes, but improvement was not enough.	2
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	0
6	No, the outcome went down.	1
7	N/A	1

Loop Closure Statistics

S/N	Resp...	Count
1	True	3
2	False	4

Fig. 4–68: SO (f) loop-closing data for Spring 2013

B.3.7 SO (g) Loop-closing

SO ID: g

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed
1	1403401 - Seminar - Khaled Almotairi	No	Instructor	Nothing was implemented	N/A	False

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	0
2	No	1
3	Yes	0
4	N/A	0

Responsibility Statistics

S/N	Response	Count
1	N/R	0
2	Instructor	1
3	Department	0
4	Instructor & depa...	0
5	N/A	0

Implementation Statistics

S/N	Response	Count
1	N/R	0
2	Yes, all parts implemented.	0
3	Only instructor's part implemented	0
4	Only department's part implemented	0
5	Nothing was implemented	1
6	N/A	0

Effectiveness Statistics

S/N	Response	Count
1	N/R	0
2	Yes, the Satisfaction criterion was met.	0
3	Yes, but improvement was not enough.	0
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	0
6	No, the outcome went down.	0
7	N/A	1

Loop Closure Statistics

S/N	Resp...	Count
1	True	0
2	False	1

Fig. 4–69: SO (g) loop-closing data for Spring 2013

B.3.8 SO (h) Loop-closing

SO ID: h

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	1403322 - Computer Communication System - Momen Al-R...	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
2	1403484 - Databases - Khaled Almotairi	Yes	Instructor	Nothing was implemented	N/A	False
3	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
4	1403489 - Microprocessors - Maher Rajab	N/A	N/A	N/A	N/A	False
5	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Instructor & departm...	Nothing was implemented	No, was not at all effective	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	0
2	No	1
3	Yes	3
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	0
2	Instructor	3
3	Department	0
4	Instructor & depa...	1
5	N/A	1

Implementation Statistics

S/N	Response	Count
1	N/R	0
2	Yes, all parts implemented.	1
3	Only instructor's part implemented	1
4	Only department's part implemented	0
5	Nothing was implemented	2
6	N/A	1

Effectiveness Statistics

S/N	Response	Count
1	N/R	0
2	Yes, the Satisfaction criterion was met.	2
3	Yes, but improvement was not enough.	0
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	2

Loop Closure Statistics

S/N	Resp...	Count
1	True	3
2	False	2

Fig. 4–70: SO (h) loop-closing data for Spring 2013

B.3.9 SO (i) Loop-closing

SO ID: i

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	1403401 - Seminar - Khaled Almotairi	No	Instructor	Nothing was implemented	N/A	False
2	1403472 - Computer Architecture - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
3	1403472 - Computer Architecture - Maher Elshakankiri	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
4	1403489 - Microprocessors - Maher Rajab	N/A	N/A	N/A	N/A	False
5	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Instructor & departm...	Nothing was implemented	No, was not at all effective	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	0
2	No	2
3	Yes	2
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	0
2	Instructor	2
3	Department	0
4	Instructor & depa...	2
5	N/A	1

Implementation Statistics

S/N	Response	Count
1	N/R	0
2	Yes, all parts implemented.	2
3	Only instructor's part implemented	0
4	Only department's part implemented	0
5	Nothing was implemented	2
6	N/A	1

Effectiveness Statistics

S/N	Response	Count
1	N/R	0
2	Yes, the Satisfaction criterion was met.	2
3	Yes, but improvement was not enough.	0
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	2

Loop Closure Statistics

S/N	Resp...	Count
1	True	3
2	False	2

Fig. 4–71: SO (i) loop-closing data for Spring 2013

B.3.10 SO (j) Loop-closing

SO ID: j

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	1403322 - Computer Communication System - Momen Al-R...	Yes	Instructor	Only instructor's part implemented	Yes, the Satisfaction criterion was...	True
2	1403472 - Computer Architecture - Turki Al-Somani	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
3	1403472 - Computer Architecture - Maher Elshakankiri	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, but improvement was not en...	True
4	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
5	1403489 - Microprocessors - Maher Rajab	N/A	N/A	N/A	N/A	False
6	1403489 - Microprocessors - Abdellatif MOUSTAFA	No	Instructor & departm...	Nothing was implemented	No, was not at all effective	True

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	0
2	No	1
3	Yes	4
4	N/A	1

Responsibility Statistics

S/N	Response	Count
1	N/R	0
2	Instructor	3
3	Department	0
4	Instructor & depa...	2
5	N/A	1

Implementation Statistics

S/N	Response	Count
1	N/R	0
2	Yes, all parts implemented.	3
3	Only instructor's part implemented	1
4	Only department's part implemented	0
5	Nothing was implemented	1
6	N/A	1

Effectiveness Statistics

S/N	Response	Count
1	N/R	0
2	Yes, the Satisfaction criterion was met.	3
3	Yes, but improvement was not enough.	1
4	Yes, but improvement was insignificant.	0
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	1

Loop Closure Statistics

S/N	Resp...	Count
1	True	5
2	False	1

Fig. 4–72: SO (j) loop-closing data for Spring 2013

B.3.11 SO (k) Loop-closing

SO ID: k

S/N	Course File Name	Plan existed	Responsible	Was the plan implemented	Was the plan effective?	Loop Closed?
1	1403201 - Circuit Theory - Abdulbasit Abid	No	N/R	N/R	N/R	False
2	1403201 - Circuit Theory - Omar Sonbul	Yes	Instructor & departm...	Yes, all parts implemented.	Yes, but improvement was not en...	True
3	1403312 - Digital Electronic Systems and Circuits - kadry m...	Yes	Instructor & departm...	Only instructor's part implemented	Yes, but improvement was not en...	False
4	1403312 - Digital Electronic Systems and Circuits - kadry m...	Yes	Instructor	Only instructor's part implemented	Yes, but improvement was not en...	False
5	1403312 - Digital Electronic Systems and Circuits - kadry m...	N/R	N/R	N/R	N/R	False
6	1403322 - Computer Communication System - Momen Al-R...	No	N/A	N/A	N/A	False
7	1403371 - Advanced Logic Design - Muhammad Rashid	No	N/A	N/A	N/A	False
8	1403372 - Computer Organization - Maher Elshakankiri	N/R	N/R	N/R	N/R	False
9	1403381 - Numerical Analysis - Khaled Almotairi	Yes	Instructor	Yes, all parts implemented.	No, was not at all effective	False
10	1403401 - Seminar - Khaled Almotairi	No	Instructor	Nothing was implemented	N/A	False
11	1403484 - Databases - Khaled Almotairi	Yes	Instructor	Nothing was implemented	N/A	False
12	1403487 - Process Control - Esam Khan	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
13	1403489 - Microprocessors - Maher Rajab	Yes	Instructor	Yes, all parts implemented.	Yes, the Satisfaction criterion was...	True
14	1403489 - Microprocessors - Abdellatif MOUSTAFA	Yes	Instructor	N/R	Yes, but improvement was insignif...	False

Plan Existed - Statistics

S/N	Resp...	Count
1	N/R	2
2	No	4
3	Yes	8
4	N/A	0

Responsibility Statistics

S/N	Response	Count
1	N/R	3
2	Instructor	7
3	Department	0
4	Instructor & depa...	2
5	N/A	2

Implementation Statistics

S/N	Response	Count
1	N/R	4
2	Yes, all parts implemented.	4
3	Only instructor's part implemented	2
4	Only department's part implemented	0
5	Nothing was implemented	2
6	N/A	2

Effectiveness Statistics

S/N	Response	Count
1	N/R	3
2	Yes, the Satisfaction criterion was met.	2
3	Yes, but improvement was not enough.	3
4	Yes, but improvement was insignificant.	1
5	No, was not at all effective	1
6	No, the outcome went down.	0
7	N/A	4

Loop Closure Statistics

S/N	Resp...	Count
1	True	3
2	False	11

Fig. 4–73: SO (k) loop-closing data for Spring 2013

B.4 Improvement Planning based on Faculty's Opinion of Students' Weaknesses

Instructors identify student weaknesses and suggest possible improvements in their courses. They do it in two ways: 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 sixteen. This list is shown in Table 4–32.

Table 4–32: Student Weaknesses

S/N	Weakness
1	Students' abilities were not according to the prerequisite 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.

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 4–33.

Table 4–33: 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:

The data gathered by the instructors for their courses are correlated by CLOSO to perform SO-wise analysis. Such SO-wise analysis gives a good idea of what are the particular weaknesses and particular improvement methods for a particular SO. Figs. 4–74 and 4–75 show such data displayed by CLOSO for SO (a).

All such data are evaluated by the Assessment and Evaluation committee for making recommendations for future improvements. However, as mentioned earlier, such data are collected each semester but are evaluated once every three years. We hope to have all such data considered in the Fall of 2013-14.

B.5 Improvement Planning based on Course Readiness

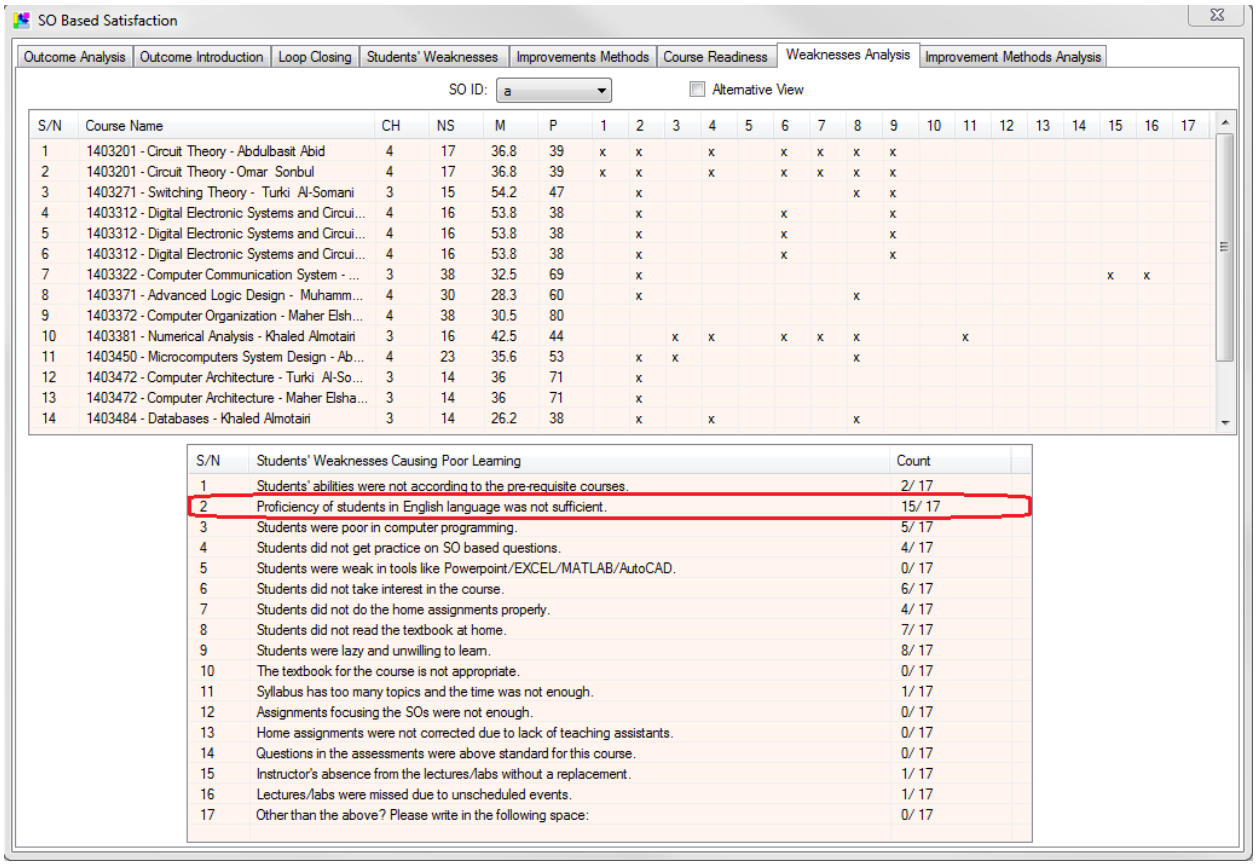
CLOSO software provides the opportunity to the instructors to voice their concerns about the "Course Readiness". It involves the readiness aspects required at the beginning of the semester. Snapshots from the analysis of such survey for Fall 2012 are given in Figures 4–76 to 4–94.

B.6 Improvement Planning based on Exit Surveys

The results of exit surveys as shown in Section A.4.6 clearly indicate that the SO attainments as perceived by the students have improved in 2012 as compared to previous year. Mainly it happened because of several activities concerning preparations for ABET accreditation. Therefore, no improvement plans are based on these results.

B.7 Improvement Planning based on Alumni and Employer Surveys

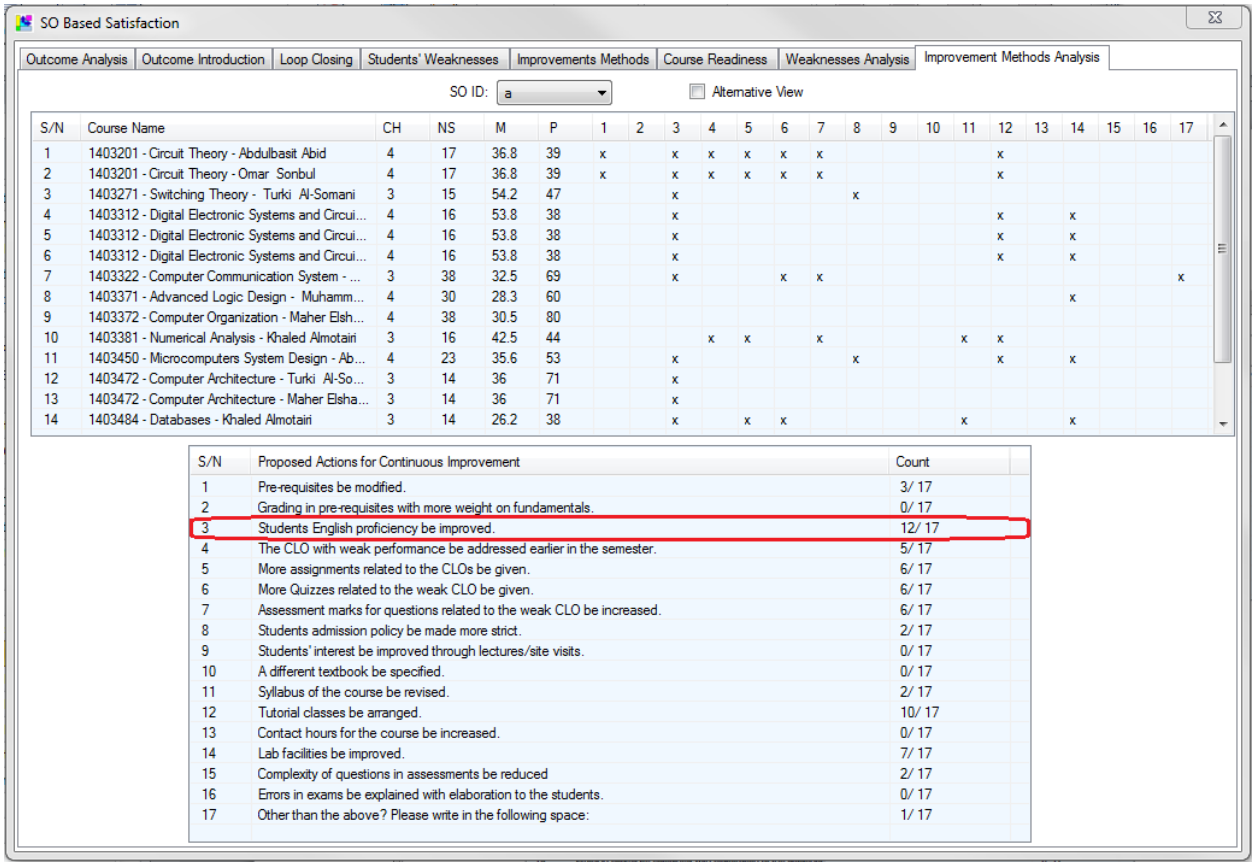
Alumni and Employer surveys are done every three years. In the last Alumni survey shown in Section A.4.7, it was found that for SOs (h), (j) and (k), the Alumni perception is less than 60%. For the last Employer survey shown in Section A.4.8, it was found that the employer perception of software abilities of our students is less than 60%. These results will be discussed in the Assessment and Evaluation Committee meeting and recommendations will be passed on to the departmental council.



S/N	Course Name	CH	NS	M	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1403201 - Circuit Theory - Abdulbasit Abid	4	17	36.8	39	x	x		x		x	x	x	x								
2	1403201 - Circuit Theory - Omar Sonbul	4	17	36.8	39	x	x		x		x	x	x	x								
3	1403271 - Switching Theory - Turki Al-Somani	3	15	54.2	47		x						x	x								
4	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38		x				x			x								
5	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38		x				x			x								
6	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38		x				x			x								
7	1403322 - Computer Communication System - ...	3	38	32.5	69		x													x	x	
8	1403371 - Advanced Logic Design - Muhamm...	4	30	28.3	60		x						x									
9	1403372 - Computer Organization - Maher Elsh...	4	38	30.5	80																	
10	1403381 - Numerical Analysis - Khaled Almotairi	3	16	42.5	44			x	x		x	x	x			x						
11	1403450 - Microcomputers System Design - Ab...	4	23	35.6	53		x	x					x									
12	1403472 - Computer Architecture - Turki Al-So...	3	14	36	71		x															
13	1403472 - Computer Architecture - Maher Elsha...	3	14	36	71		x															
14	1403484 - Databases - Khaled Almotairi	3	14	26.2	38		x		x				x									

S/N	Students' Weaknesses Causing Poor Learning	Count
1	Students' abilities were not according to the pre-requisite courses.	2/ 17
2	Proficiency of students in English language was not sufficient.	15/ 17
3	Students were poor in computer programming.	5/ 17
4	Students did not get practice on SO based questions.	4/ 17
5	Students were weak in tools like Powerpoint/EXCEL/MATLAB/AutoCAD.	0/ 17
6	Students did not take interest in the course.	6/ 17
7	Students did not do the home assignments properly.	4/ 17
8	Students did not read the textbook at home.	7/ 17
9	Students were lazy and unwilling to learn.	8/ 17
10	The textbook for the course is not appropriate.	0/ 17
11	Syllabus has too many topics and the time was not enough.	1/ 17
12	Assignments focusing the SOs were not enough.	0/ 17
13	Home assignments were not corrected due to lack of teaching assistants.	0/ 17
14	Questions in the assessments were above standard for this course.	0/ 17
15	Instructor's absence from the lectures/labs without a replacement.	1/ 17
16	Lectures/labs were missed due to unscheduled events.	1/ 17
17	Other than the above? Please write in the following space:	0/ 17

Fig. 4–74: Example of SO-wise weakness analysis for SO (a)



S/N	Course Name	CH	NS	M	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1403201 - Circuit Theory - Abdulbasit Abid	4	17	36.8	39	x		x	x	x	x	x					x					
2	1403201 - Circuit Theory - Omar Sonbul	4	17	36.8	39	x		x	x	x	x	x					x					
3	1403271 - Switching Theory - Turki Al-Somani	3	15	54.2	47			x					x									
4	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38			x									x		x			
5	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38			x									x		x			
6	1403312 - Digital Electronic Systems and Circui...	4	16	53.8	38			x									x		x			
7	1403322 - Computer Communication System - ...	3	38	32.5	69			x			x	x										x
8	1403371 - Advanced Logic Design - Muhamm...	4	30	28.3	60														x			
9	1403372 - Computer Organization - Maher Elsh...	4	38	30.5	80																	
10	1403381 - Numerical Analysis - Khaled Almotairi	3	16	42.5	44				x	x		x				x	x					
11	1403450 - Microcomputers System Design - Ab...	4	23	35.6	53			x					x				x		x			
12	1403472 - Computer Architecture - Turki Al-So...	3	14	36	71			x														
13	1403472 - Computer Architecture - Maher Elsha...	3	14	36	71			x														
14	1403484 - Databases - Khaled Almotairi	3	14	26.2	38			x		x	x					x			x			

S/N	Proposed Actions for Continuous Improvement	Count
1	Pre-requisites be modified.	3/ 17
2	Grading in pre-requisites with more weight on fundamentals.	0/ 17
3	Students English proficiency be improved.	12/ 17
4	The CLO with weak performance be addressed earlier in the semester.	5/ 17
5	More assignments related to the CLOs be given.	6/ 17
6	More Quizzes related to the weak CLO be given.	6/ 17
7	Assessment marks for questions related to the weak CLO be increased.	6/ 17
8	Students admission policy be made more strict.	2/ 17
9	Students' interest be improved through lectures/site visits.	0/ 17
10	A different textbook be specified.	0/ 17
11	Syllabus of the course be revised.	2/ 17
12	Tutorial classes be arranged.	10/ 17
13	Contact hours for the course be increased.	0/ 17
14	Lab facilities be improved.	7/ 17
15	Complexity of questions in assessments be reduced	2/ 17
16	Errors in exams be explained with elaboration to the students.	0/ 17
17	Other than the above? Please write in the following space:	1/ 17

Fig. 4–75: Example of SO-wise improvement methods analysis for SO (a)

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	13
2	Inappropriate	3
3	No response from the instructor	1

Fig. 4–76: Prerequisite courses

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	13
2	Inappropriate	3
3	Very Poor	1
4	No response from the instructor	0

Fig. 4–77: Prerequisite abilities in the students

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	15
2	Inappropriate	2
3	No response from the instructor	0

Fig. 4–78: Instructor's class schedule

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	13
2	Too big	4
3	No response from the instructor	0

Fig. 4–79: Instructor's class size

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	14
2	Inappropriate	3
3	No response from the instructor	0

Fig. 4–80: Instructor's classroom space

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	7
2	Inappropriate	10
3	No response from the instructor	0

Fig. 4–81: Instructor's classroom facilities

S/N	Possible responses (linstructors' Input)	Count
1	Comfortable	10
2	Noisy	2
3	Disturbing	0
4	Improper Temperature	4
5	Improper Lighting	1
6	No response from the instructor	0

Fig. 4–82: Instructor's classroom environment

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	5
2	Inappropriate	4
3	Non-existent	2
4	Not applicable	6
5	No response from the instructor	0

Fig. 4–83: Lab equipment

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

Fig. 4–84: Lab utilities

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	9
2	Inappropriate	0
3	Non-existent	1
4	Not applicable	7
5	No response from the instructor	0

Fig. 4–85: Lab assistants/technicians

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	10
2	Too big	1
3	Not applicable	4
4	No response from the instructor	2

Fig. 4–86: Lab class size

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	10
2	Too big	1
3	Not applicable	4
4	No response from the instructor	2

Fig. 4–87: Lab assistants

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	7
2	Inappropriate	0
3	Non-existent	3
4	Not applicable	5
5	No response from the instructor	2

Fig. 4–88: Required software

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

Fig. 4–89: Textbook availability

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

Fig. 4–90: Reference material availability

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

Fig. 4–91: Teaching assistants

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

Fig. 4–92: Calssroom Wifi

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

Fig. 4–93: Lab Wifi

S/N	Possible responses (linstructors' Input)	Count
1	Appropriate	12
2	Inappropriate	0
3	Non-existent	0
4	Not needed	3
5	Custom Possible Answers	0
6	Custom Possible Answers	0
7	No response from the instructor	2

Fig. 4–94: Instructor's office Wifi

B.8 Improvement through Curriculum

Several improvements have been made in the curriculum based upon ABET requirements and feedback from the faculty. Previously, SO (g) was not addressed in any of the courses. The contents of the course "1403401 Seminar" were revised to ensure that this SO is addressed in one of the core courses in addition to the Capstone Project and Summer Training. Based upon student learning of SOs, faculty recommended that contents, CLOs and/or CLO-SO mapping of some of the courses be revised. As a result, several meetings took place between the course instructors, curriculum committee and the department council before approving changes to course contents. Courses whose contents were revised and/or where the textbooks were changed were as follows:

1. 1403201 Circuit Theory
2. 1403271 Switching Theory
3. 1403372 Computer Organization
4. 1403371 Advanced Logic Design
5. 1403401 Seminar
6. 1403489 Microprocessors
7. 1403472 Computer Architecture
8. 1403450 Microcomputer System Design

In addition, major changes were made to assessments and processes of Summer Training I & II and the Capstone Project.

B.9 Future Program Improvement Plans

Future 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 under the heading "Microscopic Continuous Improvement Plans". Based upon the evaluations of Spring 2013, faculty has already planned to implement the CCIP they have submitted. 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 the evaluation results for three years. Following is a list of improvement plans based upon the recent evaluations:

1. A new curriculum is under consideration that will have various tracks for students to choose from. Further, the curriculum will impart state of the art education and will be based upon industry needs and the feedback obtained in the EAB meetings.
2. Capstone Project processes and assessments are being improved gradually. SO based assessment has already been implemented. Further enhancements in processes have been proposed and will be presented to the department council at the beginning of the next academic year.
3. Summer training processes and assessments have been overhauled and will be implemented beginning next academic year.
4. SO attainments have been satisfactory or close to satisfactory in almost all the SOs. However, based upon the evaluations of recent past, it is realized that some of the SOs need further improvements, such as, (a), (c), (e), (f), (g) and (k). Faculty members will be selected as SO champions for these SOs and they will be assigned the task of suggesting plans to improve the attainments.
5. From the evaluations and discussion, it is obvious that students in several courses need tutorials. Although, the Department has already started offering tutorial sessions but it is limited to selected courses. More courses will be added where tutorial sessions will be offered for students to enhance their learning.
6. At present, the computer engineering department is using a temporary location borrowed from other colleges. A new building for the College of Computer & Information Systems has been constructed. Before moving to this new building, the department is ensuring that it fulfills all the

requirements of engineering education such as safety, spacious classrooms and state of the art laboratories.

C. Additional Information

Hard copies of the course folders will be 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 review at the time of visit.

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: Design Project. The Program includes over one year combination of college level mathematics and basic sciences (35 credits, 32 minimum), 81 credit hours of engineering topics (48 minimum), 19 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.

Table 5–1: Curriculum Computer Engineering

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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		
Physics, 403101, General Physics I	R	4	0	0	0	Fall 2011 Fall 2012	Lecture 40 Lab 20
Preparation Year Center, 800101, Calculus I	R	4	0	0	0	Fall 2011 Fall 2012	Lecture 40
Dawah and Islamic Culture, 605101, The Holy Quran I	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
English Language Center, 705101, English Language I	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
Dawah and Islamic Culture, 601101, Islamic Culture I	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
Mechanical Engineering, 804151, Engineering Graphics I	R	0	2	0	0	Fall 2011 Fall 2012	Lecture 20
Physics, 403102, General Physics II	R	4	0	0	0	Spring 2012 Spring 2013	Lecture 40 Lab 20
Preparation Year Center, 800102, Calculus II	R	4	0	0	0	Spring 2012 Spring 2013	Lecture 40
Dawah and Islamic Culture, 605201, The Holy Quran II	R	0	0	2	0	Spring 2012 Spring 2013	Lecture 40
English Language Center, 705102, Communication Skills in English I	R	0	0	3	0	Spring 2012 Spring 2013	Lecture 40

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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, 601201, Islamic Culture II	R	0	0	2	0	Spring 2012 Spring 2013	Lecture 40
Mechanical Engineering, 804231, Engineering Workshops	R	0	2	0	0	Spring 2012 Spring 2013	Lecture 30 Lab 15
Preparation Year Center, 800201, Engineering Math I	R	3	0	0	0	Fall 2011 Fall 2012	Lecture 40
Computer Science, 1401102, Computer Programming	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 46 Lab 36
Dawah and Islamic Culture, 605301, The Holy Quran III	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
Kitab and Sunna, 102101, Biography of Prophet Muhammad (PBUH)	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
English Language Center, 705103, Communication Skills in English II	R	0	0	3	0	Fall 2011 Fall 2012	Lecture 40
Arabic Language and Grammar, 501101, Arabic Language	R	0	0	2	0	Fall 2011 Fall 2012	Lecture 40
Electrical Engineering, 802301, Circuits Analysis I*	R	0	4	0	0	Fall 2012 Spring 2013	Lecture 23 Lab 14
Preparation Year Center, 800202, Engineering Math II	R	3	0	0	0	Spring 2012 Spring 2013	Lecture 40
Computer Science, 1401104, Structured Programming	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 25 Lab 15

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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		
Chemistry, 402101, General Chemistry	R	4	0	0	0	Spring 2012 Spring 2013	Lecture 40 lab 20
Dawah and Islamic Culture, 605401, The Holy Quran IV	R	0	0	2	0	Spring 2012 Spring 2013	Lecture 40
Electrical Engineering, 802321, Signal Analysis	R	0	3	0	0	Fall 2011 Fall 2012	Lecture 35
Computer Engineering, 1403311, Electronics	R	0	4	0	0	Fall 2012 Spring 2013	Lecture 16 Lab 19
Computer Engineering, 1403271, Switching Theory	R	0	4 ✓	0	0	Fall 2012 Spring 2013	Lecture 16 Lab 15
Dawah and Islamic Culture, 601301, Islamic Culture III	R	0	0	3	0	Fall 2011 Fall 2012	Lecture 40
Mechanical Engineering, 804343, Eng. Statistics & Probability Theory	R	3	0	0	0	Fall 2011 Fall 2012	Lecture 40
Computer Engineering, 1403381, Numerical Analysis	R	3	0	0	0	Fall 2012 Spring 2013	Lecture 18
Computer Science, 1401105, Advanced Programming	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 35 Lab 21
Computer Engineering, 1403372, Computer Organization	R	0	4	0	0	Fall 2012 Spring 2013	Lecture 22 Lab 24
Dawah and Islamic Culture, 601401, Islamic Culture IV	R	0	0	2	0	Spring 2012 Spring 2013	Lecture 40

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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, 1403312, Digital Electronic Syst. & Circuits	R	0	4	0	0	Spring 2012 Spring 2013	Lecture 22 Lab 15
Computer Engineering, 1403300, Summer Training 1	R	0	2	0	0	Sum.2011 Sum. 2012	50
Computer Engineering, 1403322, Computer Communication System	R	0	4	0	0	Fall 2012 Spring 2013	Lecture 33
Computer Science, 1401218, Data Structures and Algorithms	R	0	0	0	4	Fall 2012 Spring 2013	Lecture 35 Lab 21
Mechanical Engineering, 804344, Engineering Economics	R	0	2	0	0	Fall 2011 Fall 2012	Lecture 40
Computer Engineering, 1403371, Advanced Logic Design	R	0	4 ✓	0	0	Fall 2012 Spring 2013	Lecture 24 Lab 25
Computer Science, 1401210, Discrete Structures	R	3	0	0	0	Fall 2012 Spring 2013	Lecture 28
Computer Engineering, 1403401, Seminar	R	0	2	0	0	Fall 2012 Spring 2013	Lecture 08
Computer Engineering, 1403422, Computer Networks	R	0	4	0	0	Spring 2012 Spring 2013	Lecture 33 Lab 20
Computer Engineering, 1403489, Microprocessors	R	0	4 ✓	0	0	Fall 2012 Spring 2013	Lecture 24 Lab 30
Computer Engineering, 1403472, Computer Architecture	R	0	3	0	0	Fall 2012 Spring 2013	Lecture 14

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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, 1403400, Summer Training 2	R	0	2	0	0	Sum.2011 Sum. 2012	60
Computer Engineering, 1403484, Databases	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 17
Computer Science, 1401311, Operating Systems	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 52
Computer Engineering, 1403364, Basics of Integrated Circuits Design	R	0	3 ✓	0	0	Fall 2012 Spring 2013	Lecture 37
Computer Engineering, 1403450, Microcomputers System Design	R	0	4 ✓	0	0	Fall 2012 Spring 2013	Lecture 13 Lab 15
Mechanical Engineering, 804345, Engineering Management	R	0	2	0	0	Fall 2011 Fall 2012	Lecture 40
Computer Engineering, 1403499, Project	R	0	4	0	0	Fall 2012 Spring 2013	32
Computer Engineering, 1403487, Process Control	R	0	3 ✓	0	0	Fall 2012 Spring 2013	Lecture 27
Computer Science, 1401313, Software Engineering	R	0	0	0	3	Fall 2012 Spring 2013	Lecture 39
Computer Engineering, 1403xxx, Elective	E	0	3	0	0	Fall 2012 Spring 2013	Lecture 21
Computer Engineering, 1403xxx, Elective	E	0	3	0	0	Fall 2012 Spring 2013	Lecture 18
Computer Engineering, 1403xxx, Elective	E	0	3	0	0	Fall 2012	Lecture 26

Course (Department, Number, Title) List all courses in the program by term starting with first term of 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		
							Spring 2013	
TOTALS-ABET BASIC-LEVEL REQUIREMENTS			35	79	29	22		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM		165						
PERCENT OF TOTAL			21.21%	47.88%	17.58%	13.33%		
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours		32 Hours	48 Hours				
	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.

*Since 2010, the course Circuit Theory is offered by the computer engineering department itself. It used to be “802301-4 Circuit Analysis I” offered by the Electrical Engineering Department.

According to the information given in Table 5–1, it can be seen that courses belonging to Math & Basic Sciences collect 35 hours that fits with minimum required credit hours. Also, engineering topics collect 81 hours which is more than the minimum required.

Course syllabi describing the course offerings for 2011-2012 are provided in Appendix A. A course prerequisite flowchart is included on the next page as Figure 5–1. Undergraduate lecture courses usually have a class size ranging from 20 to 45. The laboratory courses usually have 20 – 35 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 while other required courses are offered once a year. Each academic semester, a selection of technical electives is also offered to facilitate exposure to current technologies and specialization in an area (if desired). In consultation with their faculty advisers, students choose 9 credit hours of technical electives.

A.2 Relationship between CE curriculum and the PEOs

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

A.3 Relationship between CE curriculum and SOs

Table 5–3 lists all courses of the Computer Engineering program and their support with the (a – k) student outcomes. As it can be noticed from Table 5–3, the student outcomes are achieved during the curriculum years.

A.4 Prerequisites Flowchart

Fig. 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 164 credit hours. These areas are mathematics, basic science, computer engineering, others (consisting of courses from computer science) and general education. Table 5–4 summarizes the credit hours corresponding to each area.

A.5.1 Mathematics and Basic Sciences

One year of mathematics and basic sciences are 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).

A.5.1.1 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. The total number of credits required of all Computer Engineering majors is 23 credits.

A.5.1.2 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 81 engineering credits including 72 required credits and 9 elective credits.

A.5.2.1 Required Courses

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

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

*Since 2010, this course is offered by the computer engineering department itself. It used to be “802301-4 Circuit Analysis I” offered by the Electrical Engineering Department.

Table 5–3: Relationship between CE curriculum and SOs

Course Code	Course Title	Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Required Courses												
1403201-4	Circuit Theory	1	1			1						1
1403311-4	Electronics	1	1	1								1
1403271-4	Switching Theory	1	1	1		1						
1403381-3	Numerical Analysis	1										1
1403372-4	Computer Organization	1		1		1						1
1403312-4	Digital Electronic Systems & Circuits	1	1	1		1						1
1403322-4	Computer Communication System	1	1			1			1		1	
1403371-4	Advanced Logic Design	1	1	1		1						1
1403401-2	Seminar				1	1	1	1	1	1	1	1
1403422-4	Computer Networks	1	1			1			1	1		1
1403489-4	Microprocessors	1	1	1		1			1	1	1	1
1403472-3	Computer Architecture	1		1		1				1	1	
1403484-3	Distributed Databases	1		1			1		1			1
1403364-3	Basics of IC Design	1		1		1		1	1	1	1	
1403450-4	Microcomputer System Design	1	1	1		1						
1403487-3	Process Control	1		1	1	1			1		1	
1403300-2	Summer Training I	1	1	1	1	1	1	1	1	1	1	1
1403400-2	Summer Training II	1	1	1	1	1	1	1	1	1	1	1
1403499-4	Project	1	1	1	1	1		1			1	
Summary of 19 Courses		**18**	**12**	**14**	**05**	**16**	**04**	**05**	**09**	**07**	**09**	**12**
Electives												
1403464-3	Design of Integrated Circuit	1		1		1					1	1
1403446-3	Mobile Computing	1		1		1			1	1	1	1
1403478-3	Computer Vision	1	1	1		1		1				1
1403481-3	Neural Networks	1		1		1						1
1403476-3	Simulation & Modeling	1	1	1								1
1403421-3	Digital Signal Analysis	1				1						1
1403480-3	Artificial Intelligence	1	1	1		1	1	1	1		1	1
Summary of 7 Courses		**7**	**3**	**6**	**0**	**6**	**1**	**2**	**2**	**1**	**3**	**7**

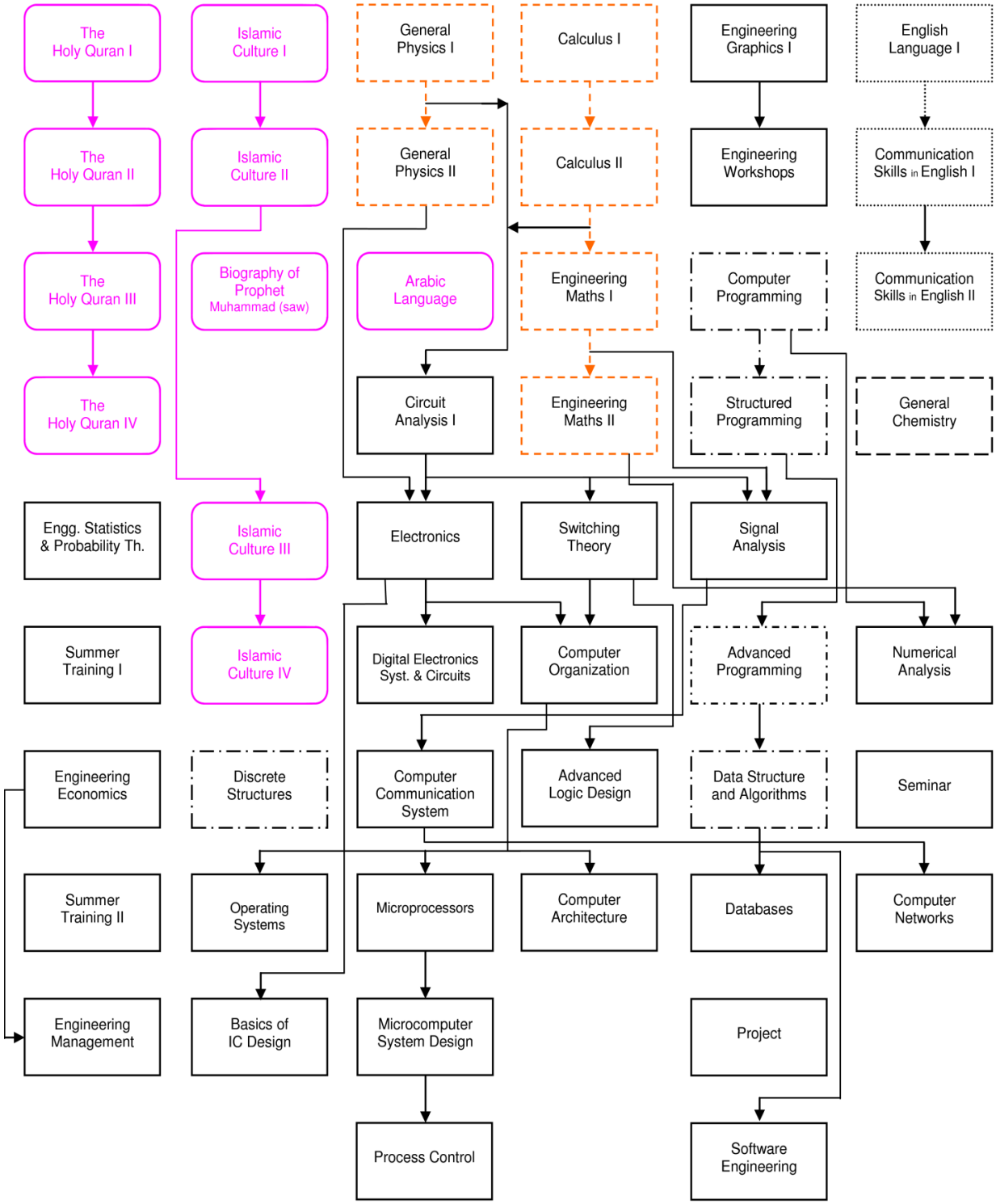


Fig. 5–1: Prerequisites flow chart

Table 5–4: Number of Credit Hours for Each Curriculum Areas

Area	Credit hours	% of Credit hours
Mathematics	23	13.94%
Basic Sciences	12	7.27%
Engineering Topics	79	47.88%
Others	22	13.33%
General Education	29	17.58%

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

Course Code	Course Title	Credit Hours
	1st Year	
804151-2	Engineering Graphics I	2
804231-2	Workshop Basics	2
	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
1403484-3	Databases	3
	5th Year	
1403364-3	Basics of Integrated Circuits Design	3
1403450-4	Microcomputers System Design	4
1403499-4	Project	4
1403487-3	Process Control	3
804345-2	Engineering Management	2
1403xxx-3	Elective	3
1403xxx-3	Elective	3
1403xxx-3	Elective	3

A.5.2.2 Professional Electives

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

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

A.6 Major Design Experience for Engineering Practice

Seniors in their final year take their major design experience, Graduation Project. Students work in teams of anywhere from three to five students, where the average team size is three students. Students are allowed to form their own teams and choose projects which must be approved by the faculty member teaching the course. The projects need to incorporate engineering standards and realistic constraints such as economic, environmental, sustainability, ethical, security, social, and political considerations. A detailed and thorough treatment of graduation project has been given in Section A.9.2 while the document highlighting the complete process is available at: https://uqu.edu.sa/computer-sciences-information-en/en/93195852.

A.7 Cooperative Education Branch

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

A.8 Material That Will Be Available For Review during the Visit

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

1. Course syllabi.
2. Teaching Materials.
3. Course text books.

B. Course Syllabi

Appendix A contains the syllabus for each course used in the computer engineering program curriculum.

CRITERION 6: FACULTY

A. Faculty Qualifications

Recent developments have taken place to raise the standard of education in computer engineering department to a higher level in order to meet the growing demands of the employers in recruiting computer engineers. Accordingly, the department has taken the initiative to add some important quality measures to its program of study. These quality measures demanded quality faculty and staff. Accordingly, the department has taken some leaps through the College deanship and in coordination with the Computer Science department through the following:

A. Ensure knowledge and research development and enhancements of the existing faculty members, by means of:
    1. Encouraging conferences participation by speeding up the process through the head of department directly.
    2. Holding weekly faculty seminars to keep the faculty members aware of new research topics being examined by other colleagues from within and outside the college and to entice research collaboration among them. Many visiting professors have presented their work in these seminars.
    3. Building bonds with research centers of academic and industrial entities to facilitate research funding for the faculty. Some of the main research funding bodies are:
        a) KACST (King Abdul-Aziz City of Science and Technology)
        b) NPSTI (National Program of Science, Technology and Innovation)
        c) SABIC (Saudi Arabian Basic Industries Corporation)
        d) Haj Research Institute
        e) Haj Core (Centre of Research Excellence)
        f) ICRS (Institute of Consulting Research and Studies)
        g) Institute of Scientific Research and Revival of Islamic Heritage

B. Recruitment of highly qualified members of academic staff from world-wide reputable universities and academic institutes, based on their quality research activities and publications, and on their academic teaching experience.

These measures have resulted in a momentous advancement in the department as follows:

1. Whereby, joint research with computer science department has resulted in a 40 million Saudi Riyals of funding from the above mentioned industrial and research bodies. This has substantially increased the number of quality research among the academic staff.

2. Moreover, the department, through the new recruitment policy, encompasses some of the distinguished professors in their field of research. Hence, with the already existing academic staff who graduated from different universities around the globe, the department has a diversity of academic and research backgrounds from USA, Canada, UK, Australia, and Japan.

3. The department academic staff has become sought by various bodies for their research and teaching experience, whereby:
    a) A member holds the post of the College Dean.
    b) A member holds the post of the College Vice-Dean for Academic Affairs.

c) A member holds the post of the College Vice-Dean for Post-Graduate Studies and Scientific Research.

d) A member holds the post of the College Vice-Dean for Academic Development and Community Service.

e) A member holds the post of the Dean of the Information Technology Deanship.

f) A member holds the post of the Vice-Dean of the Information Technology Deanship.

g) Three members of staff have established "House of Expertise" which serves as a channel of which the industry can seek consultants and experts from the University in the concerned field.

h) A member is currently the College website committee officer.

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 mentioned University policy is implemented through the department's work frame which governs the allocation of work load for its academic staff in the following context:

- An academic staff member is assigned no more than two different courses in the same semester.
- The work load of a faculty member holding an official University or College administrative post is given 50% of the maximum required work load with the possibility of reducing it to 3 hrs.
- The work load of a faculty member who's assigned high service load, such as student advising, department committees, training, is reduced in order to allow him to offer better teaching standard and contribute towards the tasks assigned to him alike.
- The work load for a faculty member who recently completed his education is reduced in his first semester at the department, to allow him time to settle down.

C. Faculty Size

The B.Sc. Program, which is currently the only program in the department, has 28 faculty members, of which twenty two are PhD holders. Out of these twenty two, two are Professors, five Associate Professors and fifteen Assistant Professors. There are also six Lecturers in the Department. There are two more PhD holders that do not belong to the Department of Computer Engineering but regularly teach courses in the Department.

The number of registered students in the department is around 200 students. This brings the student to faculty ratio to 6.67:1.

D. Professional Development

The CE Department in collaboration with the College deanship and the Development and Quality Deanship promotes the development of its faculty members through:

- Offering modern teaching techniques training.
- Offering administration and leadership workshops through the Institute of Public Administration.
- Collaborating with other renowned Universities in giving an insight and enhancing the faculty view of the best practices in course and program design.
- Announcing and supporting the attendance in the national and international conferences and workshops in the academic development and teaching.
- Announcing and supporting the attendance in the national and international conferences and workshops in the conferences of various computer and IT disciplines.
- Announcing and supporting the attendance in the E-learning Workshops supervised by the National Center for E-learning in KSA.

E. Authority and Responsibility of Faculty

Faculty qualifications, responsibilities and workload are listed in Tables 6–1 and 6–2 respectively.

Faculty members' Vitae are available in Appendix B.

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	23	7	--	M	M	H
Abdulbasit Abid	PhD – CE – 2008	AST	T	FT	0	13	8	--	M	M	M
Anas Basalamah	PhD – CE – 2009	AST	T	FT	3	2	2	--	L	M	M
Emad Felemban	PhD – CE – 2009	AST	T	FT	0	3	3	--	M	M	L
Esam Khan	PhD – CE – 2005	AST	T	FT	0	10	8	--	L	L	L
Fahad Al-Zahrani		ASC	T	FT				--			
Fahd Aldosari	PhD – CE– 2011	AST	T	FT	0	8	2	--	L	M	L
Faisal Al-Osaimi	PhD – CE – 2010	AST	T	FT	0	2	2	--	M	M	M
Imran Tasadduq	PhD – ECE – 2002	P	NTT	FT	0	11	4	--	L	L	L
Kadry Montasser	PhD – CE – 1987	P	NTT	FT	0	40	12	--	M	H	M
Khaled H. Almotairi	PhD – ECE – 2012	AST	T	FT	0	1	1	--	L	L	L
Khalid Al-Hindi		ASC	T	FT				--			
Khalid Khayyat	PhD – CE – 2011	AST	T	FT	4	17	2	--	H	M	M
Maher Rajab	PhD – CE – 2004	ASC	T	FT	0	15	10	--	L	M	L
Maher Elshakankiri	PhD – CE – 2009	AST	NTT	FT	0	17	7	--	M	M	M
Majid Al-Gethami	PhD – CE – 2011	AST	T	FT	1	2	2	--	L	L	L
Mohsin Murad	MSc – CE – 2012	L	NTT	FT	1	2	1	--	M	M	M
Momen Al-Rawi	PhD – CE - 2007	AST	T	FT	0	6	6	--	L	L	L
Muhammad Al-Saleh	PhD – EE – 1991	ASC	T	FT	0	31	31	--	L	L	L

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
Muhammad A. Manzoor	MSc – CE – 2010	L	NTT	FT	0	6	1	--	M	M	M
Muhammad F. Khan	MSc – ECE – 2010	L	NTT	FT	4	3	1	--	H	H	L
Muhammad Al-Turkistany	PhD – CE – 2006	AST	T	FT	1	16	8	--	H	M	L
Muhammad Ibrahim	PhD – EE – 1985	P	NTT	FT	0	28	2	--	L	L	L
Muhammad Rashid	PhD – CE – 2009	AST	NTT	FT	10	3	2	--	M	M	M
Muhammad Yousuf I. Zia	MS – CE – 2002	L	NTT	FT	2	9	2	--	M	M	L
Muhammad Zafar	M.Sc. – CE – 1992	L	NTT	FT	0	16	16	--	L	L	L
Muhammed Saqib	MS – EE – 2010	L	NTT	FT	0	2	2	--	M	M	M
Omar Sonbul	PhD – CE – 2012	AST	T	FT	1	9	9	--	M	M	L
Saleh Basalamah	PhD–BioEng–2005	AST	T	FT	0	7	7	--	L	L	L
Turki Al-Somani	PhD – CSE – 2006	ASC	T	FT	14	11	7	MCSE, CCNA, CCDA	H	H	H

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. At the institution

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	(1403450/4) (2 Sections) Fall 2012, (1403450/4) (2 Sections), (1403489/4) Spring 2013	80%	10%	10%	100%
Abdulbasit Abid	FT	(1403271/4), (1403371/4) Fall 2012, (1403201/4) (3 Sections) Spring 2013	40%	40%	20%	100%
Ahmad Qamar	FT	(1403484/3) Fall 2012	85%	15%		100%
Anas Basalamah	FT	(1403472/3) Fall 2012, (1401418/3) (2 Sections) Spring 2013	33%	33%	33%	100%
Emad Felemban	FT	(1403422/4) Fall 2012, (1403446/3) Spring 2013	25%	50%	25%	100%
Esam Khan	FT	(1403487/3) Fall 2012, (1403487/3) Spring 2013	20%	40%	40%	100%
Fahad Al-Zahrani	FT	(1403476/3) Fall 2012, (1403322/4) Spring 2013	50%	0	50%	100%
Fahd Aldosari	FT	(1403489/4) Fall 2012, (1403489/4) Spring 2013	25%	15%	60%	100%
Faisal Al-Osaimi	FT	None	0	50%	50%	100%
Imran Tasadduq	FT	(1403381/3) Fall 2012, (1403322/4) (2 Sections) Spring 2013	20%	20%	60%	100%
Kadry Montasser	FT	(1403311/4), (1403201/4), (1403364/3) Fall 2012, (1403312/4) (3 Sections) Spring 2013	60%	30%	10%	100%
Khaled Al-Motairi	FT	(1403401/2), (1403484/3), (1403381/3) Spring 2013	70%	15%	15%	100%
Khalid Al-Hindi	FT	(1403481/3) Fall 2012 (1403401/2), (1403481/3) Spring 2013	40%	20%	40%	100%
Khalid Khayyat	FT	(1403271/4) (2 Sections) Fall 2012, (1403271/4), (1401213/3) (2 Sections) Spring 2013	65%	25%	10%	100%
Maher Elshakankiri		(1403372/4) (2 Sections), 1403472/3) Spring 2013	60%	30%	10%	100%
Maher Rajab	FT	(1403489/4) (2 Sections) Fall 2012, (1403489/4), (1403490/3), (1403478/3) Spring 2013	95%	5%	0	100%
Majid Al-Gethami	FT	(1403489/4) Fall 2012, (1403489/4) Spring 2013	40%	40%	20%	100%

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]	
Mohsin Murad	FT	(1403311/4) (3 Lab Sections), Fall 2012, (1403312/4) (2 Lab Sections), (1403450/4) (2 Lab Sections), (1403201/4) Lab Spring 2013	60%	20%	20%	100%
Momen Al-Rawi	FT	(1403322/3) (2 Sections) Fall 2012, (1403322/3) (2 Sections) Spring 2013	50%	10%	40%	100%
Muhammad Al-Saleh	FT	(1403311/4) (2 Sections) Fall 2012, (1403311/4) (2 Sections) Spring 2013	70%	20%	10%	100%
Muhammad A. Manzoor	FT	(1403372/4) (4 Lab Sections) Fall 2012, (1403372/4) (2 Lab Sections), (1403322/4) (2 Lab Sections) Spring 2013	40%	60%	0	100%
Muhammad F. Khan	FT	(1403371/4) (3 Lab Sections) Fall 2012, (1403422/4) (2 Lab Sections), (1403371/4) (2 Lab Sections), (1403201/4) Lab Spring 2013	80%	10%	10%	100%
Muhammad Al-Turkistany	FT	(1403322/3), (1403401/2) (2 Sections) Fall 2012, (1403322/3), (1403422/3) (2 Sections) Spring 2013	80%	20%	0	100%
Muhammad Ibrahim	FT	(1403421/3) Fall 2012, (1403364/3) (2 Sections) Spring 2013	40%	20%	40%	40%
Muhammad Rashid	FT	(1403371/4) (2 Sections) Fall 2012, (1403371/4) (2 Sections) Spring 2013	40%	40%	20%	100%
Muhammad Y. Zia	FT	(1403201/4) (2 Lab Sections) Fall 2012, (1403311/4) (2 Lab Sections), (1403312/4) Lab Spring 2013	50%	10%	40%	100%
Muhammad Zafar	FT	(1403271/4) (3 Lab Sections) Fall 2012, (1403271/4) (2 Lab Sections), (1403201/4) (3 Lab Sections) Spring 2013	90%	0	10%	100%
Muhammad Saqib	FT	(1403450/4) (4 Lab Sections) Fall 2012, (1403489/4) (3 Lab Sections), (1403322/4) (2 Lab Sections) Spring 2013	70%	20%	10%	100%
Omar Siraj Sonbul	FT	(1403372/4) Fall 2012, (1403201/4) Spring 2013	50%	0	50%	100%
Saleh Basalamah	FT	(1403478/3) Fall 2012	20%	20%	60%	100%
Sultan Khan	FT	(1403489/4) (3 Lab Sections), Fall 2012	85%	15%	0	100%

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]	
Turki Al-Somani	FT	(1403372/4), (1403490/3) Fall 2012, (1403271/4), (1403472/3), (1401311/3) Spring 2013	70%	20%	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

The Computer Engineering (CE) department has 18 faculty offices. Due to space shortage, some of these offices are shared. Lecturers are given office space in labs. However, the new building will solve this problem where independent offices will be provided to each faculty member. Office sizes in the new building allow enough space for individual and collective work including the possibility to hold meetings with at least two colleagues or students.

All offices benefit from air-conditioning and fit the 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. 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. The last replacement of computers happened in January 2012.

A.2 Classrooms

Classrooms are equipped with an adequate number of seats, an instructor's desk, a data projector if the lecture hall is big enough, and a white board. Also, most of the classrooms are covered with a wireless network allowing instructors to connect their laptops to the Internet.

A.3 Laboratory Facilities

There are a total of eight physical laboratories covering ten different subjects including an exclusive lab for Graduation Projects. These laboratories are well equipped as is mentioned in the equipment list in Appendix C. 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.

Laboratory courses are very important for students to gain practical knowledge about their field. Assessment of laboratories is an important requirement for any engineering accreditation. However, a comprehensive assessment methodology is often ambiguous that can result in inconsistent and subjective assessments. Therefore, an assessment methodology is required to evaluate the effectiveness of laboratories.

Furthermore, Criterion 4 of ABET states that a program must show evidence of actions to improve the program. In the context of laboratories, a continuous improvement plan consists of four steps as shown in Figure 7–1.

It is evident from Figure 7–1 that a methodology is required before performing assessments. Based on the assessment results, recommendations are generated. In the execution phase, recommendations are implemented. The output from execution phase goes to step 1 (specify a methodology) or step 2 (perform assessments) to improve the effectiveness of laboratories in a continuing fashion.

The laboratories' assessment committee has developed a methodology for assessing the effectiveness of laboratories. The proposed methodology covers pedagogic as well as implementation aspects of laboratory activities. The pedagogic aspects cover relationship between theory and laboratory practice, content level, activity level and learning environment. The implementation aspects cover facilities support, reliability, safety and laboratory manual. By assessing these pedagogic as well as implementation aspects, various practical abilities of the labs can be evaluated.

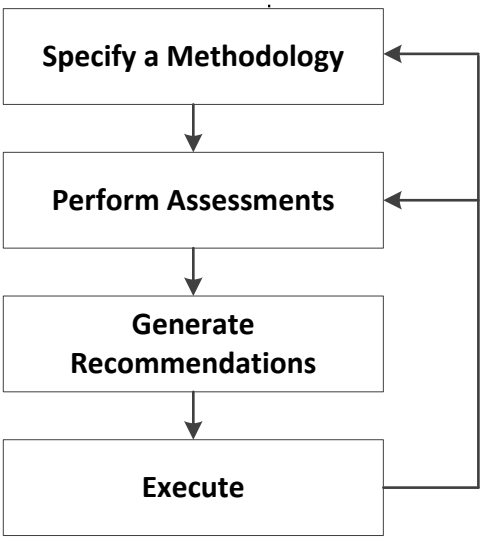


Figure 7–1: Continuous Improvement Methodology for Labs

Details of proposed methodology have been published [3,4]. Based upon this methodology, several recommendations were generated and implemented in the laboratories of computer engineering that enhanced the overall working and learning environment of these laboratories.

In the year 2012, the department upgraded several laboratories and purchased state of the art equipment, software and components. Appendix C enlists the major and latest equipment available in computer engineering laboratories.

Moreover, 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/computer-sciences-information-en/en/52780.

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. Student 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.

For other laboratories that have specialized engineering equipment, the Department has adopted a new policy beginning year 2012. The department will try to replace/upgrade the equipment whose warranty period is going to expire soon. Or, wherever possible, purchase extended warranty from the original suppliers in order to ensure smooth and hassle-free working of the laboratories. For old equipment where the warranty has expired long ago, the Department will try to get their replacement as soon as possible. Until such time, in-house technicians and lecturers try to fix any hardware problems by themselves. In this regard, a comprehensive manual on maintenance of all the facilities has been developed by the department. The department will implement this manual gradually as working of this manual requires hiring of technical personnel also. The manual will be available for the evaluators to review at the time of the visit.

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 library holdings can be searched electronically by using computer terminals at the library or via the internet at www.uqu.edu.sa/lib. 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

The library is opened from 8 a.m. to 8 p.m. during working days (Saturday to Wednesday).

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 affixed in laboratories and in different appropriate places in the college building.
- 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 also 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

Umm Al-Qura University administration has been very supportive in terms of providing money to hire faculty and support College activities and obtaining funding to build a new building for the College. In general, the College-level administration is very positive towards this program, and shows a good understanding of the discipline of Computer Engineering. The Dean has been willing to commit resources to the program whenever the need exists.

The departmental leadership consists of the department chair, Dr. Omar Sonbul and the department council (which includes all faculty members with a PhD degree). Dr. Sonbul chairs the department council which is responsible for taking decisions relating to the curriculum, faculty and staff appointment, teaching load distribution and faculty research and professional development activities.

The department chair and council have played a key role in promoting departmental interests at the college and university levels. They have created a productive environment to facilitate the department's teaching and research.

B. Program Budget and Financial Support

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, University hospitals, 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 will be submitted to the University Council for approval. Once the proposal is approved by the Council, it will be submitted to the Ministry of Finance with copies of the same to the Ministry of Civil Service and the Ministry of Economy & Planning. A date will be set for discussing the draft budget with the Ministry. The Directorate has to prepare all required data for holding discussions on the budget proposal with the Ministry of Finance. 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 around Two Billion Saudi Riyals. The college budget is a part of the University. The budget of the college during 2013 is SR 520,000, and includes consumables, raw materials, educational, or miscellaneous expenses only. 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 College has managed to increase its full-time non-Saudi faculty with highly-qualified full-time faculty members from all over the world.

The University also supports the College with a generous share of the available Teaching Assistant positions at the University level for top Saudi graduates. Appointed Teaching Assistants are required to pursue their MS and PhD 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. Budgets continue to be adequate to cover program and departmental needs for all operations.

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 (renewal every 5 years)
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 teaching assistants with the "lecturer" title, 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 quantity of its 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 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. There are no specific regulations or policy to carry out periodic or emergency maintenance of equipment in different laboratories. However, in order to maintain equipment in good operating conditions, the following measures are taken:

a. Currently, the suppliers are called upon by faculty or researchers using the equipment to provide periodical, calibration and/or repair and maintenance using funds supplied by the University administration in the form of maintenance contracts.
b. There is a plan to adopt a maintenance contract with a specialized firm for the maintenance of equipment and facilities. The process of providing maintenance contracts is governed by the regulations and procedures set by the University.

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 department.

C. Staffing

Administrative and technical staffs are recruited by the University based on the College nomination.

Currently, the computer engineering department has three technicians, five teaching assistants and eight lecturers on duty. In addition, twelve teaching assistants are on leave for PhD studies.

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.

D. Faculty Hiring and Retention

The recruitment processes at the College are well documented and follow several pathways for Saudi faculty, non-Saudi faculty and non-academic staff. Job announcements and interviews are performed at the level of departments. Decisions and recommendations are then reported to the Deanship of Faculty and Staff Affairs through the Dean of the College. Positions are publicly advertised at local newspapers, the University website, as well as in international newspapers and websites. The advertisements include job title, means to apply and selection criteria.

For hiring Saudi teaching assistants and lecturers, committees at the department level write their recommendations, which have to be approved by the department council, then by the college council, and then the final decision is made by the Committee of Teaching Assistants and Lecturers headed by the Vice Rector for Graduate Studies and Research. The same procedures are followed for the recruitment of assistant professors and higher academic ranks, except that the final decision of employment is made at the Scientific Council. As for non-Saudis, their recruitment is accomplished through advertisements posted on the University and other international websites. The College is strict about verifying the standing and reputation of the institutions from which degrees were obtained. The process undoubtedly includes considering if the institution is recognized by the Ministry of Higher Education.

Transfer within the institution and promotion of teaching staff are processed by department councils, then college councils. Those councils, following the regulations of the Ministry of Higher Education, take measures to ensure that qualifications and skill requirements are met. Then the Scientific Council makes the final decision based on the recommendations of the former councils.

Criteria for performance evaluation are clearly specified. There is a standard form for performance evaluation. Evaluation criteria for faculty members give a substantial weight to research compared to other faculty roles. Saudi faculty members who teach their full load will receive an additional 25% salary compensation. In addition, faculty members whose research is published in highly-ranked international journals are financially rewarded and recognized by both the College and University.

E. Support of Faculty Professional Development

Support for faculty professional development is adequate. Saudi faculty members are entitled to attend national and international conferences, symposia and workshops. Faculty members are given financial support for transportation, conference/workshop registration fees and living allowance for the event duration. Umm Al-Qura University encourages faculty to actively engage in a variety of professional workshops, meetings, and conferences worldwide, which will enhance their teaching and research capabilities.

Moreover, career and personal development at the College and the University provide faculty with opportunities to build productive and satisfying careers while contributing to the achievement of the University's mission. The University has established a Deanship of University Development and Quality which plays a major role not only in organizing the workshops and seminars, but also in identifying the staff needs and setting strategies to meet those needs. UQU Saudi faculty members are eligible for one semester sabbatical leave every three years or one year every five years. The procedure for applying for sabbatical leave involves written requests that go through the department chair and up through the dean's office. Requests are granted based on a prior sabbatical application, sabbatical plans and timelines as well as availability of faculty for courses to be fully covered. Faculty members should achieve at least one piece of research during their sabbatical 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 (Criteria 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 (Calculus I and Calculus II), which 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 structure 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 Criteria 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.

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1. M.H. Imam and Imran A. Tasadduq, “Evaluating the Satisfaction of ABET Student Outcomes from Course Learning Outcomes through a Software Implementation”, *International Journal of Quality Assurance in Engineering and Technology* (*IJQAETE*), vol. 2, no. 3, pp. 21–33, 2012
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3. Muhammad Rashid, Imran A. Tasadduq, Yousuf Irfan Zia, Mohammad Turkistany, Saima Rashid, “A Methodology for the Assessment of Pedagogic and Implementation Aspects of Laboratories”, *Proc. 2012 International Conference on Frontiers in Education: Computer Science and Computer Engineering*, (FECS’2012), 16–19 July, 2012, Las Vegas, Nevada
4. Muhammad Rashid, Imran A. Tasadduq, Yousuf Irfan Zia, Mohammad Turkistany, Saima Rashid, “Evaluation of engineering laboratories”, *Proc. International Conference on Education and e-Learning Innovations (ICEELI), 2012,* 1–3 July, 2012, Sousse, Tunisia

Appendix A – Course Syllabi

Circuit Theory

Coordinator	Kadry Montasser		
Course Number	1403201-4	**Credit Hours**	3 + 1
Prerequisites	Physics-I and Introduction to Mathematics-II		

Catalog Description

Learn about the basic circuit concepts, resistive networks, circuit structure, direct application of Ohm's and Kirchhoff's laws, storage elements, nodal and mesh analysis, linearity and superposition, network theorems and network reduction, two port network, transient response of first order networks, resonant circuits.

Major Topics Covered in the Course

- Introduction
- Basic circuit laws
- Resistance equivalent circuits
- Nodal analysis
- Mesh analysis
- Circuit theorems
- Inductance and capacitance equivalent circuits
- 1st order circuits (RL, RC)
- 2nd order circuits (RLC)
- 2-Port circuits

Textbooks/References

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

Course Learning Outcomes (CLOs)

1. The ability to apply basic laws and power calculations *
2. The ability to analyze resistive networks and simplify complicated networks.
3. The ability to use different circuit analysis techniques and theorems *
4. The ability to determine the natural and the step responses of first and second order circuits*
5. The ability to analyze basic two port circuits.

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1	1									
2	1										
3	1	1			1						1
4	1	1			1						1
5	1				1						1

Electronics

Coordinator	Kadry Montasser		
Course Number	1403311-4	**Credit Hours**	3 + 1
Prerequisites	General Physics II		

Catalog Description

Students will learn about the background of basic electronic devices and their operation with numerous examples of applications. The course introduces the concepts of basic electronic devices available today, their theory of operation, typical device characteristics, device specifications and a number of typical applications.

Major Topics Covered in the Course

- Semiconductor Theory
- Diodes
- Diode Devices
- Transistor
- DC and AC Analysis
- Field-Effect Transistor

Textbook / Reference(s)

1. Electronic Devices and Circuit Theory, Robert Boylestad and Louis Nashelsky, 10th ed., Prentice Hall, 2009.
2. Digital Integrated Circuits, Thomas DeMassa and zack Ciccone, John Wiley & Sons, 1996
3. Microelectronics, Millman, McGraw-Hill, 1999

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An understanding of the background of basic electronic devices and their operation with numerous examples of applications.
2. The ability to utilize dc and ac models of semiconductor devices in both analysis and design *
3. An ability to analyze and evaluate typical device characteristics, device specifications and a number of typical applications.*

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

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

Switching Theory

Coordinator	Abdulbasit Z. Abid		
Course Number	1403271-4	**Credit Hours**	3 + 1
Prerequisites	802301-4 or 1403201-4		

Catalog Description

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

Major Topics Covered in the Course

- Introduction to Digital Systems
- Number Systems and Codes
- Boolean Algebra and Logic Circuits Optimization
- Combinational Logic: Design and Analysis
- Sequential Logic: Design and Analysis

Textbooks/References

- M. Morris Mano and Charles Kime, Logic and Computer Design Fundamentals, 4th Edition, 2007, Prentice Hall, ISBN-10: 01398926X, ISBN-13: 978-013989269.

Course Learning Outcomes (CLOs)

1. An ability to understand number systems and codes.
2. An ability to understand Boolean algebra and logic circuits optimization.
3. An ability to design and analyze combinational logic circuits.
4. An ability to understand arithmetic functions.
5. An ability to design and analyze sequential circuits.
6. An ability to implement various digital circuits.*

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										
2	1										
3	1		1		1						
4	1										
5	1		1		1						
6		1									

Numerical Analysis

Coordinator	Faisal Al-Osaimi		
Course Number	1403381-3	**Credit Hours**	3 + 0
Prerequisites	Eng. Math.-II and Computer Programming		

Catalog Description

Roots of nonlinear equations. Solutions of systems of linear algebraic equations. Numerical differentiation and integration. Interpolation. Least squares & regression analysis. Numerical solution of ordinary & partial differential equations. Introduction to error analysis. Engineering case studies.

Major Topics Covered in the Course

- Introductory material (Absolute and relative errors, Rounding and chopping, Computer errors in representing numbers, Review of Taylor series
- Locating roots of algebraic equations
- Systems of linear equations
- The Method of Least Squares
- Interpolation
- Numerical Integration
- Numerical Differentiation
- Ordinary Differential Equations
- Partial Differential Equations

Textbook / Reference(s)

1. Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 6th Edition, McGraw-Hill, 2009. ISBN: 0073401064
2. W. Cheney and Kincaid, Numerical Mathematics and Computing, 6th Edition, Brookes Cole, 2007. ISBN: 9780495114758

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated (including use of Matlab or a similar software):

1. The ability to use Taylor Series to approximate functions and evaluate the approximation errors
2. The ability to use various algorithms to locate the roots of equations
3. The ability to solve problems involving linear algebraic equations
4. The ability to use least squares method to smooth collected engineering data and to use polynomials to interpolate engineering data or approximate a given function
5. The ability to solve numerical differentiation and integration problems
6. The ability to solve ordinary differential equations or partial differential equations

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										1
2	1										1
3	1										1
4	1										1
5	1										1
6	1										1

Computer Organization

Coordinator	Turki Somani		
Course Number	1403372-4	**Credit Hours**	3 + 1
Prerequisites	Switching Theory and Electronics		

Catalog Description

Introduction to computer organization and architecture, performance, basic computer arithmetic, multi-cycle implementations of modern computer instruction sets, memory hierarchy

Major Topics Covered in the Course

- Introduction
- Performance and performance assessment
- Computer Arithmetic
- MIPS Instruction Set
- Memory Hierarchy

Textbook / Reference(s)

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

Course Learning Outcomes (CLOs)

1. An ability to evaluate and analyze computer performance
2. An ability to understand computer instruction set architecture
3. An understanding of basic computer arithmetic algorithms
4. An ability to write assembly language programs using MIPS assembly language *
5. An ability to understand memory hierarchy

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1				1						
2	1		1								
3	1		1								
4	1	1			1						1
5	1										

Digital Electronic Systems and Circuits

Coordinator	Kadry Montasser		
Course Number	1403312-4	**Credit Hours**	3 + 1
Prerequisites	Electronics		

Catalog Description

This course is an extension of the course 1403311 (electronics). It covers BJT transistor modeling, BJT small-signal analysis, FET small-signal analysis, frequency response, operational amplifiers and their applications and feedback and oscillator circuits. It emphasizes on properties and definitions of digital ICs, diode and transistor modeling, DRL, DTL, RTL and TTL gates and characteristics

Major Topics Covered in the Course

- Understanding of amplification in AC domain, BJT transistor modeling, hybrid equivalent model
- Understanding of CE and CB configurations and networks, collector feedback configuration, approximate and complete hybrid equivalent circuit
- Understanding the difference between fixed and self-biasing, CG configuration, designing FET amplifier networks
- Understanding of differential and common mode operation, Op-Amp basics and circuits, different applications of Op-Amp
- Understanding of feedback concepts and connection types, practical feedback circuits, oscillator operation and types
- Understanding of diode and transistor modeling, DRL, DTL, RTL and TTL gates and characteristics

Textbook / Reference(s)

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

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An understanding of BJT and FET transistors modeling and small-signal analysis.
2. An ability to understand operational amplifiers and their applications.
3. An ability to analyze and evaluate the feedback and oscillator circuits.
4. An ability to identify and distinguish the properties, characteristics and definitions of digital ICs, diode and transistor modeling, DRL, DTL, RTL and TTL gates.
5. An ability to implement logic gates using transistors and ICs *

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										
2	1				1						
3	1		1								1
4	1				1						
5	1	1	1								

Computer Communication System

Coordinator	Anas Basalamah		
Course Number	1403322-4	**Credit Hours**	3 + 1
Prerequisites	Signal Analysis		

Catalog Description

A conceptual view of data communications and network layers and models (OSI, TCP/IP), explaining the idea of internetworking of networks and addressing. Emphasis on the Physical Layer underlying data and signal transmission and transmission impairment, signal conversion, modulation, bandwidth and throughput, Multiplexing (FDM, WDM, TDM), FHSS, an overview of transmission media (TP, Coax, Fiber-Optic, Radio Waves, Microwaves), Switching (Circuit Switched and Datagram networks), a basic idea of the switching fabric, Modems and DSLs.

Major Topics Covered in the Course

Studying the functions of network layers in accordance with the TCP/IP suite, while skipping the Physical Layer which was covered in "Computer Communications, 1403322".

- **Networks and Data Communication**; Data flow, Physical Structure and Topologies. The concept of internetworking, The advent of the Internet, Categories of Networks (LAN, MAN, WAN), The role of protocols in networking and their standardization. The concept of layers and encapsulation in networking. An overview of the OSI and TCP/IP models' layers and their tasks. The mechanism of addressing in the TCP/IP layer structure.
- **Data and Signals' Representation in Networking**; Analog and digital, periodic and non-periodic and composite signals, Time and Frequency domains. Transmission of digital signals (Base-band, and Broadband using modulation), The negative effects of attenuation, distortion, and noise in transmission. Data rate limits underlying the use of Nyquist bit rate and Shannon capacity. Network performance parameters; Bandwidth, Throughput, Latency, Jitter, Bandwidth-Delay Product.
- **Digital and Analog Transmission**; Digital-To-Digital Conversion, explaining Line Coding, Block Coding, Scrambling, Analog-To-Digital Conversion, explaining PCM, and DM. Parallel and Serial Transmission. Digital-To-Analog Conversion, explaining ASK, FSK, PSK, QAM. Analog-To-Analog Conversion, AM, FM, PM.
- **Bandwidth Optimization**; using Multiplexing (FDM, WDM, TDM), and Spreading (FHSS, DSSS)
- **Transmission Media**; Guided media (TP, Coax, Fiber-Optics), Unguided media (Radio waves, Microwaves, Infrared).
- **Switching Network**; Circuit-Switched Networks, Datagram Networks, looking at the role of routing table in determining the Internet data traffic paths. Structure of the switch and switching fabric. Network Data Transmission Through Circuit-Switched Networks; Modem, DSLs.

Textbook / Reference(s)

1. Data Communications and Networking, By: Behrouz A. Forouzan (4th Edition).
2. Data and Computer Communications, By: William Stallings (6th Edition).
3. Computer Networks, By: Andrew Tanenbaum. (4th Edition).

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to describe the fundamentals of data communications and network layers using the encapsulation and addressing mechanism through the OSI and TCP/IP models.
2. Demonstrating knowledge of the fundamental principles of communication media, and communication channels; including concepts of signal conversion, modulation, signal transmission and propagation, bandwidth, throughput, multiplexing, channel capacity and transmission impairment, switching in circuit and datagram networks.
3. Analyze the concepts of planning and designing basic communication networks.
4. An ability to perform experiments on physical and data link layers of a typical communication system*

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1							1		1	
2	1									1	
3	1				1						
4		1									1

Advanced Logic Design

Coordinator	Muhammad Rashid		
Course Number	1403371-4	**Credit Hours**	3 + 1
Prerequisites	Switching Theory		

Catalog Description

Logic level design, Register Transfer Level (RTL) Design, Physical implementation on ICs, Programmable processors, Hardware description language

Major Topics Covered in the Course

- Design of combinational circuits (Logic Level design)
- Design of sequential circuits: Finite state machines and controller (Logic Level design)
- Design of datapath components (Logic Level design)
- Register Transfer Level (RTL) design: High level state machines and processor
- Physical implementation on ICs: ASICs and FPGAs
- Programmable processors
- Hardware Description Language (HDL)

Textbook / Reference(s)

- Frank Vahid, Digital Design with RTL Design, VHDL, and Verilog, Second Edition, 2011, John Wiley and Sons.

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to design digital circuits at Logic Level
2. An ability to design digital circuits at Register Transfer Level
3. An ability to analyse the ASICs, FPGAs and programmable processors
4. An ability to design digital circuits by using hardware description language*

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1		1		1						
2	1		1		1						
3	1										
4		1									1

Seminar

Coordinator	Khaled Al-Motairi		
Course Number	1403401-2	**Credit Hours**	2 + 0
Prerequisites	None		

Catalog Description

Creative thinking, Technical communication skills, Technical writing skills, Oral presentation skills, Working in teams, Engineering Responsibilities and Ethics, Research skills: Problem definition, Information Gathering, Information evaluation, Information Presentation

Major Topics Covered in the Course

- What it means to be an Computer Engineer: Theory and Practice
- Importance of Research, Entrepreneurship and how they fit with the National Plan for Science and Technology
- Methods for Creative Thinking
- Research Methods
- Technical Communication and Presentation Skills
- Technical Writing
- Engineering Ethics
- 8- Student Presentation Sessions

Textbook / Reference(s)

- N/A

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to formulate an engineering problem and research solutions
2. An ability to present an engineering idea in front of audience
3. An ability to write an academic report
4. An understanding of an engineer's professional and ethical responsibilities
5. An ability to value the importance of research, innovation, and their economic and social impact.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1					1				1		1
2				1			1				
3							1				
4						1					
5								1		1	

Computer Networks

Coordinator	Anas Basalamah		
Course Number	1403422-4	**Credit Hours**	3 + 1
Prerequisites	Computer Communication Systems		

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.

Major Topics Covered in the Course

Studying the functions of network layers in accordance with the TCP/IP suite, while skipping the Physical Layer which was covered in 1403322.

- **Data link Layer**; Error Detection and Correction (Block Coding, Line Coding, Checksum), Framing, Design of Data-link protocols (to deal with Framing, Flow Control, and Error Control), Multiple Access (Random Access; Aloha, Pure Aloha, Slotted Aloha, CSMA, CSMA/CD, CSMA/CA), Controlled Access, Channelization (FDMA, TDMA, CDMA), Wired LAN (Ethernet evolution and types), Wireless LAN (IEEE 802.11, Bluetooth), Connecting Devices, Backbone Networks, VLAN, Wireless WAN (Cell Phones, Satellite Nets), SONET.
- **Network Layer**; IPV4 Address (Classful and Classless Addressing, NATing), IPV6, Fragmentation, Transition from IPv4 to IPv6, Address Mapping (ARP,RARP, DHCP), ICMP, Delivery, Forwarding, Routing and routing tables, Unicast and Multicast Routing Protocols.
- **Transport Layer**; Process-to-Process delivery, UDP, TCP, SCTP, Congestion Control (Open-Loop, Closed Loop Congestion Control), QoS (Scheduling, Traffic Shaping, Resource Reservation, Admission Control).
- **Application Layer**; Domain Name System, Domain Name Space, DNS in the Internet, Mapping names to Addresses and vice versa, DDNS, SNMP, Multimedia (Digitized Media, Compression, Streaming Stored Media, Streaming Live Media, Real-Time Interactive Media, RTP, RTCP, VoIP, H.323, SIP).

Textbook / Reference(s)

1. Data Communications and Networking, By: Behrouz A. Forouzan (4th Edition).
2. Data and Computer Communications, By: William Stallings (6^{th} Edition).
3. Computer Networks, By: Andrew Tanenbaum. (4^{th} Edition).

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. A comprehension of the fundamental principles underlying packet switching networks, Multiple Access, Channelization.
2. Comparison of network protocols' operations, addressing and socket approach implementation, IPv4 and IPv6 issues.
3. Recognition of the key principles behind retransmission protocols, the role of TCP in providing reliability, congestion control algorithms, and techniques to enhance QoS.
4. Grasping of the basic concepts of routing, NATing, and DNS
5. Configuration, installation, and troubleshooting of computer networks using routers and switches, both hands-on and through simulations*

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1							1		1	
2	1									1	1
3	1				1					1	1
4	1				1					1	1
5		1									

Microprocessors

Coordinator	Abdellatif I. Semeia		
Course Number	1403489-4	**Credit Hours**	3 + 1
Prerequisites	Computer Organization		

Catalog Description

To give a student in electrical engineering and computer engineering departments the fundamentals of microprocessors with the most important engineering applications.

Major Topics Covered in the Course

- Introduction.
- Basic type of microprocessor instructions. Data transfer (copy), arithmetic, logic, I/O, stack, program control instructions.
- Essential of programming with assembly language (selected examples).
- Microprocessor Architecture.
- Memory interfacing.
- Bus De-multiplexing.
- Bus timing: Machine, instruction cycles.
- Interfacing I/O devices, Parallel and Serial I/O devices.
- Microprocessor-based system Applications

Textbook / Reference(s)

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

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. Knowledge of microprocessor architecture, types, components. *
2. Familiarity of assembly language instructions and their usage.
3. Knowledge of designing interface circuits of memory and I/O devices. *
4. Ability to analyze and sketch microprocessor bus timing.
5. Ability to write assembly language programs to conduct experiments in Lab. *
6. Overview of different microprocessor- based applications systems.

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1	1									
2	1										
3	1	1	1		1						1
4	1				1						1
5	1	1			1						1
6	1							1	1	1	

Computer Architecture

Coordinator	Turki Somani		
Course Number	1403472-3	**Credit Hours**	3 + 0
Prerequisites	Computer Organization		

Catalog Description

Instructions implementation, pipelining and hazards, cache and virtual memory, storage and I/O, multiprocessing.

Major Topics Covered in the Course

- How instructions are executed (data-path and control)
- Pipelining (pipelined data-path and control)
- Pipelining hazards (structural, data and control)
- Cache memory: principles, types and performance
- Virtual memory and virtual machines
- Storage and I/O
- Multi-core, multiprocessors, and clusters

Textbook / Reference(s)

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

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to understand data-path and pipelining
2. An ability to analyze and evaluate memory hierarchy
3. An ability to understand I/O and storage devices
4. An ability to understand the architecture of multiprocessors
5. A working knowledge of modern computer architectures concepts and components via projects to increase the overall understanding of modern computer architectures.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1				1						
2	1		1		1						
3	1				1						
4	1				1						
5	1				1				1	1	

Databases

Coordinator	Maher Elshakankiri		
Course Number	1403484-3	**Credit Hours**	3 + 0
Prerequisites	Data Structures & Algorithms		

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

Major Topics Covered in the Course

- 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

Textbook / Reference(s)

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

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

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

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

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

Basics of IC Design

Coordinator	Adnan Gutub		
Course Number	1403364-0	**Credit Hours**	3 + 0
Prerequisites	Electronics		

Catalog Description

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

Major Topics Covered in the Course

- 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

Textbook / Reference(s)

1. S.-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 2nd ed., 1999.
2. N. Weste and K. Eshraghian, *Principles of CMOS VLSI Design*, Addison Wesley, 1993.
3. Ken Martin, *Digital Integrated Circuit Design*, Oxford Press, 2000.
4. Jan Rabaey, Digital Integrated Circuits; A design Perspective, Prentice Hall, 1996.

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

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

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1									1	
2	1		1					1		1	
3	1		1		1						
4	1		1		1						
5							1		1		

Microcomputer System Design

Coordinator	Abdellatif Semeia		
Course Number	1403450-4	**Credit Hours**	3 + 1
Prerequisites	Computer Organization		

Catalog Description

Microcomputer system design, Hardware and Software design considerations, Selection of Memories, I/O devices and Peripherals. Practice of design of a microcomputer systems using PIC18, testing, programming, debugging and troubleshooting.

Major Topics Covered in the Course

- Introduction to computer architecture.
- Family Architecture and program development.
- Family instruction set and assembly language programming.
- PIC18 family hardware specifications.
- Basic input output.
- Interrupts
- Controlling Systems and advanced topics

Textbook / Reference(s)

1. Barry B. Brey, Applying PIC18 Microcontrollers; Architecture, Programming and Interfacing using C and Assembly, Pearson Education, Inc., 2008.
2. Computer Organization and design: The hardware/Software Interface, The Morgan Kaufmann Series in Computer Architecture and Design, 4th Edition, 2008

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to understand and implement a complete computer system *
2. An ability to design hardware and software as per industry standards. *
3. An ability to analyze, evaluate and troubleshoot microcomputer systems using PIC18. *

* Requires lab work (may be covered in theory also if needed).

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

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

Process Control

Coordinator	Adnan Gutub		
Course Number	1403487-3	**Credit Hours**	3 + 0
Prerequisites	Microcomputer System Design		

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

Major Topics Covered in the Course

- 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.

Textbook / Reference(s)

1. Peter Marwedel, Embedded System Design, Springer, 2006.
2. Lecture notes prepared by the instructor.

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

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.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

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

Summer Training I & II

Coordinator	Majed Al-Gethami		
Course Numbers	1403300 & 1403400	**Credit Hours**	0 + 2 (each)
Prerequisites	The student should have completed a minimum of 80 credit hours		

Catalog Description

Every student is required to do two summer trainings I and II during two different summer semesters. This training experience is intended to complement the student's academic plan of study and help prepare him for his future role as a professional engineer. The prospective employer should provide the summer training office in the faculty of the training plan for approval before registration. The training period is 45 days. The faculty assigns an academic staff as an on field supervisor to visit and evaluate the students in the training venues. To assess the student, student is required to submit a report showing his summer training experience and the knowledge gained. The summer training office in the faculty carries out the rubrics assessment based on training report, employer evaluation and on field supervisor evaluation

Major Topics Covered in the Course

- N/A

Textbooks/References

- N/A

Course Learning Outcomes (CLOs)

1. Ability to associate the knowledge acquired during the student's academic plan of study to real-world-problems.
2. Explore the enterprise environment, needs, and limitations.
3. Ability to identify requirements for an appropriate and efficient solution of a real-world-problem in the presence of different technical limitations.
4. Ability to identify clear view of objectives and constraints and work effectively.
5. Having the independence sense by acquiring new techniques with minimal supervision.
6. Ability to accommodate with existing solutions in response to change in needs or limitations.
7. Ability to communicate with many people in the practical field.
8. Learning professional and ethical responsibility

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1				1			1		1	1
2	1			1							
3	1		1		1			1		1	
4				1				1			
5	1				1				1	1	1
6		1	1		1						1
7							1				
8						1					

Project

Coordinator	Maher El-Shakankiri		
Course Number	1403499-4	**Credit Hours**	0 + 4
Prerequisites	The student should have completed a minimum of 134 credit hours		

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

Major Topics Covered in the Course

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

Textbooks/References

- 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

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

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1				1				1		
2				1							
3	1		1		1	1			1	1	1
4	1	1	1					1		1	1
5	1	1	1		1			1		1	1
6		1								1	1
7						1	1				

Design of Integrated Circuits

Coordinator	Kadry Montasser		
Course Number	1403464-3	**Credit Hours**	3 + 0
Prerequisites	Basics of IC Design		

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

Major Topics Covered in the Course

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

Textbook / Reference(s)

1. Etienne Sicard& Sonia D. Bendhia, Advanced CMOS Cell Design, McGraw Hill, 2007
2. Kamran Eshraghian, Douglas A. Pucknell and Sholeh Eshraghian, Essentials of VLSI circuits and Systems, Prentice-Hall of India, INC., 2005.
3. Designing with FPGA's& CPLD's, Bob Zeidman, CMP Books, 2002.

Course Learning Outcomes (CLOs)

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.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

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

Mobile Computing

Coordinator	Emad Felemban		
Course Number	1403446-3	**Credit Hours**	3 + 0
Prerequisites	Computer Networks		

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.

Major Topics Covered in the Course

- 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)

Textbook / Reference(s)

1. Jochen Schiller, *Mobile Communications*, 2nd Edition, Addison-Wesley, 2003.
2. Supplemental materials

Course Learning Outcomes (CLOs)

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:
   a. Formulate RF problems
   b. Theoretical Design of RF systems based on given requirements
   c. Select HW components in the physical layer
   d. Calculate RF Budget
   e. Analyze existing and given RF systems
4. Recognize classical Wireless MAC and routing schemes.
5. High Level design of a wireless system to solve a community problem

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1								1		1	
2								1		1	
3	1				1						1
4								1		1	
5	1		1		1				1		

Computer Vision

Coordinator	Faisal Al-Osaimi		
Course Number	1403478-3	**Credit Hours**	3 + 0
Prerequisites	Data Structures & Algorithms		

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.

Major Topics Covered in the Course

- 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.

Textbooks/References

Richard Szeliski, *Computer Vision: Algorithms and Applications*, Springer, 2010, ISBN: 978-1848829343

Course Learning Outcomes (CLOs)

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 versus system performance or complexity).
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.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1	1			1						
2		1	1		1						
3							1				
4											1

Neural Networks

Coordinator	Khalid Al-Hindi		
Course Number	1403481-3	**Credit Hours**	3 + 0
Prerequisites			

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

Major Topics Covered in the Course

- 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

Textbooks/References

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

Course Learning Outcomes (CLO's)

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.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										
2	1										
3	1										1
4	1		1		1						

Simulation & Modeling

Coordinator	Fahad Al-Zahrani		
Course Number	1403476-3	**Credit Hours**	3 + 0
Prerequisites	Data Structures & Algorithms		

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

Major Topics Covered in the Course

- Introduction to simulation modeling
- Queuing Models
- Simulation Examples (Monte Carlo simulation)
- Concepts in discrete-event simulation
- Statistical models in simulation
- Input Modelling
- 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

Textbooks/References

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

Course Learning Outcomes (CLOs)

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

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1		1								
2	1		1								
3		1									
4	1										
5	1										
6											1
7		1									
8	1										

Digital Signal Analysis

Coordinator	Imran Tasadduq		
Course Number	1403421-3	**Credit Hours**	3 + 0
Prerequisites	Numerical Analysis		

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

Major Topics Covered in the Course

- 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

Textbooks/References

1. J.G. Proakis and D. G. Manolakis, Digital Signal Processing, Algorithms and Applications (4^{th} Edition), Prentice Hall, 2007
2. Vinay K. Ingle and J.G. Proakis, Digital Signal Processing Using Matlab, 2^{nd} Edition, Thomson Learning, 2007
3. V. Oppenheim and W. Schafer, Digital- Time Signal Processing, 4th Edition, Oxford Publishing, 1998.

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

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 compute the transforms and inverse transforms
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

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1										
2	1				1						1
3	1										1
4	1				1						1
5	1				1						1

Artificial Intelligence

Coordinator			
Course Number	1403480-3	**Credit Hours**	3 + 0
Prerequisites	Data Structures and Algorithms		

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

Major Topics Covered in the Course

- 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
- Natural Language Processing – grammars and parsing - language understanding - language generation
- Vision - low level vision & segmentation - constraint propagation - line labeling - matching

Textbooks/References

Artificial Intelligence: A New Synthesis, Nils Nilsson, Morgan Kaufman, 1998

Course Learning Outcomes (CLOs)

A student who successfully fulfills the course requirements will have demonstrated:

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 acquaintance 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.

Relationship between CLOs & SOs. Entries in the table indicate which CLOs relate to which SOs.

Student Outcomes – Mapped to Course Learning Outcomes											
CLOs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1	1	1	1		1						1
2	1										
3	1							1		1	1
4	1					1		1		1	
5	1	1	1		1		1			1	1

Appendix B – Faculty Vitae

Abdulbasit Z. 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, Colchester, UK., 2005
- B.S. in Electrical Engineering, Umm Al-Qura University, Makkah, 1995

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Vice Dean, Information Technology Deanship, Umm Al-Qura University, KSA, (2010-2011)
- Visiting Researcher (Summer time), John Moores University, Liverpool, UK., (2010)
- Vice Dean, Graduate Studies Deanship, Umm Al-Qura University, KSA, (2009-2010)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2008-present)
- Teaching Assistant, Computer Engineering, Umm Al-Qura University, KSA, (2000-2001)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Saudi Electronics Company, Electrical Engineer, Semiconductor Planting Device Operator, Jeddah, (1997-1998), Trainee
- Saudi Arabian Airlines, Electrical Engineering, Aircrafts Maintenance, Jeddah, (1996-1997), Trainee

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

- First on Dean's list on graduation for BS degree..

Service activities (within and outside of the institution):

- Member of the BS program development committee, Computer Engineering 2011.
- Member of the Academic Accreditation Committee, Computer Engineering 2011.
- Member of the Graduate Studies Program Committee 2011.
- Member of the organizing committee of the conference 1st Technology Day 2011.
- Reviewer for some international journals and conferences.

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:

- H Abdul-Rahman, M Gdeisat, D Burton, M Lalor, F Lilley and A Abid; "*Three-Dimensional Fourier Fringe Analysis*", Optics and Lasers in Engineering, Vol: 46, Issue: 6, pp: 446-455, (2008)
- Z. Abid, M. A. Gdeisat, D. R. Burton and M. J. Lalor, "Spatial fringe pattern analysis using the modified Morlet wavelet transform," Proceedings of the SPIE, Vol. 7000, Strasbourg, France 2008.
- Munther A.Gdeisat, Abdulbasit Z. Abid, David R. Burton, Michael J. Lalor, Francis Lilley, Chris Moore, Mohammed Qudeisat, "Spatial and temporal carrier fringe pattern demodulation using the one-dimensional continuous wavelet transform: Recent progress, challenges, and suggested developments," Optics and Lasers in Engineering, Vol. 47: Issue 12, pp: 1348-1361, (2009)

Briefly list the most recent professional development activities:

- Information Technology Forum in Saudi Universities, Imam Mohammad bin Saud Islamic University.
- Improving Budget Preparation Skills for University Leaders, Umm Al-Qura University.
- ABET Accreditation Workshop, Umm Al-Qura University.

Abdellatif Ibrahim Moustafa

Education – degree, discipline, institution, year:

- Ph.D. in Computer Engineering, Stevens Institute of Technology, Hoboken, NJ., 2002
- M.Sc. in Electrical Engineering, AL-Azhar University, Cairo, Egypt, 1993
- B.Sc. in Electrical Engineering, AL-Azhar University, Cairo, Egypt, 1986

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, KSA, (2006-)
- Assistant Professor, Electrical Engineering, AL-Azhar University, Cairo, (2003-2006)
- Assistant Professor (PT), Computer Engineering, Misr University for Science and Technology (MUST), Cairo, (2003-2006)
- Research Assistant, Electrical Engineering, Stevens Institute of Technology, Hoboken, (NJ., 1996-2002).
- Teaching Assistant, Electrical Engineering AL-Azhar University, Cairo, (1993-1997)
- Research Assistant, Electrical Engineering , AL-Azhar University, Cairo, (1988-1992)
- Member, Curriculum Committee for preparing M.Sc. program inComputer Engineering, Umm Al-Qura University, KSA, (2010).
- Supervised 6 Graduate Theses:1 PhDs, 5 Masters

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Management and Training Consulting firm, Nasr City, Cairo, Egypt, (2004-2006).
- Computer Consultant, Office of Information Technology, Stevens Institute of Technology, Hoboken, New Jersey, USA, (1999 – 2003)
- Network Consultant, Lucent Technologies, Crawfords Corner Road, Holmdel, New Jersey, USA, (1999 – 2003)

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

None

Service activities (within and outside of the institution):

None

Briefly list the most important Journal publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

None

Briefly list the most important Conference publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation:

- Semeia, "Automatic Dispatching Scheme for Maximum Masha'er Trains' Utilization using Integration of RFID and WSN", the 12th Hajjcore symposium, Umm AL-Qura University, KSA, 2012.
- A. I. Semeia, "Repositioning Strategies for restoring connectivity of Mobile Sensors in Hajj areas" the 11th Hajjcore symposium, Umm AL-Qura University, KSA, 2011.
- A. I. Semeia, *et al* "The effect of frame length, a, fragmentation and RTS/CTS mechanism on IEEE 802.11 MAC performance", *Intelligent Systems Design and Applications (ISDA), IEEE 10th International Conference on Date of Conference, Nov. 2010.*

Briefly list the most recent professional development activities:

- Migrations to IPv6 in KSA Workshop, STC, Jeddah, KSA.
- ABET Accreditation Workshop, King Saud University
- Accreditation workshop, Umm AL-Qura University.
- Workshop on Strategies for Assessing Teaching performance
- Workshop on E-Learning Teaching strategies, and performance.
- Workshop on Crowd Management, Hajj-Core, Umm AL-Qura University.

Anas M. Basalamah

Education – degree, discipline, institution, year:

- Ph.D. in Computer Systems and Network Engineering, Waseda University, Tokyo, 2009
- M.Sc. in Computer Systems and Network Engineering, Waseda University, Tokyo, 2006
- B.Sc. in Electrical and Computer Engineering, Umm Al Qura University, Makkah, 2003

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, KSA, (2011-2012)
- Fulbright Visiting Scholar, Computer Science and Engineering, University of Minnesota, MN, (2010-2011)
- Post-Doctoral Researcher, Institute of Industrial Science, University of Tokyo, Tokyo, (2009-2010)
- Visiting Scholar, Electrical and Computer Engineering, University of British Columbia, Vancouver, Canada (2008)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- International Cooperation, Finance, Administration and IT Advisor, The Cultural Office of the Royal Embassy of Saudi Arabia in Tokyo (2009-2010)
- Oracle Developer, Umm Al Qura University IT Center (2003-2004)
- Computer and Network Dept., Al-Jeraisi Co., Internship, Jeddah (2002)
- Material Supply Dept., Saudi Aramco, Internship, Jeddah (2001)
- Sales Manager and Technical Advisor, Aseel Computers, Makkah (2001-2003)

Certifications or professional registrations:

- Cisco Certified Network Assistant (CCNA)
- Certified Wireless Network Administrator (CWNA)

Current membership in professional organizations:

- Senior Member, IEEE
- Member, ACM

Honors and awards:

- Fulbright Visiting Research Fellowship.
- Science and Innovation Student Award presented from the Saudi Arabian Ministry of Higher Education - Cultural Office of Japan April 2010
- Best student paper award presented from the Telecommunications Advancement Foundation (Denki Fukyu Zaidan 2006).
- Fellowship for visiting research at UBC from Universitas 21.
- Full scholarship from the Japanese Ministry of Education (Monbusho) for Research, MSc and PhD at Waseda University.
- PhD scholarship from the Saudi Arabian Ministry of Higher Education.

- Early graduation M.Sc with honors.

Service activities (within and outside of the institution):

- Program Chair of the Second International Symposium on Networked Sensing, Urban Lives, and Human Probes in Tokyo Feb 25th, 2010
- Member of the ABET External Committee, Computer Eng. , Umm Al Qura University
- Member of the Information Systems Department Council
- Reviewer for many local and international journals and conferences

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:

- Shaleeza Suhail and Anas Basalamah "Computer Network Handbook - Easy way to key concepts", *KACST*, Under-submission, 2012.
- Anas Basalamah and Takuro Sato, "An FEC Adaptive Multicast MAC Protocol for Providing Reliability in WLANs", *IEICE Transactions on Communications*, Vol.E92-B, No.05, May, 2009.
- Anas Basalamah, Hiroki Sugimoto and Takuro Sato, "A Rate Adaptive Multicast Protocol for Providing MAC Layer Reliability in WLANs", *IEICE Transactions on Communications*, Vol.E89-B, No.10, pp.2733-2740, October, 2006. Won The Best Paper Award from Telecommunication Advancement Foundation (Denki Fukyu Zaidan) 2006.

Conferences/Presentations:

- Anas Basalamah, Song Min Kim, Shuo Guo, Tian He, and Yoshito Tobe. Link Correlation Aware Opportunistic Routing. In *IEEE INFOCOM Mini-Conference*, 2012.
- Anas Basalamah, Niwat Thepvilojanapong, Yoshito Tobe and Kaoru Sezaki, ", A Scheduling Algorithm for Human-Probe Sensing Enviroments", *Proc. IEICE Information Network Tech. Rep*, Tokyo , Vol. 110, no. 18, IN2010-9, pp. 49-54, April, 2010.
- Anas Basalamah and Takuro Sato, "A Comparison of Packet-Level and Byte-Level Reliable FEC Multicast Protocols for WLANs", *Proc. IEEE Globecom 2007*, pp. 4702-4707, November 2007.
- Anas Basalamah and Nabeel Koshak, "ICT for Hajj (Pilgrimage)", Proc. Symposium on ICT between Saudi Arabia and Japan, Arabic Islamic Institute, Tokyo, November, 2007.
- Anas Basalamah and Takuro Sato, "Adaptive FEC Reliable Multicast MAC Protocol for WLANs", Proc. IEEE VTC '07, Baltimore, September 2007.
- Anas Basalamah and TakuroSato,"FEC Adaptive Reliable Multicast Protocol for WLANs", *Proc. IEICE Society Conf.*, Kanazawa, Vol.2006, No.2, pp.SE.31-SE.32, September 2006.
- Anas Basalamah and Takuro Sato, "An FEC Adaptive Multicast Protocol for Providing MAC Layer Reliability in WLANs", Proc. Momuc Technical Meeting,Vol.106, No.245, pp.63- 66, Osaka September, 2006.
- Anas Basalamah, Hiroki Sugimoto and Takuro Sato, "A Rate Adaptive Multicast Protocol for Providing MAC Layer Reliability in WLANs", *Proc. IEICE General Conference*, Vol.2006, No.2, pp. SE-19-SE-20, Tokyo, March, 2006.
- Anas Basalamah, Kinichi Ito, Hiroki Sugimoto and Takuro Sato, "Buffering Stream UDP Packets control in FMIPv6 handoff", *Proc. IEICE General Conference*, Vol.2005, No.2, p.23, Osaka, March, 2005.

Emad Felemban

Education – degree, discipline, institution, year:

- Ph.D. in Computer Engineering, Ohio State University, Columbus, OH, 2009
- M.S. in Computer Engineering, Ohio State University, Columbus, OH, 2003
- B.S. in Computer Engineering, King Fahd University of Petroleum and Minerals, Dharan, 1998

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Vice Dean For Graduate Studies and Research, College of Computer and Information Systems, UQU (November 2011 – Present)
- Vice Dean For Technical Affairs, IT Department, Umm Al-Qura University, Makkah, KSA (November 2010 – November 2011)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, Makkah KSA, (2010 – Present)
- Research Assistant, Electrical and Computer Engineering, Ohio State University, USA, (2003-2009)
- Teaching Assistant, Electrical Engineering, King Saud University, USA, (1976-1977)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Consultant, Smart City Systems Consultants (2010 – Present)

Current membership in professional organizations:

- Member, IEEE
- Member, ACM

Honors and awards:

- Excellence Award, UQU 2010
- Excellence Award from Advanced Electronic Company, KFUPM, 1998
- First Honor Graduate, KFUPM, 1998
- Best Senior Design Project, KFUPM, 1998

Service activities (within and outside of the institution):

- Technical Committee Member, King Abdullah Library at UQU.
- Committee Chair, Master Program, College of Computer and Information Systems
- TPC Member of the conferences: IEEE VTC 2007, IEEE GLOBECOM 2010, 2011, 2012 IEEE PIMRC 2010, CCE 2011, ICET 2011.
- Reviewer for many local and international journals and conferences.

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:

- **Emad Felemban** and E. Ekici "Single Hop IEEE 802.11 DCF Analysis Revisited: Accurate Modeling of Chanel Access Delay and Throughput for Saturated and Understaurated Traffic Cases", in IEEE Trans. on Wireless Communication. Pages 3256-3266, Volume 10, Issue 10, Year 2011.
- R. Murawski, **Emad Felemban**, E. Ekici et al "Neighbor Discovery in Wireless Networks with Sectored Antenna", in Elsevier Ad Hoc Networks, Vol 10 Issue 1, January 2012, Pages 1-18.
- **Emad Felemban,** S. Vural, R. Murawski, E. Ekici, K. Lee, Y. Moon, S. Park "SAMAC: A Cross-Layer Communication Protocol for Sensor Networks with Sectored-Antennas", in IEEE Trans. on Mobile Computing, Vol 9, Issue 8, August 2010, Pages 1072-1088.
- **Emad Felemban,** C-G. Lee, E. Ekici "MMSPEED: Multipath Multi-SPEED Protocol for QoS Guarantee of Reliability and Timeliness in Wireless Sensor Networks", in IEEE Trans. on Moile Computing, Vol 5, Issue 6, June 2006, Pages 738-754.

Conferences/Presentations:

- **Emad Felemban**, R. Murawski and E. Ekici "SAND: Sectored-Antenna Neighbor Discovery Protocol for Wireless Network", in IEEE SECON'10 June 2010. [Slides]
- AlKazmei and **Emad Felemban** "Towards a Framework for Engineering Software Development of Sensor Nodes in Wireless Sensor Networks", In **SESENA '10**, May 2010.
- **Emad Felemban**, C-G. Lee, E. Ekici, R. Boder and S. Vural. Probabilistic QoS Gurantee in Reliability and Timeliness Domains in Wireless Sensor Networks", in **IEEE INFOCOM '05**, Volume 4, pages 2646-2657, March 2005

Briefly list the most recent professional development activities:

- Project Management Workshop

Esam A. Khan

Education – degree, discipline, institution, year:

- Ph.D. in Electrical & Computer Engineering, University of Victoria, Victoria, BC, Canada, 2005
- M.S. in Computer Engineering, King Fahd University of Petrolium & Minerals (KFUPM**),** Dhahran, Saudi Arabia, 2001
- B.S. in Computer Engineering, King Fahd University of Petrolium & Minerals (KFUPM**),** Dhahran, Saudi Arabia, 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, (2006)
- Research Assistant, Institute of The Custodian of the Two Holy Mosques for Hajj Research, Umm- Al-Qura University, (2001-2002)
- Graduate Assistant, Computer Engineering, KFUPM, (1999-2001)
- Coordinator of Industrial Senior Projects in the College of Computer Science & Engineering (CCSE), KFUPM, in 1999-2000

Honors and awards:

- Award of Distinction in Students Activities at KFUPM in 1998.
- Prince Mohammed Bin Fahd Award of Distinction in Education in 1999.

Service activities (within and outside of the institution):

- Dean of Students Affairs, Umm Al Qura University, (2011)
- Vice Dean of Students Affairs, Umm Al Qura University, (2008 – 2011)
- Member of the organizing committee of the Smart Cities conference , Makkah, 2009.
- Reviewer for some local journals.

Briefly list the most important Journal publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "Applying the Handel-C Design Flow in Designing an HMAC-Hash Unit on FPGAs", in *IEE Proc. Computers & Digital Techniques*, Vol. 153, No. 5, September 2006, pp. 323 – 334.
- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "Design and Performance Analysis of a Unified, Reconfigurable HMAC-Hash Unit", in *IEEE Transactions on Circuits and Systems-I,* Vol. 54, No. 12, December 2007, pp. 2683-2695.
- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "Design Space Exploration of a Reconfigurable HMAC-Hash Unit", in *Journal of Research and Practice in Information Technology (JRPIT), ,* Vol. 40, No. 2, May 2008, pp. 109 – 127.

- Turki F. Al-Somani, Esam A. Khan, Ahmad M. Qamar-ul-Islam, and Hilal Houssain, "Hardware/Software Co-Design Implementations of Elliptic Curve Cryptosystems," *Information Technology Journal*, Vol. 8, No. 4, 2009, pp. 403-410.
- Aiman El-Maleha, Saif al Zahirb, and Esam Khan, "Test data compression based on geometric shapes," *Computers & Electrical Engineering*, Vol. 37, No. 3, May 2011, pp. 376-391.
- Adnan Gutub and Esam Khan, "Using Subthreshold SRAM to Design Low-Power Crypto Hardware," *International Journal of New Computer Architectures and their Applications (IJNCAA)*, Vol.1, No.2, 2011, pp. 474-483

Briefly list the most important Conference publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation:

- S. Al-Zahir, A. El-Maleh, and E. Khan, "An efficient test vector compression technique based on geometric shapes," in *Proceedings of the 8th IEEE International Conference on Electronics, Circuits and Systems (ICECS 2001)*, Sep. 2001, vol.3, pp. 1561-1564.
- El-Maleh, S. Al-Zahir, and E. Khan, "A geometric-primitives-based compression scheme for testing systems-on-a-chip," in *Proceedings of the 19th IEEE on VLSI Test Symposium (VTS)*, May 2001, pp. 54-59.
- Rafiq, M. El-Kharashi, E. Khan, and F. Gebali, "A study on design approaches for network processor units", *IEEE Pacific Rim Conference on Communications, Computers, and Signal Processing*, Aug. 2003, pp. 169-172.
- E. Khan, M. El-Kharashi, A. Rafiq, F. Gebali, and M. Abd-El-Barr "Network processors for communication security: A review", *IEEE Pacific Rim Conference on Communications, Computers, and Signal Processing*, Aug. 2003, pp. 173-176.
- E. Khan, M. W. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "An FPGA design of a unified hash engine for IPSec authentication", in *the 5th International Workshop on System-on-Chip for Real-Time Applications (IWSOC' 05)*, Banff, Alberta - Canada, July 2005, pp. 450-453.
- M. Fayed, M.Watheq El-Kharashi, E. Khan, and F. Gebali, "A Unified, reconfigurable architecture implementing block cipher operational modes", in *the 3rd International Conference on Information & Communication Technology (ICICT 2005)*, Cairo, Egypt, Dec. 2005, pp. 883- 895.
- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "A Reconfigurable hardware unit for the HMAC algorithm", in *the 3rd International Conference on Information & Communication Technology (ICICT 2005)*, Cairo, Egypt, Dec. 2005, pp. 861- 874.
- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "Designing an HMAC-Hash Unit on FPGAs Using Handel-C", in *the IEEE International Symposium on Industrial Electronics (ISIE 2006)*, Montreal, Canada, July 2006, pp. 1521 - 1526.
- E. Khan, M. El-Kharashi, F. Gebali, and M. Abd-El-Barr, "Design Space Exploration of a Reconfigurable HMAC-Hash Unit", in *the 4th International Conference on Information & Communication Technology (ICICT 2006)*, Cairo, Egypt, Dec. 2006, pp. 387-399.
- Esam A. Khan, " An RFID-Based System for Pilgrim Management in King Abdul Aziz International Airport," in *2011 International Conference on Information Management, Innovation Management and Industrial Engineering (ICIII 2011)*, Shenzhen, China, Vol. 1, pp.124-129.

Fahd M. Aldosari

Education – degree, discipline, institution, year:

- Ph.D. in Computer Networks, Bradford University, Bradford, UK, 2011
- M.S. in Personal, Mobile and Satellite Communications, Bradford University, Bradford, UK, 2006
- B.S. in Computer Engineering, King Fahd University of Petroleum and Minerals, Dhahran, KSA,1998

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Assistant Professor, Computer Engineering, Umm AlQura, KSA, (2011)
- Teaching Assistant, Computer Engineering, Umm AlQura University, KSA, (2001-2011)
- Vice Dean for Academic Development, College of Computer and Information Systems, Umm AlQura University, KSA, (2012)
- Member, Faculty Awards and Recognition, Computer Engineering, , Umm AlQura, KSA, (2011-present)
- Chair, Assessment and Evaluation Committee, Computer Engineering, , Umm AlQura, KSA, (2011-Present)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Planning Engineer, IRIDIUM Satellite Company, (1999-2001)

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

- Full scholarship for Graduate Studies from Ministry Of Higher Education, KSA

Service activities (within and outside of the institution):

- Member of the university committee for the national institutional accreditation
- Member of the Saudi students club in UK

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:
Conferences/Presentations:

- F. Aldosari and M. E. Woodward, "Localized Approaches to QoS Routing" in the Proceedings of the Ninth Informatics Workshop for Research Students, Bradford University, Bradford, UK, 2008.
- F. Aldosari and M. E. Woodward, "Link-Based Localized QoS Routing" in the 4th Saudi International Conference, University of Manchester, 2010, Manchester, UK, 2010.
- F. Aldosari and M. E. Woodward, "Localized Approach to Distributed QoS Routing with Bandwidth Guarantees" in the IEEE International Conference on Information and Computer Networks (ICICN 2011), Guiyang, China. 2011.
- F. Aldosari and M. E. Woodward, " Localized QoS Routing with End-to-End Delay Guarantees " in the International Journal of Computer Networks & Communications (IJCNC 2011), Academy Research Collaboration Center, June 2011, Ankara, Turkey.

Briefly list the most recent professional development activities:

- Accreditation workshop, Umm AlQura University, KSA
- Workshop on Higher Education Strategies, KSA
- Workshop on Academic Programs and Courses Descriptions, KSA.

Faisal R. Al-Osaimi

Education – degree, discipline, institution, year:

- Ph.D. in Computing 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, Computer Engineering, Umm Al-Qura University, KSA, (2010)
- Teaching Assistant, Computer Engineering, Umm Al-Qura University, KSA, (2001-2003)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Saudi Telecom. Company, Electrical Engineer, KSA, (2000-2001)

Certifications or professional registrations:

None

Service activities (within and outside of the institution):

- Coordinator of summer training.
- Head of graduation project development committee.
- Member of ABET accreditation 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:

- Faisal R. Al-Osaimi and Mohammed Bennamoun, "3D Face Surface Analysis and Recognition based on Facial Surface Feature", submitted in 2011 as chapter no. 3 of the book "3D Face Modeling, Analysis and Recognition", Wiley.
- Faisal R. Al-Osaimi, M. Bennamoun and A. Mian, "Spatially Optimized Data-Level Fusion of Texture and Shape for Face Recognition," *IEEE Transactions on Image Processing*, vol.21, no.2, pp.859-872, Feb. 2012. ***(impact factor: 2.918,** by Journal Citation Reports®, Thomson Reuters).*
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "Illumination Normalization of Facial Images by Reversing the Process of Image Formation", *The International Journal of Machine Vision and Applications*, vol. 22, no. 6, pp. 899-911, Nov. 2011. ***(impact factor: 0.952**, by Journal Citation Reports®, Thomson Reuters, 2009)*
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "An Expression Deformation Approach to Non-rigid 3D Face Recognition", *International Journal of*

Computer Vision (IJCV), volume 81, number 3, pages 302–316, 2009. ***(impact factor: 3.508**, 2009)*

- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "Integration of Local and Global Geometrical Cues for 3D Face Recognition", *Pattern Recognition*, volume 41, number 3, pages 1030–1040, 2008. ***(impact factor: 2.554,** by Thomson Reuters 2010).*

Conferences/Presentations:

- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "On Decomposing an Unseen 3D Face into Neutral Face and Expression Deformations", *International Conference on Biometrics (ICB)*, 2009.
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "Expression Invariant Non-rigid 3D Face Recognition: A Robust Approach to Expression Aware Morphing", *International Symposium on 3D Data Processing Visualization and Transmission (3DPVT)*, pages 19–26, 2008.
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "3D Shape Representation by Fusing Local and Global Information", *IEEE International Symposium on Signal Processing and its Applications (ISSPA)*, 2007.
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "Interest point Based Face Recognition from Range Images", *British Machine Vision Conference (BMVC)*, 2007.
- Faisal R. Al-Osaimi, Mohammed Bennamoun and Ajmal S. Mian, "Illumination Normalization for Color Face Images", *International Symposium on Visual Computing (ISVC), Lecture Notes on Computer Science*, volume 4291, pages 90–101, 2006.

Imran A. Tasadduq

Education – degree, discipline, institution, year:

- Ph.D. in Electrical & Computer Engineering, University of Western Ontario, 2002
- M.S. in Systems Engineering, KFUPM, 1995
- B.S. in 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:
All full time

- Professor & ABET Coordinator, Computer Engineering, Umm Al-Qura University, (2009 – present)
- Member – Steering Committee, Curriculum Committee, SSR Writing Committee, Assessment & Evaluation Committee
- 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)
- *Supervised 6 Graduate Theses:*
- 2 PhDs (in progress), 4 Masters
- *Thesis Committee Examiner:*
- 1 PhD, 5 Masters

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:
Full time

- Electrical Engineer, Siemens Pakistan, (1990-1991)

Certifications or professional registrations:
None

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):

- Member, Graduate Program Development Committee
- Member, Undergraduate Program Revision 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:

- 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.
- M.H. Imam and Imran A. **Tasadduq**, "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),* vol. 2, no. 3, pp. 21–33, 2012
- Ibrahim M. Hussain, Imran A. **Tasadduq** and Abdul Rahim Ahmad, "A New Effective and Efficient Measure of PAPR in OFDM", *Scientific Research Int'l Journal of Communications, Network and System Sciences (IJCNS),* vol. 3, no. 9, pp. 755-766, September, 2010
- Imran A. **Tasadduq**, "OFDM-CPM for Wireless Communications: Design, Properties and Performance", VDM Verlag: Saarbrücken, Germany, 2009
- J. A. Zubairi (Ed.) and Imran A. **Tasadduq** (Co-editor), "Applications of Modern High Performance Networks", Bentham Science Publishers: Oak Park IL, 2009
- J. A. Zubairi, S. Misbahuddin and Imran A. **Tasadduq**, "Emergency Medical Data Transmission Systems And Techniques", in Handbook of Research on Advances in Health Informatics & Electronic Healthcare Applications: by K. Khoumbati, A. Srivastava, Y. K. Dwivedi and B. Lal, (*Editors*), IGI Global: Hershey PA, 2009

Conferences/Presentations:

- Muhammad Rashid, Imran A. **Tasadduq**, Yousuf Irfan Zia, Mohammad Turkistany, Saima Rashid, "A Methodology for the Assessment of Pedagogic and Implementation Aspects of Laboratories", *Proc. 2012 Int'l Conf. on Frontiers in Education: Computer Science and Computer Engineering, (FECS'2012),* 16–19 July, 2012, Las Vegas, Nevada
- Muhammad Rashid, Imran A. **Tasadduq**, Yousuf Irfan Zia, Mohammad Turkistany, Saima Rashid, "Evaluation of engineering laboratories", *Proc. Int'l Conf. on Education and e-Learning Innovations (ICEELI),* 2012, 1–3 July, 2012, Sousse, Tunisia
- M.H. Imam and Imran A. **Tasadduq**, "Satisfaction of ABET Student Outcomes", *IEEE Global Engineering Education Conference (EDUCON),* April, 2012, Morocco
- Imran A. **Tasadduq**, M.H. Imam, Abdul-Rahim Ahmad, "A Novel Metasearch Algorithm for Facility Layout Optimization", *Proc. 41st Int'l Conf. on Computers and Industrial Engineering,* Los Angeles CA, 23-26 October, 2011
- Osama M. Hussain and Imran A. **Tasadduq**, "Error Performance of 8-QAM Trellis Coded MC-CDMA with Controlled Equalization over Wireless Channels", *Proc. Canadian Conf. on Elect. & Comp. Eng.* May, 2009, Delta St. John's, Canada

Briefly list the most recent professional development activities:

- Karim, A., *Assessment & Evaluation Processes Workshop,* Makkah: Electrical Engineering Department, Umm Al-Qura University, 2010

Kadry Ibrahim Montasser

Education – degree, discipline, institution, year:

- Ph.D. in Electrical Engineering & Electronics, Faculty of Engineering, Nagoya University,
  Japan (1987)
- M.S. in Electrical Communications & Microwave Engineering, Faculty of Engineering, Alexandria University, Egypt (1979)
- B.S. in Electrical Engineering (Electronics & Electrical Communications): Faculty of Engineering, Alexandria University, Egypt (1973)

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Professor, Dept. of Computer Engineering, Umm Al-Qura University, (Aug 2001 to date)
- Professor, Dept. of Electrical Engineering, Al-Azhar University, (Jun 2000-Aug2001)
- Associate Professor, Dept. of Electrical Engineering, Al-Azhar University, (Jan 93-Jun 2000)
- Assistant Professor, Dept. of Electrical Engineering, Al-Azhar University, (Nov 87-Dec 93)
- Lecturer, Dept. of Electrical Engineering, Al-Azhar University, (Nov 79-Nov 87)
- Senior Instructor, Dept. of Electrical Engineering, Al-Azhar University, (Dec 75-Nov 79)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Computer Supervisor for the American SIC project with the Center of Research and Development of Metals in Egypt, (1995-1996), part time.

Certifications or professional registrations:

None

Current membership in professional organizations:

- Japanese membership at JJAP

Honors and awards:

None

Service activities (within and outside of the institution):

- Member of Curriculum Committee for Computer Engineering (2010-2011)
- Member of the Committee for establishing a shared CE/CS Masters program at the College of Computer and Information Systems at Umm Al-Qura University (2010-present)
- A member of the Committee for developing university departments at Umm Al-Qura University, assigned by Saudi Minster of Higher Education in 2008.

- A member of the Committee of Institute of Research and Islamic Studies, Umm Al-Qura University, since 2003.
- A member of the University Staff Promotion Referee at King Abdul Aziz University since, 2004.
- A Referee of Undergraduate and Postgraduate Academic Plans for King Abdul Aziz University since 2004.
- A Referee of research projects for Umm Al Qura University, Institute of Research and Islamic Studies, since 2003.
- A member of the University Staff Promotion Committee at Al Azhar University, since 2001.
- A member of the Committee of Developing the Technical Education and Maintenance Technology in Egypt, since 1997
- A member of the University Staff Promotion Referee at University of International Islamic Science, Jordan, (Since 2010).

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:

None

Conferences/Presentations:

None

Briefly list the most recent professional development activities:

Khaled Hatem Almotairi

Education

- Ph.D. in Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada, 2012
- M.A.Sc. in Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada, 2007
- B.Sc. in Electrical and Computer Engineering, King Abdulaziz University, Jeddah, Saudi Arabia, 2004

Academic experience

- Assistant Professor, Umm Al-Qura University, Makkah, KSA, (2012-present)
- Teaching Assistant, University of Waterloo, Waterloo, ON, Canada, (Winter 2011)
- Teaching Assistant, University of Waterloo, Waterloo, ON, Canada, (Fall 2009)
- Instructor, College of Telecommunication and Electronics, Jeddah, Saudi Arabia (Fall 2004)

Current membership in professional organizations:

- Member, Institute of Electrical and Electronics Engineers (IEEE), 2013 – present
- Member, IEEE Communication Society, 2013 – present
- Student member, Institute of Electrical and Electronics Engineers (IEEE), 2008 – 2012
- Student member, IEEE Communication Society, 2008 – 2012

Honors and awards:

- Full scholarship for Distinguished Students in Technology and Engineering from the Ministry of Higher Education, Saudi Arabia (2008-2012)
- University of Waterloo Graduate Scholarship (Winter 2006, Spring 2011)
- Full scholarship for Distinguished Students in Technology and Engineering from the Ministry of Higher Education, Saudi Arabia (2005-2007)
- Excellence Award from King Abdulaziz University, Jeddah, Saudi Arabia (2003)
- Merit Award from King Abdulaziz University, Jeddah, Saudi Arabia (Fall 2002, Fall 2004)

Service activities

- Technical program committee (TPC) member of IEEE GLOBAL Communications Conference: GLOBECOM 2010, GLOBECOM 2012, GLOBECOM 2013
- Technical program committee (TPC) member of IEEE International Conference on Communications: ICC 2011, ICC 2012
- Technical program committee (TPC) member of IEEE Vehicular Technology Conference: VTC2010Fall, VTC2011Fall
- Reviewers for IEEE Transactions on Vehicular Technology
- Reviewers for IEEE Journal on Selected Areas on Communications (JSAC)
- Special Issue on Advances in Cognitive Radio Networking and Communications

- Special Issue on Spectrum and Energy Efficient Design of Wireless Communication Networks
- Reviewer for many local and international conferences: VTC2011Spring, VTC2012Fall, VTC2013Spring, SIECPC 2013

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. Almotairi**, X. Shen, "Distributed power control over multiple channels for ad hoc wireless networks," *Wireless Communications and Mobile Computing (Wiley),* to appear
- **K. Almotairi**, X. Shen, "Multichannel medium access control for ad hoc wireless networks," *Wireless Communications and Mobile Computing (Wiley),* to appear

Conferences/Presentations:

- **K. Almotairi**, X. Shen, "*Fast and Slow hopping MAC Protocol for Ad Hoc Wireless Networks*," in Proc. IEEE International Conference on Communications (IEEE ICC'11), June 5-9, 2011, Kyoto, Japan
- **K. Almotairi**, X. Shen, "*Symmetrical Transmission Power Control for Multi-channel Multi-hop Wireless Networks*," in Proc. IEEE GLOBECOM, Miami, Florida, USA, December 6-10, 2010
- **K. Almotairi**, X. Shen, "MMAC-HR: Multi-channel Medium Access Control with Hopping Reservation for Multi-hop Wireless Networks," in Proc. IEEE GLOBECOM, Miami, Florida, USA, December 6-10, 2010
- M. Shi, **K. Almotairi**, X. Shen, J.W. Mark, and D. Zhao, "*Credit-Based User Authentication for Delay Tolerant Mobile Wireless Networks*," in Proc. IEEE ICC, Beijing, China, May 19-23, 2008

Briefly list the most recent professional development activities:

- Course on Preparing for University Teaching (GS 901) towards Certificate in University Teaching (CUT) from the Centre for Teaching Excellence, University of Waterloo, Waterloo, ON, Canada
- Certificate of Teaching Assistant training workshop from the Faculty of Engineering, University of Waterloo, Waterloo, ON, Canada
- Workshop on Workplace Hazardous Materials Information System (WHMIS) at the University of Waterloo (2006)

Khalid M. Jamil Khayyat

Education – degree, discipline, institution, year:

- **Ph.D.** in Computer Engineering, University of Victoria, Victoria, BC, Canada, 2011
- **M.Sc.** in Electrical and Computer Engineering, Colorado State University, Fort Collins, USA, 2002
- **B.Sc.** in Electrical and Computer Engineering, 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, Computer Engineering, Umm Al-Qura University, Makkah, KSA, (2001– present)
- Teaching Assistant, Electrical and Computer Engineering, University of Victoria, Victoria, BC, Canada, (2003 – 2009)
- Teaching Assistant, Electrical and Computer Engineering, Umm Al-Qura University, Makkah, KSA, (1996 – 1998)
- Member, Curriculum Revision Committee, the Fundamental Science Department, Raytheon Middle East Equipment Systems (RIMS), KSA, (1994 – 1996)
- Computer electronics instructor, the Fundamental Science Department, Raytheon Middle East Equipment Systems (RIMS), KSA, (1992 – 1996)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Computer engineer**,** Makkah Al Mukarramah District, Makkah, KSA, (1991 – 1992). Contributed to the Access Netware Project. Worked on workstations motherboard maintenance of substations, and training session on the basics of operating computer for several employees of the district.

Certifications or professional registrations:

- Teaching Methodology Training, Raytheon Middle East Equipment Systems (RIMS), KSA, 1992

Current membership in professional organizations:

- Member, IEEE

Honors and awards:

- Graduation Award for being ranked the first top student in my class, Faculty of Engineering at Umm Al-Qura University, KSA, 1991
- Graduation Award for being ranked the second top student in my class during my years of education in high school, Al Falah School, KSA, 1986

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:

- K. M.-J. Khayyat and F. Gebali, "Modeling Quality of Service of Wireless ad hoc Networks using EDCA", Submitted to IEEE Transactions on Communications, January 2011.

Conferences/Presentations:

- K. M.-J. Khayyat and F. Gebali, "Cross-layer modeling of wireless ad hoc networks in the presence of channel noise", in Proceedings of the IEEE GLOBECOM Ad Hoc, Sensor and Mesh Networking, GC AHSN'09., Honolulu, Hawaii, December 2009, pp.1-6
- K. M.-J. Khayyat and F. Gebali, "Analytical modeling and performance analysis for wireless ad-hoc networks using four-way handshaking mechanism", in Canadian Conference on Electrical and Computer Engineering, CCECE '09., St. John's, NL, Canada, May 2009, pp. 318-322.
- K. M.-J. Khayyat, F. Gebali, and E. Abdel-Raheem, "Performance analysis of the IEEE 802.11 DCF", in Proceedings of the IEEE International Symposium on Signal Processing and Information Technology (ISSPIT 2007), Cairo, Egypt, December 2007, pp. 653-657.

Briefly list the most recent professional development activities:

- Chair, Student Advising Committee, Department of Computer Engineering, Umm Al-Qura University, KSA

Maher Nabih Elshakankiri

Education

- Ph.D. in Computer & Systems Engineering, Ain Shams University, Cairo, 2009
- M.Sc. in Computer & Systems Engineering, Ain Shams University, Cairo, 2003
- B.Sc. in Computer & Systems Engineering, Ain Shams University, Cairo, 1996

Academic experience

- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA (September 2009 – Now)
- Lecturer, Computer Engineering, Umm Al-Qura University, KSA (April 2006 – August 2009)
- Associate Lecturer, Computer Engineering, CHIB, Egypt (October 2003 – March 2006)
- Teaching Assistant, Computer Engineering, CHIB, Egypt (October 1996 – September 2003)

Non-academic experience

- Quality Assurance Supervisor, UNESCO Cairo Office (March 2005 – March 2006)
- Administration & IT Manager, Cairo Computer Academy (April 2002 – March 2006)

Honors and awards

- Best paper, IEEE Women in Engineering & Industry Forum, Jeddah, Saudi Arabia, 17 December 2011
- One of the best ten papers, 46th IEEE International Midwest Symposium On Circuits & Systems Conference, Cairo, Egypt, 27 – 30 December 2003
- Ideal Student, Faculty of Engineering, Ain Shams University, 1994

Service activities

- Member, Assessment and Evaluation Committee, Computer Engineering Department, Umm Al-Qura University
- Referee, National Olympiad for Scientific Creativity, Makkah Al-Mukarramah Province, February 2012
- Referee, National Olympiad for Scientific Creativity, Makkah Al-Mukarramah Province, February 2011
- Member, Wireless Intelligent Networked Systems Group at Umm Al-Qura University (UQU-WINS), December 2010 - Now
- Member, Council of Computer Engineering Department, College of Computer & Information Systems, Umm Al-Qura University, September 2010 – Now
- Associate Researcher, Center of Research Excellence in Hajj and Omrah (HajjCoRE), June 2010 – Now
- Member, Board of Directors, Al-Seddik Private School, Makkah Al-Mukarramah, Saudi Arabia, October 2009 – Now
- Member, Egyptians Engineering Syndicate, 1996 – Now

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:

None

Conferences/Presentations:

- **M. N. Elshakankiri**, "Implementation of a wireless sensor network for Al-Masjed Al-Naba`wi", 4th Scientific Forum for Al-Madinah Al-Munawwara Researches, Al-Madinah Al-Munawwara, Saudi Arabia, 29 April – 1 May 2012 (Accepted)
- **M. N. Elshakankiri**, "Design of a 3D Adventure Game for Hajj and Omrah", 11th Scientific Forum for Hajj Researches, Makkah Al-Mukarramah, Saudi Arabia, 14 – 16 June 2011
- R. A. Al-Sudais, M. D. Al-Otaby, **M. N. Elshakankiri**, "Design of a Smart Library IT System using RFID Technology", IEEE Women in Engineering & Industry Forum, Jeddah, Saudi Arabia, 17 December 2011 [Awarded best paper]
- **M. N. Elshakankiri**, L. K. Saifaddin, H. S. Al-Buthi, R. S. Al-Qarni, "Design of a 3D Adventure Game for Hajj and Omrah", 11th Scientific Forum for Hajj Researches, Makkah Al-Mukarramah, Saudi Arabia, 14 – 16 June 2011
- **M. N. Elshakankiri**, M. H. Balfas, M. M. Kadi, "Pilgrim's Smart Card for Hajj and Omrah Applications using RFID Technology", 11th Scientific Forum for Hajj Researches, Makkah Al-Mukarramah, Saudi Arabia, 14 – 16 June 2011
- **M. N. Elshakankiri**, F. A. Al-Fraikh, A. S. Al-Zahrani, "Vehicle Tracking System using RFID Technology for Hajj and Omrah Applications", 11th Scientific Forum for Hajj Researches, Makkah Al-Mukarramah, Saudi Arabia, 14 – 16 June 2011
- **M. N. Elshakankiri**, T. A. Felemban, "Hajj Step by Step Software fully supporting blind users", 11th Scientific Forum for Hajj Researches, Makkah Al-Mukarramah, Saudi Arabia, 14 – 16 June 2011
- **M. N. Elshakankiri**, "Energy Efficient Routing Protocol for Wireless Sensor Networks using Dual Power Management", 7th International Computing Conference in Arabic (ICCA 2011), Riyadh, Saudi Arabia, 31 May – 2 June 2011
- R. A. Al-Sudais, M. D. Al-Otaby, **M. N. Elshakankiri**, "Design of a Smart Library IT System using RFID Technology", 7th International Conference on Innovations in Information Technology (Innovations'11) Abu Dhabi, United Arabic Emirates, 25 – 27 April 2011
- H. E. Mimish, H. S. Ba-Atiyah, **M. N. Elshakankiri**, "Design of a Self-Service Checkout IT System using RFID Technology", 7th International Conference on Innovations in Information Technology (Innovations'11), Abu Dhabi, United Arabic Emirates, 25 – 27 April 2011
- L. K. Saifaddin, H. S. Al-Buthi, R. S. Al-Qarni, **M. N. Elshakankiri**, "Hajj and Omrah 3D Game Design", 7th International Conference on Innovations in Information Technology (Innovations'11), Abu Dhabi, United Arabic Emirates, 25 – 27 April 2011
- **M. N. Elshakankiri**, Y. H. Dakroury, "A Quality of Service Protocol for Mobile Ad-Hoc Networks", 46th IEEE International Midwest Symposium On Circuits & Systems Conference, Cairo, Egypt, 27 – 30 December 2003 [Awarded one of the best ten papers]

Maher I. Rajab

Education – degree, discipline, institution, year:

- Ph.D. in Electrical & Computer Engineering, University of Nottingham, UK, 2004
- M.S. in Computer Engineering, KAAU, KSA, 1995
- B.S. in Electrical & Computer Engineering, UQU, KSA, 1990

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:
All full time

- Associate Professor, Computer Engineering, Umm Al-Qura University, (2009 – present)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:
None

Certifications or professional registrations:
None

Current membership in professional organizations:
None

Honors and awards:
None

Service activities (within and outside of the institution):

- Member, Preparatory Year Committee, UQU.
- Member, General Projects Management Committee, UQU
- Member , MSc Program Committee, CE Department, UQU
- Member, Faculty Promotion Advisory Committee, UQU
- Vice-Dean College of Computer & Information Systems, UQU, 2008-2009
- Supervisor of Information and Records Unit - General Projects Management, UQU, 2008.
- Supervisor of Computer & Information Services – College of Engineering & Islamic Architecture, UQU, 2004-2005.

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:

- Maher I. Rajab, Ayman A. Eskandar. (2011) Enhancement of radiographic images in patients with lung nodules. In Thoracic Cancer.
- Maher I. Rajab. (2011) Segmentation of dermatoscopic images by frequency domain filtering and k-means clustering algorithms. Skin Research & Technology.

- G Schaefer, M I Rajab, M E Celebi et al. (2011) Colour and Contrast Enhancement for Improved Skin Lesion Segmentation. In Computerized Medical Imaging and Graphics.
- Rajab MI, "Analysis and Applications of Neural Networks for Skin Lesion Border Detection ", Chapter in Computational Intelligence in Medical Imaging: Techniques & Applications, to be published by CRC Press, 2008, Editors: G. Schaefer, A. Hassanien and J. Jiang. http://vision.cs.aston.ac.uk/CfP/CIMI/
- Rajab MI, "Feature extraction of dermatoscopic images by iterative segmentation algorithm ", Journal of X-Ray Science and Technology, Vol. 16, No. 1, PP. 33-42, 2008.

Conferences/Presentations:

- Rajab M.I., Morgan S.P., Stockford I.M., and CRowe J.A., "Stabilization and Enhancement of Videocapillaroscopy of Human Blood Vessel Microcirculation", in the 2010 6th International Colloquium on Signal Processing and its Applications, May 21-23, Malacca, Malaysia.
- Rajab M.I., and Saif M.A., "Detection of Road Rutting Using Video and Image Processing", in the 2010 6th International Colloquium on Signal Processing and its Applications, May 21-23, Malacca, Malaysia.
- Gerald Schaefer, Maher Rajab, M. Emre Celebi, AND Hitoshi Iyatomi, "Skin lesion extraction in dermoscopic images based on colour enhancement and iterative segmentation", in the 2009 IEEE International Conference on Image Processing ICIP, Nov. 7-10, 2009, Cairo, Egyp
- Gerald Schaefer, Maher Rajab, M. Emre Celebi, and Hitoshi Iyatomi, " Skin lesion segmentation using cooperative neural network edge detection and colour normalization", in the 9th International Conference on Information Technology and Applications in Biomedicine ITAB, Nov. 5-7, 2009, Larnaca, Cyprus

Briefly list the most recent professional development activities:

None

Mohammed Abdullah Al-Saleh

Education – degree, discipline, institution, year:

- Bachelor of Science in Electrical Engineering, University of Michigan, Ann Arbor, Michigan, USA. 1981.
- Master of Science in Electrical Engineering, Wayne State University, Detroit, Michigan, USA. 1982.
- Doctorate of Philosophy in Electrical Engineering, Pittsburgh University, Pennsylvania, USA. 1991.

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer at the Faculty of Applied Science and Engineering Umm Al-Qura University (1982-1985).
- Assistant Professor at the Electrical and Computer Engineering Department Faculty of Engineering and Islamic Architecture Umm Al-Qura University *since 1992.*
- Chairman of the Electrical and Computer Engineering Department Umm Al-Qura University (1992-1999).
- Chairman of the Computer Engineering Department 2000-2003.
- Vice Dean College of Engineering and Islamic Architecture *since 2002-2026.*
- Dean of the college of Computer and Information systems *2006-2030.*
- Member of the assigned committee to develop the curriculum for the Electrical and Computer Engineering department at the Faculty of Engineering and Islamic Architecture (1983).
- Member of the assigned committee to develop the curriculum for the Computer Engineering and Sciences department at the Faculty of Engineering and Islamic Architecture (2000).
- Member of the assigned committee by the director of Umm Al-Qura university for strategic planning and study of the university (1999-2000).
- Member of the organization committee for the fifth Saudi Engineering conference University of Umm Al-Qura university Makkah, Saudi Arabia 1-4 March (1999).
- Chairman of the technical services committee for the fifth Saudi Engineering conference held at the University (1999).
- Chairman of the implementation committee of the Computer Network for the Faculty of Engineering and Islamic Architecture (1995-1996).
- Director of the Computer Network at the Faculty of Engineering and Islamic Architecture *since 1996.*
- Computer training for Unix and Window-NT at United Kingdom (1996).
- Member of Saudi computer society.
- Member of the assigned committee by the director of Umm Al-Qura university for distance learning and educational development 2002.
- Member of the organization committee for the seventh Saudi computer conference King Abdulaziz University in association with Saudi computer society Madinah Saudi Arabia 5-8 April 2004..
- Member of the organization committee for the Net Control Engineering Muscat, Oman 13-17 October 2003.

- Member of the scientific committee by the governor of Makkah Province Saudi arabia.
- Member of the committee to give an award for best performance in teaching and contraption in the University and society by the faculty member in the year of 2004.
- Member of the assigned committee to establish a college of computer Engineering and science at Umm Al-Qura University 2004.
- Member of the assigned committee to establish a community college at Umm Al-Qura University 2004.

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

None

Honors and awards:

- Undergraduate Scholarship from the Ministry of Higher Education to pursue B.S. in Electrical Engineering from USA. (1976-1981).
- Graduate Scholarship from the Ministry of Higher Education to pursue M.S. in Electrical Engineering from USA. (1981-1982).
- Graduate Scholarship from Umm Al-Qura University to pursue Ph.D. in Electrical Engineering from USA. (1986-1991).

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:

None

Conferences/Presentations:

Briefly list the most recent professional development activities:

None

Mohammad O. Al-Turkistany

Education – degree, discipline, institution, year:

- Ph.D. in Computer Engineering, University of Florida, Gainesville, FL., 2006
- M.S. in Computer Engineering, University of Florida, Gainesville, FL., 2002
- B.S. in Electrical Engineering, King Saud University, Riyadh, 1996

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Chair, Curriculum Committee, Computer Engineering, Umm Al-Qura University, KSA, (2011-present)
- Chair, ABET Steering Committee, Computer Engineering, Umm Al-Qura University, KSA, (2011-present)
- Chairman, Computer Engineering Department, Umm Al-Qura University, KSA, (2011-present)
- Chairman, Computer Science Department, Umm Al-Qura University, KSA, (2010-2010)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2006-2012)
- Teaching Assistant, Electrical Engineering, Umm Al-Qura University, KSA, (1996-1997)
- *Supervised Graduate Theses:*
- *Thesis Committee Examiner:*

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Engineer, Saudi Aramco, (1996-1996), full time

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

None

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:

- Mohammad Al-Turkistany, Abdelsalam (Sumi) Helal, Mark Schmalz, "Adaptive wireless thin-client model for mobile computing". The International Journal on Wireless Communications and Mobile Computing, Wiley & Sons, Vol. 9, 2009

Conferences/Presentations:

- Mohammad Al-Turkistany, Abdelsalam (Sumi) Helal, 2004. Fuzzy Rule-based Adaptation Framework for Wireless Thin-Clients. Proceedings of the International Conference on Computing, Communications and Control Technologies. pp. 251–256

Briefly list the most recent professional development activities:

- ABET Accreditation Workshop, Umm Al-Qura University

Mohammad K. Ibrahim

Education – degree, discipline, institution, year:

- Ph.D. in Electrical and Electronic Engineering, University of Newcastle Upon Tyne, UK, 1985
- B.S. in Electrical and Electronic Engineering, University of Newcastle Upon Tyne, UK, 1982

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- 2011- Current Advisor, Vice Presidency of Business and Innovation, Professor of Information and System Engineering, Umm Al-Qura University
- 2005- 2011: Chair Professor of Information & Systems Engineering, Faculty of Technology, De Montfort University, UK.
- 1999-2005: Professor of Computer Engineering, Department of Computer Engineering, KFUPM, Saudi Arabia.
- 2001-2003: Visiting Professor, School of Computer Science, Queens University Belfast, UK.
- 1995-1999: Professor and Head of DSP Systems Group, Faculty of Computing Sciences and Engineering, De Montfort University, UK.
- 1985-1995: Lecturer in Electronic Engineering, University of Nottingham.
- Supervised Numerous Graduate Theses: 10 PhDs, more than 50 Masters

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

None

Certifications or professional registrations:

None

Current membership in professional organizations:

- Senior Member, IEEE

Honors and awards:

- 2010 KFUPM 2010 Patent Award.
- 2003-2004 KFUPM Distinguished Teacher Award
- 2003-2004 KFUPM College of Computer Sciences and Engineering, Distinguished Award for Research Activity on Cryptography
- 1982-1984 UK Overseas Research Student (ORS) Award

Service activities (within and outside of the institution):

- Member of the IEEE Circuits and Systems Society Technical Committee on Multimedia Systems and Applications
- Member of the IEEE Circuits and Systems Society Technical Committee on VLSI Systems and Applications

- Member of the Editorial Board of the Journal VLSI Signal Processing Systems (Editor in Chief, Professor S Y Kung, Princeton University, USA)
- Member of the IEEE Signal Processing Society Advisory Board for the Technical Committee on Design and Implementation of Signal Processing Systems
- Associate Editor of the IEEE Transaction on VLSI Systems (January 2001)
- Member of the IEEE Interactive Communication Magazine Editorial Board, Communications Society

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Issued Patents

- 20100166175, L Ghouti, MK Ibrahim, A Al-Najjar, Cryptographic hash functions using elliptic polynomial cryptography
- 20100166174, L Ghouti, MK Ibrahim, A Al-Najjar, Hash functions using elliptic curve cryptography
- 20100166176, L Ghouti, MK Ibrahim, A Al-Najjar, Elliptical polynomial-based message authentication code

Journal Publications

- Al-Miladi, A, Ibrahim, M.K., High Performance Scalable radix-2n GF(2m) Serial-Serial Multipliers, 2009, Journal of Circuits, Systems, and Computers (JCSC), Volume: 18, Issue: 1, pp. 11-30.
- Al-Somani, T.F., Ibrahim M.K., (2009) Generic-point parallel scalar multiplication without pre-computations, IEICE Electronics Express, Vol. 6 (24), pp. 1732-1736
- Al-Hudhud, G., Ibrahim, M. K. and Al-Akaidi, M. (2010) Automatic production of quantisation matrices based on perceptual modelling of wavelet coefficients for grey scale images. Image and Vision Computing, 28 (4), pp. 644-653.

Conferences/Presentations:

- Alio, J., Ibrahim, M., Pickton, D. and Bassford, M., (2009) A systems-based media effectiveness framework for e-marketing communications, IEEE International Systems Conference, Vancouver, pp150-155.
- Ibrahim, M.K., (2009) A new paradigm for behaviour-context dynamics and applications to the behaviour of humans and human-centric systems, IEEE International Systems Conference, Vancouver, pp 144-149.
- Ibrahim, M.K., Bassford, M., Ackerley, H., and Cornellus, V., (2009) Creative Design Dynamics and Creative Systems, IEEE International Systems Conference, Vancouver, pp.273-278.
- Alio, J., Pickton, D., Ibrahim, M.,(2010), Assessing the Effectiveness of Networked Interactive Media in E-Marketing Environments Using Eye-Tracking Technology, 2010 Academy of Marketing Conference, UK.

Mohammad Zafar Zahir ulhaque

Education – degree, discipline, institution, year:

- M.B.A. in Business Administration, Florida Institute of Technology, Florida, USA., 1994
- M.S. in Computer Engineering, Florida Institute of Technology, Florida, USA, 1992
- B.S. in Electrical Engineering, University of Engineering & Technology Lahore, Pakistan 1989

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer in Computer Engineering Department , Umm Al-Qura University, KSA, (1997-2012)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Recovery officer in Telecom Foundation, Pakistan (1997), (full time)

Certifications or professional registrations:

- Lab VIEW Core 1
- Lab VIEW Core 2

Current membership in professional organizations:

- Pakistan Engineering Council

Honors and awards:

None

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:

- None

Conferences/Presentations:

None

Briefly list the most recent professional development activities:

- Currently working as a member in one of the Computer Engineering Labs Committee for ABET Accreditation.

Mohsin Murad

Education – degree, discipline, institution, year:

- M.Sc. in Computer Systems Engineering, University of Engineering and Technology, Peshawar, Pakistan, 2012
- B.Sc. in Computer Systems Engineering, 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, Department of Computer Systems Engineering, 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:

- Research Officer, Ministry of Defense, Islamabad, Pakistan, (2011-2012)

Certifications or professional registrations:

- Pakistan Engineering Council

Honors and awards:

- Received Merit Scholarship during all undergraduate studies (2005-2009).

Service activities (within and outside of the institution):

- Reviewer for 4th IEEE International Conference on Computer Science and Information Technology (IEEE ICCSIT 2011), Chingdu, China.
- Member of the Society for Automotive Engineers at University of Engineering & Technology, Peshawar, Pakistan.

Briefly list the most important publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

Conferences/Presentations:

- Mohsin Murad, Abdullah Rehman, Arif Ali Shah, (2011). "RFAIDE – An RFID Based Navigation and Object Recognition Assistant for Visually Impaired People". In Proceedings of IEEE's International Conference on Emerging Technologies (ICET '11), Islamabad, Pakistan.
- Mohsin Murad, Khawaja Yahya, Ghulam Mubashar, (2009). "Web Based Poultry Farm Monitoring System Using Wireless Sensor Network". In Proceedings of ACM's International Conference on Frontiers of Information Technology (FIT '09), Abottabad, Pakistan.

- Fahim Jan, Qaiser Habib, Irfan Khan, Mohsin Murad, (2010). "Carbon monoxide Detection and Autonomous Countermeasure system for a Steel Mill using Wireless Sensor and Actuator Network". In Proceedings of IEEE's International Conference on Emerging Technologies (ICET '10), Islamabad Pakistan.

Briefly list the most recent professional development activities:

- Attended a workshop "Android Development for Beginners" at National University of Sciences and Technology, NUST, Islamabad, Pakistan, (2011).
- Attended 1-month workshop on Cryptography & Network Security at National Systems, Islamabad, Pakistan, (2011).
- Was a part of workshop "Teaching the Teachers – Analog Electronic Circuits & Semiconductor Devices" by Prof. Dr. Asad Abidi (Univeristy of California, LA), at Lums, Lahore, Pakistan, (2011).
- Was a part of workshop "Teaching the Teachers – Basic Circuit Theory" by Prof. Dr. Asad Abidi (University of California, LA), at Lums, Lahore, Pakistan, (2010).
- Attended workshop on "Information Security" jointly organized by HEC and Riphah International University, Islamabad, Pakistan, (2010).
- Was part of workshop titled "FPGA Based Chip Design" organized by Military College of Signals, NUST, Islamabad, Pakistan (2010).

Momen M. Al-Rawi

Education – degree, discipline, institution, year:

- Ph.D. in Computer Networks, Loughborough University, Loughborough, UK., 2007
- M.S. in Computer Engineering, University of Leeds, Leeds, UK., 1997
- B.S. in Computer Engineering, LaVerne University, LaVerne, CA., USA., 1987

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, Makkah, KSA., (2007-2012)
- Teaching Assistant, Electrical Engineering/Computer Engineering, Umm Al-Qura University, Makkah, KSA, (1989-2007)
- Teaching Assistant, Computer Centre, King Abdulaziz University, Jeddah, KSA., (1988-1989)
- *Supervision of Graduate works:*
- *7 Graduation Projects.*
- *Committee Examiner:*
- 9 Graduation Projects.

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Networks Engineer, Computer Centre, KAAU (1988-1994),

Certifications or professional registrations:

None

Current membership in professional organizations:

- Member, IEEE
- Member, IEEE Communications Society
- Member, IEEE Computational Intelligence Society
- Member, ACM

Honors and awards:

- KAAU Computer Centre award for outstanding staff.
- Umm Al-Qura University Rector Award for excellence in IT Centre directorship.
- Students affairs deanship award for collaborative achievements with IT Centre.

Service activities (within and outside of the institution):

- Deputy Director of IT Centre.
- Director General of IT Centre.
- Vice Dean of the Computer and Information Systems College.

- Member of several committees on a college and University level during directorship of IT Centre as well as administration of the College.

Briefly list the most important Journal publications from the past five years – title, co-authors if any, where published, date of publication or presentation:

None

Briefly list the most important Conference publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation:

- Momen M. Al-Rawi, David J. Parish, "Determination Of VoIP (Voice Over IP) Service Quality On A Hop By Hop Basis", IADAT, International Conference on Telecoms & Computer Networks, 2006

Briefly list the most recent professional development activities:

- Introductory ABET Accreditation Workshop, Umm Al-Qura University.

Muhammad Asif Manzoor

Education – degree, discipline, institution, year:

- M.Sc. in Computer Systems Engineering, University of Engineering and Technology, Peshawar, Pakistan, 2010
- B.Sc. in Computer Systems Engineering, University of Engineering and Technology, Peshawar, Pakistan, 2007

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, Computer Engineering, Umm Al-Qura University, KSA, (2012-present)
- Lecturer, Computer Systems Engineering, University of Engineering and Technology, Peshawar, Pakistan, (2007-2011)
- Undergraduate Coordinator, Computer Systems Engineering, University of Engineering and Technology, Peshawar, Pakistan, (2009-2011)
- Supervised 18 Undergraduate Theses (2007-2011)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Consultant, Adamax Inc, Peshawar, Pakistan (2009-2011), part time

Certifications or professional registrations:

None

Current membership in professional organizations:

- Member, Pakistan Engineering Council

Honors and awards:

- 4th position in B.Sc (Computer Systems Engineering)
- 5th position in Board of Intermediate and Secondary Education, Peshawar, Pakistan.
- Position Holder Scholarship from Board of Intermediate and Secondary Education Peshawar, Pakistan for four years.
- Peshawar Model Degree College Talent Scholarship for two years.
- Merit Scholarship from University of Engineering and Technology, Peshawar for four years.

Service activities (within and outside of the institution):

- Member of the organizing committee of the DICE 2011, UET, Peshawar, Pakistan.
- Reviewer for many local and international journals and conferences.

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:

None

Conferences/Presentations:

- Salim Ullah, **Muhammad Asif Manzoor**, et. al., "An Efficient Communication Architecture for FPGA Based Many Core System", International Conference on Intelligence and Information Technology 2010, October 28-30, 2010, Lahore, Pakistan.
- Salim Ullah, **Muhammad Asif Manzoor**, et. al., "FPGA Implementation of FHSS-BPSK Modulator", International Conference on Intelligence and Information Technology 2010, October 28-30, 2010, Lahore, Pakistan.
- Muhammad Bilal, **Muhammad Asif Manzoor**, et. al., "Model-Based Pose Estimation using Genetic Algorithm for Obstacle Avoidance", International Conference on Intelligence and Information Technology 2010, October 28-30, 2010, Lahore, Pakistan.
- Hameed Ullah, **Muhammad Asif Manzoor**, et. al., "Constant Inter Vehicle Distance maintenance System", International Conference on Intelligence and Information Technology 2010, October 28-30, 2010, Lahore, Pakistan.
- **Muhammad Asif Manzoor**, Ghulam Mubashar Hassan, et. al., "Real Time Image Registration Based on Feature Tracking using Digital Signal Processor", IEEE International Conference on Emerging Technologies 2010, October 18-19, 2010, Islamabad, Pakistan.
- Imran Ashraf, **Muhammad Asif Manzoor**, et. al., "Parameter Tuning of Evolutionary Algorithm by Meta-EAs for WCET Analysis", IEEE International Conference on Emerging Technologies 2010, October 18-19, 2010, Islamabad, Pakistan.
- Aamir Ali Shah, **Muhammad Asif Manzoor**, et. al. "Efficient implementation of Image Registration based on Feature Tracking", IEEE International Conference on Wireless Communication, Networking and Mobile Computing 2010, September 23-25, 2010, Chengdu, China.

Briefly list the most recent professional development activities:

- 5-days Training Workshop on Embedded Systems Methodologies & Real Time Operating Systems by Engr. Zeeshan Khan at University of Engineering & Technology, Peshawar, Pakistan.
- Seminar on Computing Technologies arranged by Department of Computer Systems Engineering, University of Engineering & Technology, Peshawar, Pakistan.
- Course on FPGA Based Chip Design at Military College of Signals (NUST), Islamabad, Pakistan
- Training Workshop on Evolution of Wireless Standards by Dr. Raziq Yaqub at University of Engineering & Technology, Peshawar, Pakistan.
- Training Workshop on WCDMA/HSPA Technology by Dr. Ismail Shah at University of Engineering & Technology, Peshawar, Pakistan.
- Training Workshop on WCDMA Engineering Basics by Dr. Ismail Shah at University of Engineering & Technology, Peshawar, Pakistan.

Muhammad Farhan Khan

Education – degree, discipline, institution, year:

- M.S. in Communications Engineering, Aalto University, School of Science and Technology, Finland, 2010
- B.S. in Computer Engineering, Sir Syed University of Engineering and Technology, Pakistan, 2006

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Research Scientist, Aalto University, School of Science and Technology and Nokia Siemens Network, Finland, (2010)
- Teaching Assistant, Aalto University, School of Science and Technology, Finland, (2009-2010)
- Teaching Assistant, Helsinki University of Science and Technology, Finland, (2008)
- Teaching Assistant, Sir Syed University of Engineering and Technology, Pakistan, (2005)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Manager Engineering and Mathematical Sciences, L.E.J. National Science Information Center, University of Karachi, Pakistan, (2010-2012)
- Network Administrator and Security Specialist, OY Finn-Tack Ltd., Finland, (2009)
- Project Assistant, White Vector Oy, Finland, (2008), Part time
- Network Administrator, Freight Systems Co. Ltd (LLC), Pakistan, (2007)
- Network Engineer, Multinet Pakistan (Pvt.) Ltd., Pakistan, (2006)

Certifications or professional registrations:

- Registered Engineer, Pakistan Engineering Council, PEC

Current membership in professional organizations:

- Member, ISOC

Honors and awards:

- Awarded, Master of Science degree with distinction by the faculty of Electronics, Communications and Automation Engineering of Aalto University School of Science and Technology, Finland
- Worked on a running 4G telecommunication project with 15 project partners, contributing from 7 different European countries.

Service activities (within and outside of the institution):

- TPC Member of the conferences: Globecom 2012, ISBEIA 2012, ISIEA 2012, ISWTA 2012.

- Member of the organizing committee of the workshop, "How to write Scientific Research Proposal" and "How to write Scientific Manuscript", University of Karachi, Pakistan, 2011.
- Reviewer for many local and international and conferences.

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:

- Muhammad Farhan Khan, "Application Level Gateways (ALG)". Technical Report submitted to the *Department of Communications and Networking (Comnet)*, Aalto University School of Science and Technology, May 2010.
- Iikka Airaksinen, Muhammad Farhan Khan, Ville Syrjäläinen, Sunbul Zahid Hussain, "R&D Innovation Strategy: Successful Idea Generation in Large Firms". Technical Report submitted to the *Institute of Strategy*, Aalto University School of Science and Technology, December 2009.
- Muhammad Farhan Khan, Kasimir Lehväslaiho, Pardeep Maheshwaree, Ville Syrjäläinen. "Nokia Music Business, The Case Of Comes With Music CWM". Technical Report submitted to the *Department of Communications and Networking (Comnet)*, Aalto University School of Science and Technology, September 2008.

Conferences/Presentations:

- Khan, M. I., Khan, M. F., & Raahemifar, K. (2012). A Study of COFDM Based Radio-Over-Fiber System Over Graded Index Multimode Fiber. 25th Canadian Conference on Electrical and Computer Engineering. Montreal. Canada: IEEE.
- Khan, M. F. (2011). An Extensive Study on Application Level Gateways (ALGS). 14th IEEE International Multitopic Conference (pp. 316-322). Karachi. Pakistan: IEEE.
- Khan, M. F., & Khan, M. I (2011). Next Generation Protocol for P2P SIP Communication. IEEE Conference on Computer Applications and Industrial Electronics (pp. 651-655). Penang. Malaysia: IEEE.
- Khan, M. F., Khan, M. I., & Raahemifar, K. (2011). Local IP Access (LIPA) enabled 3G and 4G Femtocell Architectures. 24th IEEE Canadian Conference on Electrical and Computer Engineering (pp. 1049-1053). Niagara Falls. Canada: IEEE
- Khan, M. F., Khan, M. I., & Raahemifar, K. (2011). Femtocell Architectures in LTE-Advanced Network. 24th IEEE Canadian Conference on Electrical and Computer Engineering (817-821). Niagara Falls. Canada: IEEE.

Briefly list the most recent professional development activities:

- The Int'l Innovation and Entrepreneurship Forum 2012, Umm Al Qura University.
- 2nd Technical Training of National Video Conference, Higher Education Commission (HEC), Islamabad, Pakistan.
- Organized HEC funded on-line distance learning course, English for University Success (EUS), University of Sydney, Australia.
- Delivered a talk on "How to use e-Learning Management System (eLMS)", University of Karachi, Pakistan.
- Course coordinator of HEC funded on-line distance learning course, "Security Awareness Campaigns, How to Increase Security by Increasing Awareness?" IBM, Germany.

Muhammad Rashid

Education – degree, discipline, institution, year:

- Ph.D. in Embedded Systems Design, University of Bretagne, France, 2009
- M.S. in Embedded Systems Design, University of Nice Sophia Anti Polis, France, 2006
- B.E. in Electrical Engineering, N.W.F.P UET 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 Univesity, KSA, (2011-present)
- Visiting Professor, Electrical Engineering, COMSATS, Pakistan, (2010-2011)
- Member, Assessment and Evaluation Committee, Computer Engineering, Umm Al-Qura Univesity, KSA, (2011-present)
- Chair, Laboratories Assessment and Evaluation Committee, Computer Engineering, Umm Al-Qura Univesity, KSA, (2011-present)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Project Manager, AERO, Pakistan, (January 2010 to May 2011)
- Research Engineer, Thomson R&D, France, December 2006 to December 2009
- Assistant Manager, AERO , Pakistan, July 2000 to June 2005

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

- ANRT Award by French Ministry of Research for doctorate industrial research
- Financial Awards by two international conferences on PhD dissertation abstract
- Scholarship by Higher Education Commission Pakistan for Masters leading to PhD studies
- Research Funding by Texas Instruments during masters in France
- Certificate of Merit from Engineering University Peshawar Pakistan for securing silver medal
- First Position at school and college level

Service activities (within and outside of the institution):

- Member, Assessment and Evaluation Committee, Department of Computer Engineering, Umm Al-Qura University
- Chair, Labs Assessment Committee, Department of Computer Engineering, Umm Al-Qura University

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:

- System Level Design: A Holistic Approach, Paperback: 200 pages, Publisher: LAP LAMBERT Academic Publishing (March 25, 2011), ISBN-10: 3844323279

Conferences/Presentations:

- "HARTES Design Flow for Heterogeneous Platforms", Muhammad Rashid, Fabrizio Ferrandi and Koen Bertels, In Proceedings of the 10th International Symposium on Quality of Electronic Design (ISQED'09), pp.330--338, Santa Clara, CA, USA, 2009
- "Application Capturing and Performance Estimation in a Holistic Design Environment" Muhammad Rashid and Bernard Pottier, In Proceedings of the 16th IEEE International Conference on the Engineering of Computer Based Systems, pp. 21--30, CA, USA, 2009
- "A Transformation Methodology for Capturing Data Flow Specification", Muhammad Rashid, Fabrice Urban and Bernard Pottier, In Proceedings of the IASTED Conference on Parallel and Distributed Computing and Networks, pp. 220–225, Austria, 2009
- "Application Analysis for Parallel Processing", Muhammad Rashid, Damien Picard and Bernard Pottier, In Proceedings of the 11th Euro Micro Conference on Digital System Design, Architectures, Methods and Tools (DSD'08), pp. 633--640, Parma, Italy, 2008
- "Application Specific Processors for Multimedia Applications", Muhammad Rashid, Loudvic Apvrille and Renaud Pacalet, In Proceedings of the 11th IEEE International Conference on Computational Science and Engineering, pp. 109-116, Brazil, July 2008
- "Evaluation of ASIPs Design with LISATek", Muhammad Rashid, Loudvic Apvrille and Renaud Pacalet, In Embedded Computer Systems: Architectures, Modeling, and Simulation, Springer, Lecture Notes in CS, vol. 5114/2008, pp. 177-186, 2008
- "Video Encoding Analysis for Parallel Execution on Reconfigurable Architectures", Muhammad Rashid, Jean-Christophe Le Lann and Koen Bertels, 6th Symposium on Design, Analysis, and Simulation of Distributed Systems, Edinburgh, UK, June 2008
- "A High Level Generic Application Analysis Methodology for Early Design Space Exploration", Muhammad Rashid., Thierry Goubier and Bernard Pottier, International Workshop on Design and Architectures for Signal and Image Processing, France, 2007
- "A High Level Design based on Performance Estimation Methodology for Reconfigurable Architectures", Muhammad Rashid, 4th International Workshop on Reconfigurable Communication Centric System-on-Chips (ReCoSoC'08), Barcelona, Spain, July 2008

Briefly list the most recent professional development activities:

- Holistic approach to Wireless sensor networks
- Article on laboratories assessment for ABET accreditation
- Development of application analysis framework

Muhammad Saqib

Education – degree, discipline, institution, year:

- M.S. in Electrical & Electronics Control and Instrumentation Engineering, Hanyang University, Erica Campus, South Korea, 2010
- B.Sc in Computer Systems Engineering, N-W.F.P UET Peshawar, Pakistan, 2007

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Computer Engineering, Umm Al-Qura University KSA, Lecturer, (2011)
- Digital Communication Systems Lab, Hanyang University, Research Student, South Korea, (2008-2010)
  - Worked on project, "Real Time Localization in Wireless Sensor Network".
  - Developed a Traffic Monitoring System using wireless sensor network.
  - Hands on experience with sensors (NanoLoc) from Nanotron company.
  - Study and simulations of Chirp Spread Spectrum for localization in Matlab.

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Government of Pakistan, various organizations, Internship, 2007 – 2008, full time.
- Worked in, various departments of University of Peshawar under this internship program.
- Major responsibilities included assembling, setup, troubleshooting, and maintenance of LAN operations.

Certifications or professional registrations:

- Registered Engineer, Pakistan Engineering Council, Islamabad, 2007 – 2011.
- LabVIEW Training, Umm Al-Qura University, Makkah, Kingdom of Saudi Arabia, Sept 2011.
- FPGA Based Digital Design Training, Skill Development Council, Islamabad Pakistan, Sept 2007.
- Project Based Database Training in Visual Basic. NET and SQL Server 2000, Department of Computer Systems Engineering, Peshawar Pakistan, Aug 2004.

Current membership in professional organizations:

None

Honors and awards:

- Full scholarship for Graduate Studies in South Korea.

Service activities (within and outside of the institution):

- Member of the Laboratories Assessment Committee, Computer Engineering, UQU, KSA.

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:

- Muhammad Saqib, Sultan Daud Khan, Saleh Mohmmad Basalamah, "Vehicle Speed Estimation using Wireless Sensor Network" accepted for presentation in The First International Conference on Advanced Communication and Computation INFOCOMP 2011, Barcelona, Spain.
- Sultan Daud Khan, Mohammad Saqib, Saleh Mohammad Basalamah, "Effective Memory Access Optimization by Using Memory Delay Modeling, Memory Allocation, and Slack Time Management" Published in IEEE International Conference on Computer Science and Information Technology, ICCSIT 2011, Chengdu, China and extended version is accepted for International Journal of Machine Learning and Computing (IJMLC).
- Saqib Muhammad; Chankil Lee; "Traffic control system using wireless sensor network," Advanced Communication Technology (ICACT), 2010 The 12th International Conference, vol.1, no., pp.352-357, 7-10 Feb. 2010
- URL:http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5440446&isnumber=5440112
- Ajmal khan, Muhammad Saqib, Zeeshan kaleem, "Functional Unit Parallelism in RISC Architecture." International Conference on Frontier of Information Technology 2009,Abbotabad. ACM Digital Library, January 2010
- Zeeshan Kaleem; Chan Kil Lee; Saqib Muhammad; Mohsin, Sheikh; Salim, Farrukh; , "The way towards amplifier design using CAD (ADS) tool," Advanced Communication Technology (ICACT), 2010 The 12th International Conference on , vol.2, no., pp.962-967, 7-10 Feb. 2010
- URL:http://www.ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5440203&isnumber=5440109

Briefly list the most recent professional development activities:

Muhammad Yousuf Irfan Zia

Education – degree, discipline, institution, year:

- M.S. in Computer Engineering, NED University, Karachi, Pakistan, 2002
- B.S. in Electronic Engineering, Sir Syed University, Karachi, Pakistan, 1998

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, Computer Engineering, Umm Al Qura University, KSA, (2011-2012)
- Lecturer, Computer Engineering, National University FAST, Pakistan, (2005-2010)
- Lecturer, Electronic Engineering, Sir Syed University, Pakistan, (2001-2004)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Advance Electronics International, Electronic Engineer, worked on industrial and research projects, designed industrial systems and developed software (1999-2000), full time.

Certifications or professional registrations:

- Fundamentals of Project Management, 2009
- IEEE Workshop on CDMA2000, 2007
- IEEE Workshop on Biometrics, 2007
- Linux Red Hat Training, 2005
- United Nations Workshop on Remote Sensing and GIS, 2004
- Radio Telephone Operator's Certificate, Second Class, PMG-II, 1998
- Radio Telephone Operator's Certificate Special Class, 1998
- Restricted Radio Telephone Operator's Certificate, RRT, 1998
- Radio Telephone Operator's Certificate, RT, 1995

Current membership in professional organizations:

- Member, International Association of Engineers, IAENG.
- Member, Pakistan Engineering Council, PEC.
- Member, Project Management Institute, PMI.

Honors and awards:

- Secured 1st class 3rd position in M.S. program.
- Secured 1st class 7th position in B.S. program

Service activities (within and outside of the institution):

- Member, Labs Assessment Committee
- Helping in preparation of requirements for CE labs in new building at UQU.
- Co-chair guest relations IEEE International Conference on Information and Emerging Technologies, Pakistan 2010

- Member, National Curriculum Revision Committee, Telecommunication, Pakistan 2008
- Convener, 18th Multi-topic International Symposium IEEEP, Pakistan, 2003

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:

- M. Asif, M. R. Arshad, M.Y.I. Zia, A. Yahya, "An Implementation of Active Contour and Kalman Filter for Road Tracking", IAENG International Journal of Applied Mathematics, Nov., 2007.

Conferences/Presentations:

None

Briefly list the most recent professional development activities:

- National Instruments, LabVIEW Core-I Hands-On training (2011).
- National Instruments, LabVIEW Core-II Hands-On training (2011).
- National Instruments, LabVIEW Hands-On training (2011).
- National Instruments, LabVIEW FPGA Hands-On training (2011).
- National Instruments, Control Design & Robotics Hands-On training (2011).
- National Instruments, Multisim & ELVIS Hands-On training (2011).
- National Instruments, Veristand Hands-On training (2011).
- National Instruments, DIAdem Hands-On training (2011).

Omar Sonbul

Education – degree, discipline, institution, year:

- Ph.D. in Electrical and Electronic Engineering, The University of Nottingham, Nottingham, 2012
- M.S. in Electronic Communication and Computer Engineering, The University of Nottingham, Nottingham, 2008
- B.S. in Electrical and Computer Engineering, Umm Al-Qura University, Makkah, 2003

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Chairman, Computer Engineering, Umm Al-Qura University, KSA, (2013)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2013), full time
- Teaching Assistant, Computer Engineering, Umm Al-Qura University, KSA, (2004-2013), full time

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Saudi Electricity Company, Electrical engineer, (2003-2004), full time

Certifications or professional registrations:

None

Current membership in professional organizations:

None

Honors and awards:

None

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:

None

Conferences:

- O.Sonbul, M. Byamukama, S.Alzebda, A.N.Kalashnikov, "Autonomous intrusion detection information system", *The 1th International Advanced Information Systems and Technologies Conference*, Sumy, Ukraine, 15-18 May 2012,

- O.Sonbul, P.Popejoy, A.Kalashnikov, "Ultrasonic Sensor Array for Remote Sensing of Profiles of Bulk Materials", *IEEE International Instrumentation and Measurement Technology Conference*, Graz, Austria, 13-16 May 2012
- P.Popejoy, S.Alzebda, O.Sonbul, A.Kalashnikov, "Linear Angle Measurement using Continuous Wave Ultrasonic Oscillator", *IEEE International Instrumentation and Measurement Technology Conference*, Graz, Austria, 13-16 May 2012,
- E.Otoakhia, T.Jenmanachaiyakun, A.Afaneh, S.Alzebda, M.Mani, O.Sonbul, A.N.Kalashnikov, "Embedded web server for remote laboratory access for undergraduate students studying electronic engineering", *IEEE International Symposium on Circuits and Systems*, Rio de Janeiro, Brazil, 15-18 May 2011, p. 337-340
- O.Bener, M.Mani, O.Sonbul, A.Bener, A.Kalashnikov, "Intrinsically safe and RF interference free device for synchronisation of ultrasonic scans with the heart activity", 4th international Conference. "Sensor Electronics and Microsystems Technology" (SEMST-4), Ukraine, Odessa, June 28 - July 2, 2010, p.133

Presentations:

- **May 3, 2012,** Advances in Wireless Sensor Networks for Hostile Environments Event**, The Derby Conference Centre**, "Low Cost Ultrasonic Wireless Sensor Network for Homeland Security"
- **April 24, 2012,** *Applied Optics Group Seminar, University of Nottingham*, "Remote evaluation of bulk material profiles using ultrasonic sensor array".
- **March, 6, 2012,** RCNDE Research Networking Event**,** Imperial College, "Remote evaluation of bulk material profiles using ultrasonic sensor array",
- **June 7, 2011**, the Graduate School, Trent Building, University of Nottingham, "A Strong Security System for museums", *the author's press release was selected for the Postgraduate Research Showcase 2011 competition.*

Briefly list the most recent professional development activities:

- Accreditation workshop on peer-review assessment, Umm AL-Qura University
- Introductory event to teaching for PG research students and researchers, Graduate School, University of Nottingham.
- Referencing and citing using EndNote. Graduate School, University of Nottingham

Saleh Basalamah

Education:

- 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:

- Dean, College of Computing and Information Systems, Umm Al-Qura University, KSA, (2009-present)
- Vice Dean for Academic Development, College of Computing and Information Systems, Umm Al-Qura University, KSA, (2008-2009)
- Assistant Professor, Computer Engineering, Umm Al-Qura University, KSA, (2006)

Current membership in professional organizations:

- Member, IEEE
- Member, ACM

Honors and awards:

- Research visit to Waseda Univeristy sponsored by KACST.
- Research grant from Saudi Basic Industries Corporation (SABIC).

Journals/Books/Book Chapters:

- Muhammad Arif and Saleh Basalamah, “Similarity-Dissimilarity Plot for High Dimensional Data of Different Attribute types in Biomedical Datasets”, International Journal of Innovative Computing, Information and Control, 8(2), Feb 2012.
- Abdulrahman A. Almutairi, Muhammad I. Sarfraz, Saleh Basalamah, Walid G. Aref, Arif Ghafoor, "A Distributed Access Control Architecture for Cloud Computing," *IEEE Software*, vol. 29, no. 2, pp. 36-44, March-April 2012.

Conferences/Presentations:

- Mohammed J. Islam, Saleh Basalamah, Majid Ahmadi and Maher A. Sid-Ahmed, “Capsule Image Segmentation in Pharmaceutical Applications Using Edge-Based Techniques”. IEEE International Conference on Electro/Information Technology, May 2011.
- Saleh Basalamah, “Object Detection Using RGB Colour Channels”. 2nd South-East European Conference on Computational Mechanics, June 2009.
- Saleh Basalamah, Anil Bharath and Donald McRobbie. “Contrast Marginalized Gradient Template Matching”. Lecture Notes on Computer Science, Springer-Verlag, 3023:417-429. May 2004.

Sultan Daud Khan

Education – degree, discipline, institution, year:

- M.S. in Electronics & Communication Engineering, Hanyang University, South Korea, 2010
- B.S. in Computer System Engineering, University of Engineering & Technology, Peshawar, 2005

Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time:

- Lecturer, Computer Engineering, Umm Al-Qura University, Pakistan, (2011-till date)
- Lecturer, Electrical Engineering, Sarhad University of Science & Technology, (2010-2011).
- Research Assistant, Electrical Engineering, Hanyang University, South Korea, (2008-2010)

Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time:

- Design Engineer, And Or Logics, (2005-2006), full time
- Design Engineer, North West Research Company, (2006-2008), part time

Certifications or professional registrations:

- Registered with Pakistan Engineering Council,

Current membership in professional organizations:

- Student Member, IEEE

Honors and awards:

- Scholarship award for graduate studies in South Korea.

Service activities (within and outside of the institution):

- Member of Laboratory Assessment 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:

- Bilal Habib, Ahmad Anbar, **Sultan Daud Khan**, *"The Effect of Multi-Core Communication Architecture on System Performance"*, Accepted in 2th Workshop on System for Future Multi-Core Architectures (SFMA 2012).

- **Sultan Daud Khan**, Zahid Ullah**,** *" An approach to Block/Sub Block functional level parallelism for Homogeneous Multiprocessor Architecture*"**,** published for presentation in IEEE International Conference on Computer, Communication and Information Technology, 2011, Beijing, China

- Mohammad Saqib, **Sultan Daud Khan**, Saleh Mohmmad Basalamah**,** "*Vehicle Speed Estimation using Wireless Sensor Network*" Published in The First International Conference on Advanced Communication and Computation INFOCOMP 2011, Barcelona, Spain

- **Sultan Daud Khan**, Mohammad Saqib, Saleh Mohammad Basalamah**,** "*Effective Memory Access Optimization by Using Memory Delay Modeling, Memory Allocation, and Slack Time Management*" Published in IEEE International Conference on Computer Science and Information Technology, ICCSIT 2011, Chengdu, China and extended version is accepted for International Journal of Machine Learning and Computing (IJMLC)**.**

- **Sultan Daud Khan**, Hyunchul Shin, "*Effective Memory Access Optimization by Using Memory Delay Modeling, Memory Allocation, and Buffer Allocation*" published in IEEE International System on Chip Conference, ISOCC 2009, Busan, South Korea

- **Sultan Daud Khan**, Hyunchul Shin, "*Cycle Accurate Memory Delay Modeling for Off-Chip DRAMs*" published in SOC conference , Cheonbuk National University 2009, South Korea

Briefly list the most recent professional development activities:

- Member of Laboratory Assessment Committee.

Turki F. Al-Somani

Education – degree, discipline, institution, year:

- Ph.D. in Computer Science and Engineering, King Fahd University of Petroleum and Minerals, Dharan, Saudi Arabia, 2006.
- M.S. in Electrical and Computer Engineering, King Abdul Aziz University, Jeddah, Saudi Arabia, 2000.
- B.S. in Electrical and Computer Engineering, King Abdul Aziz University, Jeddah, 1997.

Academic experience:

- Associate Professor, Computer Engineering Department, Umm al-Qura University, Makkah, Saudi Arabia, 2011 – Now.
- Dean, Faculty of Engineering, Al-Baha University, Al-Baha, Saudi Arabia, 2010 – 2011.
- Adjunct Assistant Professor, Department of Electrical and Computer Engineering, University of Victoria, Canada, 2009 – 2012.
- Assistant Professor, Computer Engineering Department, Umm al-Qura University, Makkah, Saudi Arabia, 2006 – 2010.
- Research Assistant, Computer Engineering Department – Cryptographic Hardware Design & Analysis, KFUPM, 2004 – 2006.

Non-academic experience:

- Senior IT Consultant in many governmental and private institutes.
- IT Director, Information Technology Center, Umm Al-Qura University, Makkah, Saudi Arabia, 2007 – 2010.
- Network & Operating System Manager, Information Technology Center, Umm Al-Qura University, Makkah, 2001 – 2002.
- Product Manager, Information & Communication Enterprise Solutions – Voice & Data Networks, SIEMENS, 2000 – 2001.

Certifications or professional registrations:

- SIEMENS HiPath Qualification Program, 2001.
- CCDA (Cisco Certified Design Associate), 2001.
- CCNA 2.0 (Cisco Certified Network Associate), 2000.
- MCSE (Microsoft Certified System Engineer), 2000.

Current membership in professional organizations:

- IEEE Computer Society, Senior Member.
- Association of Computing Machinery (ACM).
- The Institute of Electronics, Information and Communication Engineers (IEICE).
- International Association for Cryptologic Research (IACR)
- Center of Excellence in Information Assurance (COEIA), King Saud University.

Honors and awards:

- Elected to the grade of *IEEE Senior Member* in June 2011.

Service activities (within and outside of the institution):

- Chairman of the External Advisory Board Committee of the department.
- Member of the ABET steering Committee of the department.
- Member of the Curriculum Revision Committee of the department.
- Reviewer for many local and international journals and conferences.

Briefly list the most important publications from the past five years:
Patents -

- **Turki F. Al-Somani** and Alaaeldin Amin, Method for elliptic curve scalar multiplication, (USPTO Application #: 20090214023).
- **Turki F. Al-Somani** and Alaaeldin Amin, Method for elliptic curve scalar multiplication, (CIP of USPTO Application #: 20090214023).
- **Turki F. Al-Somani** and M. K. Ibrahim, Method for Generic-Point Parallel Scalar Multiplication without Precomputations, (Filed in 30/12/2010).

Journal Papers -

- Hilal Houssain and **Turki F. Al-Somani**, "Elliptic Curve Cryptoprocessor Implementation on a Nano FPGA: Interesting for Resource-Constrained Devices", to appear soon in the International Journal of RFID Security and Cryptography, 2012.
- Hilal Houssain, Mohamad Badra and **Turki F. Al-Somani**, "Comparative Study of Elliptic Curve Cryptography Hardware Implementations in Wireless Sensor Networks", to appear soon in the International Journal of RFID Security and Cryptography, 2012.
- Hilal Houssain, Mohamad Badra and **Turki F. Al-Somani**, "Software Implementations of Elliptic Curve Cryptography in Wireless Sensor Networks", to appear soon in Journal of Communication and Computer, 2012.
- **Turki F. Al-Somani**, Fast Elliptic Curve Scalar Multiplication with Pipelined Redundant Representation Multiplier, to appear soon in Umm Al-Qura University Journal for Engineering, 2012.

Conference Papers:

- **Turki F. Al-Somani** and Hilal Houssain, "Implementation of $GF(2^m)$ Elliptic Curve Cryptoprocessor on a Nano FPGA", In the Proc. of the 6th International Conference on Internet Technology and Secured Transactions (ICITST 2011), Abu Dhabi, United Arab Emirates (UAE), pp. 7 – 12, , 11-14 December, 2011.
- Hilal Houssain, Mohamad Badra and **Turki F. Al-Somani**, "Hardware Implmementations of Elliptic Curve Cryptography in Wireless Sensor Networks", In the Proc. of the 6th International Conference on Internet Technology and Secured Transactions (ICITST 2011), Abu Dhabi, United Arab Emirates (UAE), pp. 1 – 6, 11-14 December, 2011.
- Fayez Gebali and **Turki F. Al-Somani**, "Finite Field Multiplication Using Reordered Normal Basis Multiplier," In the Proc. of the 6th International Conference on Broadband and Wireless Computing, Communication and Applications, Technical University of Catalonia, Barcelona, Spain, pp. 320 – 326, October 26-28, 2011.

Briefly list the most recent professional development activities:

- ABET Accreditation workshop, College of Computer and Information Systems, Umm Al-Qura University.

Appendix C – Equipment

Laboratory Name	Equipment Details
Advanced Logic Design Lab	12 National Instruments Elvis II Plus Trainers 12 Personal Computers
Computer Networks Lab	22 PCs 4 Switches 16 Penril Datability network 5 Cisco catalyst switches 3560 series 5 Cisco 2900 series routers
Digital Electronic Systems and Circuits Lab	12 National Instruments Elvis II Plus Trainers 12 Personal Computers
Switching Theory Lab	24 IC-Trainer W5101 30 Project Boards 20 jump wire kits
Microprocessor Lab	10 Flight 8086 Experiment Boards 10 LED Application Boards 10 General Application Boards 15 PCs Projector
Microcomputer System Design Lab	50 FPGA Boards 04 FLT-32 Trainer Boards 25 All in One EEDT 6.0 Kits 12 Personal Computers
Computer Communications 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 8 Star-Quad cable 8 Function generators 9 Oscilloscopes 12 ISDN Phone sets 5 ISDN Modular 7 ISDN Test bags

Project Lab	1 CNC PCB designing machine 3 drilling machines 3 tanks (for making PCBs) 2 Extech data logging light meters 4 Garmin GPS 2 QinetiQ Q20 HS Demo Kit 1 Dataman EPROM programmer 1 Picoscope PC oscilloscope 1 Extech Heavy duty light meter 1 Extech sound meter 2 Paladinpro PC Cable Check 2 Bluetooth remote controllers 3 boxes of RFID kits Intelligent Universal Programmer 3 Mimio digital whiteboard recorders

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

Dr. Bakri bin Matouq Assas
Rector

A.3 Name and title of the person submitting the self-study report.

Dr. Fahd Aldosari
Dean
College of Computer & Information Systems

Dr. Omar Sonbul
Chairman
Department of Computer Engineering

A.4 Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations.

The Mechanical and Electrical Engineering Departments of the University were evaluated by ABET-EAC in the year 2011. Whereas some of the other colleges and departments of the University are either accredited individually or are in the process of accreditation.

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 three academic departments with two academic programs. These are:

1. Computer Engineering
2. Computer Science
3. Information Systems

The administrative body of the College is composed of:

1. Dr. Fahd Al-Dosari, Dean
2. Dr. Adnan Abuarafah, Vice Dean
3. Dr. Emad Felemban, Vice Dean for Research and Graduate Studies
4. Dr. Khalid Khayyat, Vice Dean for Academic Affairs

The department chairs are:

1. Dr. Omar Sonbul, Chairman Computer Engineering Department
2. Dr. Ahmed Kattan, Chairman Computer Science Department
3. Dr. Abdulqader Sahrawi, Chairman Information Systems Department

D. Academic Support Units

Support Unit (Department)	Unit Head
Computer Science	Dr. Ahmed Kattan
Mechanical Engineering	Dr. Talal Mandoura
English Language Center	Dr. Sultan M. Alshareef
Physics	Dr. Saud H. Allihyani
Deanship of Preparatory Year	Dr. Abullah A. Abdullah
Dawah and Islamic Culture	Dr. Hasan A. AlAbdel-Hadi
Chemistry	Dr. Khalied S. Khairo
Arabic Language and Grammar	Dr. Hasan M. Alqarni
Electrical Engineering	Dr. Ahmad Nahhas
Kitab and Sunna	Dr. Ghaleb M. Alhumaidi

E. Non-academic Support Units

E.1 Deanship of Admissions and Registration (Responsible: Dr. Mohammad Al-Hazmi – Dean)

This unit has following sub-units:

E.1.1 Admission and statistics:

This unit is concerned with the acceptance of new students and all the other activities that relate to it such as organizing interviews, evaluation of certificates, preparation of the new students ID cards, and coordination with the university faculties with reference to acceptance conditions that relate to their respective departments. This unit is also responsible to maintain the statistics of students.

E.1.2 Registration, Time-Tables and Computer:

This administration prepares the academic calendar, time-tables and other related registration activities such as examination results, withdrawals, and all computer-related matters.

E.1.3 Documents, Graduation and Certificates:

This administration is responsible for the follow up of graduation requirements for each department and the preparation of final documents and certificates. It is also responsible for translation of university certificates and other documents for presentation to countries outside the Kingdom.

E1.4 Academic Guidance:

This administration is responsible for the academic guidance of new students and matters related to transfer of students from one department to another or, from one university to another.

E.1.5 Financial Aid:

The financial aid administration deals with financial aid eligibility and monthly payments, and all other decisions on different types of payments and allowances.

E.1.6 Administrative Affairs:

This department is responsible for the administrative affairs of the deanship such as the performance of the staff, typing, archiving and photocopying services.

E.1.7 Academic Follow-Up and Monitoring:

This department is responsible for the follow-up and monitoring of students' educational performance in the light of academic standards. The department also prepares reports on suspended students and submits to the admissions and registration committee to take necessary actions.

E.2 Deanship of Library Affairs (Responsible: Dr. Adnan M. Al-Shareef – Dean)

The Central Library serves the University community and Makkah region in various academic, cultural and research activities. The Central Library has the most important material on the Two Holy Mosques of Makkah and Madina in the Hall of The Custodian of The Two Holy Mosques. The Central Library embraces all information resources such as books, periodicals, documents, manuscripts, audio-visual material, maps and atlases, and other electronic material. These services are provided by the following departments:

1. The Department of Library Users Services.
2. The Department of Scripts, Dissertations, and Audio-visual Materials.
3. The Department of Technical Procedures.
4. The Department of Exchange and Official Publications.
5. The Department of Special Collections.
6. The Hall of the Custodian of the Two Holy Mosques.
7. The Teaching Staff Hall.
8. The Department of Planning, Follow Up, Organizations and Research.
9. The Computer Department.

E.3 Deanship of Information Technology (Responsible: Dr. Fahad Al-Zahrani – Dean)

This unit provides the required IT support to the University faculty, staff and students. This includes a high speed Internet on fiber optic, infrastructure and environment to support remote lecturing specially for the girls' campus, software, servers, and PCs etc.

E.4 Deanship of Student Affairs (Responsible: Dr. Ali A. Al-Zahrani – Dean)

This Deanship is responsible for the welfare of students. The objectives of the Deanship of Student Affairs are:

1. To promote healthy social relations between the students on the basis of the noble Islamic principles.
2. To promote self-reliance, leadership and objective thinking among students by giving them the opportunity to be responsible for planning, execution, follow up and evaluation of their activities and the services provided to them.
3. To help the students attain the best academic progress by discovering the problems they might face and solving them.
4. To enhance the spirit of teamwork, cooperation and mutual support.
5. To Identify gifted students and give them special attention and guidance.
6. To help the students utilize their leisure time in activities that suit their interests and needs, and contribute to their behavioral and mental development.

To achieve these objectives, the Deanship provides the following services/facilities to students:

a. Students' employment
b. Students' mail services
c. Students' housing
d. Summer centers
e. The Guest House (Dar Al-Diyafa)
f. Students' catering
g. Scouts

The students' activities include four departments that consist of fourteen clubs. These are as follows:

1. The Department of Cultural Activities. It includes the following clubs:
    - The Students' Cultural Club
    - The Islamic Awareness Club
    - The Students' Theater
2. The Department of Social Activities. It includes the following clubs:
    - The Students' Social Club
    - The General Students' Club
    - Al-Noor Club for Blind Students
    - The Foreign Students Club
3. The Department of Public Relations and Media For Student's Activities. It includes the following clubs:
    - The Information Office (Manar Al-Jamm'ah)
    - The Public Relations Office
    - The Light Photography Club
4. The Department of Scientific and Aesthetical Activities. It includes the following clubs:
    - The Scouts Club
    - The Scientific Inventions Club
    - The Aesthetical Talents Club
    - The Computer Club

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	1433	FT											
		PT											
1	1432	FT						214			51		
		PT											
2	1431	FT	31					265			59		
		PT											
3	1430	FT	25					291			81		
		PT											
4	1429	FT	25					357			84		
		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]: 2012-13

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[3]	-	-	-
Faculty (tenure-track)	17	1	11.75
Other Faculty (excluding student Assistants)	11	1	11.5
Student Teaching Assistants	5		5
Student Research Assistants	1		1
Technicians/Specialists	3		3
Office/Clerical Employees	2		2
Others[4]	-	-	-

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] 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. For faculty members, 1 FTE equals what your institution defines as a full-time load.

[3] 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.

[4] Specify any other category considered appropriate, or leave blank.

Appendix E – Policy on Regulations of Study and Examinations

Policy on Regulations of Study and Examinations for Undergraduate Studies and Implementation Rules at Umm Al-Qura University

According to the Regulations of Study and Examinations at UQU, the University Council, according to recommendations sent by different colleges' councils, determines the number of newly admitted students each year. The implementation rules of the admission policy states that any applicant for admission to the University must satisfy the following requirements

New Students Admission

Article #2:
UQU University Council decides the number of students to be accepted for admission for the coming academic year based on the proposals of councils of the colleges and the concerned authorities.

Implementation Rules of Article #2:
Deanship of Admission and Registration prepare a presentation in coordination with colleges for the University Council in which the numbers of students to be accepted for admission for next academic year are proposed.

Article #3:

a. The applicant should have his secondary school certificate or an equivalent certificate from inside or outside the Kingdom of Saudi Arabia.
b. The applicant should have obtained the secondary school certificate, or its equivalent, within less than five years prior to his application. However, the University may waive this condition if the applicant has a persuasive explanation.
c. The applicant should have a certificate of good conduct.
d. The applicant should successfully pass any examinations or interviews deemed necessary by the University Council.
e. The applicant must be medically fit.
f. The applicant must obtain the approval of his employer, if he is an employee in any government or private institution.
g. The applicant must satisfy any other requirements specified by the University Council at the time of application.

Implementation Rules of Article #3:

a. For those applicants who are working in any government institution, the approval by the employer should be in accordance with the implemented courses schedule in the UQU department of concern.
b. The applicant should not have been suspended from UQU or any other university for academic or conduct related reasons.
c. If the annual academic system is applied in the department of concern, the applicant should have obtained the secondary school certificate, or its equivalent, within less than two years. However, the College Council may waive this

condition, unless it is more than five years, if the applicant has a persuasive explanation.

Article #4:
A Comparison based on the results of students' grades in their secondary school examinations, as well as the results of the interviews and the admission examinations, if applicable, may be performed for all the students who satisfy all admission requirements.

Implementation Rules of Article #4:
Deanship of Admission and Registration performs comparison on the results of students' grades in their secondary school examinations, as well as the results of the interviews and the admission examinations, if applicable, for all the students who satisfy all admission requirements and tabulates the results. The students are informed about their results after verification by His Excellency, the Rector of UQU.

Study System:
Article # 7: Term (Levels) system
The Academic year is divided into two main terms, and there may be a summer term, whose duration is half that of the main term, and the graduation requirements are formulated to achieve the degree at the levels in accordance with the study plan approved by university council.

Implementation Rules of Article #7
The departments prepare study plans in coordination with the Deanship of Admission Registration and complete its procedures from Scientific Council in order to get approval from university council.

Graduation
Article #19:
A student is graduated if he successfully completes all the requirements of graduation according to his study plan with a minimum CGPA of not less than the passing CGPA (1.00) by the time of graduation. If the student has less than the passing CGPA (1.00), given that he has already passed his program requirements, the College Council can assign certain courses to raise the CGPA to the passing level based on the recommendation of the Department Council.

Implementation Rules of Article #19:
1. During the term in which a student is expected to complete all the requirements of graduation:
2. The Deanship of Admission and Registration provides the department with copies of the academic records of all candidates for graduation, during the first five weeks of the term in which the student is expected to graduate. The department reviews all the academic records to ensure that students have completed all graduation requirements, and approve it by both the academic advisor and the head of the department.

3. The department then gives a list of the students who are qualified for graduation to the Deanship of Admission and Registration, during the first eight weeks of the term in which the student is expected to graduate.
4. The Deanship of Admission and Registration reviews the graduation recommendations, and verifies that the student has met the graduation requirements with a minimum CGPA of 1.0 (pass) by the end of the term of graduation.
5. The Deanship of Admission and Registration prepares a list of the students who are expected to be graduated and recommends it to the University Council.
6. The Deanship of Admission and Registration issues the transcripts and certificates for graduated students.

Suspension from University
Article#20:
A student is suspended from the University in the following conditions:

a. If the student gets a maximum of three consecutive warning due to having a *Cumulative Grade Point Average* (CGPA) lower than (2.00 out of 5.00, or 1.00 out of 4.00). However, the University Council, based on a recommendation from the College Council, may give the student a fourth chance to study some of the offered courses in order to improve his CGPA.
b. If the student failed to meet the requirement of graduation within a maximum period of time equals to one and a half time the normal period of the program. However, the University Council may give the student an exceptional chance to meet the graduation requirements within a maximum period of time equal to double the period of the original program.
c. The University Council has the right to take corrective actions for the students whom cases fall within the two abovementioned points by giving them an exceptional chance of a maximum of two terms.

Note that the normal period of the program, including PYP, is 10 terms (semesters).
The *Implementation Rule of Article#20available at UQU URL address:* (academic suspension) are as follows:

1. At the beginning of each term, the Deanship of Admission and Registration issues the Academic Records, which reflects the obtained grades of the studied courses according to his study plan and the number of academic warning, if any, for each student.
2. A student is suspended from the university, according to a resolution from the Deanship of Admission and Registration, if any of the two following cases take place:
   a. The student receives three consecutive academic warnings due to having a CGPA less than 1.0/4.0. However, the University Council, based on recommendation from the College, has the right to give the student a fourth opportunity to improve his CGPA after being suspended for one term.

b. The student is not able to fulfill the program requirements within a maximum period of one and a half time the normal period of the program. However, the University Council has the right to give the student an exception in which the student can take up to double the original program period to fulfill the program requirements.

Transfer

Article # 42: Transfer from one University to the other

The policy *(Article #42: Transfer form one University to the other)* which regulates the transfer of students from other universities to UQU states that:

a. The student should have studied at a recognized university or college,
b. The student should have not been suspended from the university he is transferring from due to disciplinary reasons, and
c. The student should fulfill the conditions required by the university council.

The *Implementation rules* for article #42 states that the transfer of a student from a recognized university to UQU may be accepted under the following conditions:

1. The student should not have been suspended from the university he is transferring from due to disciplinary or academic reasons.
2. The student should have not spent more than six terms in the university he is transferring from.
3. The transfer student should study at least 60% of the required courses at UQU.
4. The student should present to the Deanship of Admission and Registration the transfer application. Then, the transfer application along with copies form the complete student file is referred to the concerned College, after the fulfillment of the Deanship of Admission and Registration's conditions.
5. All the conditions of the college, which the student is applying to be transferred to, are applied.
6. It is required to get the approval of the dean of the college and the head of the department the student is applying to be transferred to.

Courses Equivalency:

Article # 43:

College Council grant equivalency transfer credits for the courses that the transferring students has studied outside the university (UQU) based on the recommendations of the department offering those courses. The equivalent courses are documented in the academic record of the transferred student without using them for CGPA computation.

Implementation Rules for Article #43:

1. The student applies to the Deanship of Admission and Registration to get equivalency credits for the course he has studied outside the university (UQU) attached with the original academic record and the detailed certified description of all the items of the courses studied by the student.

2. The application is referred to the concerned department to take over for the courses equivalency.
3. No Equivalency credits will be granted for the courses in which the student has obtained a letter grade of less than 'C'.
4. After the approval of the college council the department returns the results of the courses equivalency to the Deanship of Admission and Registration.

Transfer from on college to another College at UQU

Article # 46:

The transfer of a student from one college to another college within the UQU is allowed as long as he satisfies the conditions required by the university council.

Implementation Rules for Article #46:

The Implementation rules for this policy states that a student may transfer from one college to another within the University, in accordance with the following rules:

1. It is allowed for students to be transferred from one college to the other according to the following conditions:
   a. The student should have already spent not less than one term (semester) in his college, not including the postponed or excused terms (semesters).
   b. The student should have not been already transferred from a college to another college during his studies at UQU, however, the Academic Coordination Committee has the right to make exceptions.
   c. The remaining part from the student's study period should be enough to meet the graduation requirements, calculated according to his old field of specialization.
   d. The Head of the Department and the Dean of the College, which the student will transfer to, should accept the transfer.

2. The student should fill the particular transfer form and should return the completed form back to the Deanship of Admission and Registration for completion of transfer procedures.

Article # 47:

All the courses studied at both the colleges by the student, transferring one college to the other, are documented in his academic record. It also includes the grades, Term GPAs, and CGPA obtained throughout his study at the university.

Transfer from One Specialty to another inside a College at UQU

Article # 48:

A student may be allowed to transfer from one specialty to another inside a college at UQU after the approval of the dean of the college concerned in accordance with the rules laid down by the university council.

Implementation Rules for Article #48:

A student may transfer from one specialty to another inside a college at UQU in accordance with the implementation rules of article # 46 as above.

Appendix F – Laboratory Safety Guidelines

Umm Al-Qura University

Computer Engineering Department

LABORATORY SAFETY GUIDELINES

A. General Laboratory Safety Rules

1. Personal Safety

- Be familiar with the electrical and fire hazards associated with your workplace.
- Be as careful for the safety of others as for yourself. Think before you act.
- Be tidy and systematic.
- Avoid bulky, loose or trailing clothes. Avoid long loose hair.
- No one is allowed to enter in the lab area bare foot due to increased risk of electric shock.
- Remove metal bracelets, rings or watchstraps when working in the laboratories.
- Avoid working with wet hands and clothing.

2. Food, Beverages and Smoking

- Due to the increased risk of electric shock, no drinking of beverages, consumption or storage of any kind of food is allowed in the laboratory.
- Smoking is prohibited in all laboratories in all timings.

3. Soldering

- No one is allowed to do soldering in any of the computer engineering laboratories except the graduation project design laboratory.
- Anyone doing soldering in the graduation project design laboratory must wear appropriate apparel, socks, gloves, covered shoes and safety goggles to prevent the possibility of severe burns resulting from the splashing or dripping of hot liquefied solder into the face and eyes or on to the exposed skin on the chest, hands, legs, and feet.
- Students who are not so properly attired for these tasks will NOT be allowed to perform any type of soldering in the graduation project design laboratory.

4. Laboratory Operating Hours

- Students are never allowed to work alone in any lab area other than scheduled laboratory operating hours unless either a Lab T/A or Course Instructor is present inside that lab area.
- The laboratory operating hours for students are posted on the entrance doorway and on the notice board of computer engineering department.

5. Power Supply Related Safety

- Voltages above **50-VAC** or **120-VDC** are always dangerous.
- Extra precautions should be considered as voltage levels are increased.
- Never make any changes to circuits or mechanical layout without first isolating the circuit by switching off and removing connections to power supplies.

6. Laboratory Equipment

- Lab equipment may not be removed from the Computer Engineering lab areas without the permission of the Laboratory Supervisors.
- Laboratory bench equipment (except for some lab bench computers) must be turned off before closing down the lab area for the day.
- Never open (remove cover) of any equipment in the laboratories.
- Never "jump," disable, bypass or otherwise disengage any safety device or feature of any equipment in the laboratories.
- Laboratories shall be locked when unoccupied.

7. Waste Management Safety

- Know the correct handling, storage and disposal procedures for batteries, cell, capacitors, inductors and other high energy-storage devices.

8. Equipment Safety

- Before equipment is energized ensure, circuit connections and layout have been checked by a Teaching Assistant (TA) and all colleagues in your group has given their consent.
- Experiments left unattended should be isolated from the power supplies. If for a special reason, it must be left on, a barrier and a warning notice are required.
- Equipment found to be faulty in any way should be reported to the lab supervisor and taken out of service until inspected and declared safe.

9. Equipment Accessories

- Use extension cords only when necessary and only on a temporary basis.
- Request new outlets if your work requires equipment in an area without an outlet.
- Discard damaged cords, cords that become hot, or cords with exposed wiring.

B. Electrical and Fire Emergency Responses

1. Police, Fire or Medical Emergency

- Use the telephone located in the laboratory area and press **0-996** to notify police, fire, and ambulance for emergency help.
- Everyone present in the laboratory area shall be familiar with the locations and operation of safety and emergency equipment, including but not limited to, fire extinguishers, first aid kits, emergency power off system, fire alarm pull stations, and emergency telephones.

2. Electric Shock

- When someone suffers serious electrical shock, he may be knocked unconscious.
- If the victim is still in contact with electrical current, immediately turn off the electrical power source.
- If you cannot disconnect the power source, depress the Emergency Power Off switch.
- Do not touch a victim that is still in contact with a live power source; you could be electrocuted! Have someone call for emergency medical assistance immediately. Administer first-aid, as appropriate.

3. Electrical Fire

- If an electrical fire occurs, try to disconnect the electrical power source, if possible.
- If the fire is small and you are not in immediate danger; and if you have been properly trained in fighting fires, use the correct type of fire extinguisher to extinguish the fire.
- When in doubt, push in the Emergency Power Off button.
- **NEVER use water to extinguish an electrical fire**.

4. Emergency Power Off

- Every lab is equipped with an Emergency Power off System.
- When this switch is depressed, electrical power to the lab will shut off, except for lights.
- Only authorized personnel are permitted to reset power once the Emergency Power Off system has been engaged.

5. Building Evacuation in Emergency

- Everyone present in the laboratory should be familiar to emergency exits & way out plans.
- Use the nearest exit doorway from lab area closest to the stairwell to exit the building.
- Follow the Emergency Exit Signs posted in the hallways. Do not use elevators.
- Lab Teaching Assistants (T/As) or Instructor shall make sure all persons are out of the laboratory area and follow the directions posted at each doorway to the laboratory area.

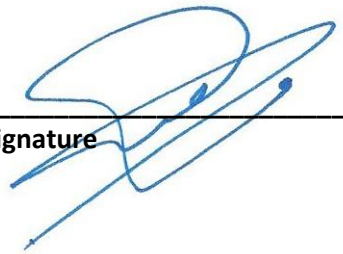
The above general laboratory safety rules are designed to safeguard you and your co-workers, fellow students and colleagues and are a minimum requirement for individuals working in the computer engineering laboratories at Umm Al-Qura University, Makkah Al-Mukarramah. Specialized training and rules may apply depending on type and scope of activities involved.

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. Fahd Aldosari**_____
Dean's Name (As indicated on the RFE)



_____ _**15 June, 2013**_____
Signature **Date**