Ministry of Higher Education & Scientific Research

University of Baghdad

College of Engineering

Environmental Engineering Department

Reviewed Self-Assessment Report
Environmental Engineering Program
Environmental Engineering Department
College of Engineering –Baghdad University

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Preface

The present report is a review of the first self-assessment report written for the Environmental Engineering Department- College of Engineering –Baghdad University. It represents a modification of the first report written at September / 2011. The two reports represent an important step towards achieving Quality Assurance in accordance with international standards. In writing the present report, we have relied mainly on the comments and recommendations made by the reviewers in Erbil Workshop under the guidance of UNESCO Experts and Staff, and support of the Iraqi Ministry of Higher Education and Scientific Research. . Also, it involves up-dating to the information in the first report,

This report includes an introduction to structure, and program history. The first section covers the Students Criterion and deals with information about the undergraduate and graduate students.

The second and third sections include the Program Educational Objectives and the Program Outcomes. The fourth section is the Continuous Improvement Criterion.

The fifth section includes Curriculum Criteria while the sixth section deals with the Faculty members. The seventh section describes the facilities in the Department.

The eighth section deals with the Institutional Support. Finally, The ninth section describes the scientific researches and the outboard relationships in the fields of the relation between scientific research and teaching, faculty researches, researches supported by the Government Ministries and Institutes, the relationship with the Dean office, society, states offices, and the International Universities.

Each section of the report includes the SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) of the department and Recommendations for each Criterion. We tried to give the precise image of our department and we hope that we will provide the experts in UNESCO Iraq office with the realistic diagnoses of the situation in order to help us to reach the Quality Assurance of the Educational System.

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1-Introduction

Forward

The Department of Environmental Engineering at University of Baghdad - College of Engineering has dedicated faculty applying state of the art technologies, utilizing excellent facilities, small classes, and a supportive staff to help students in the department to reach their academic and career goals. Our graduates, who can be found in agencies and businesses throughout the country, are the best indicator of our dedication to student success.

Program History

Environmental Engineering Department at the College of Engineering- Baghdad University began as a postgraduate program at the Civil Engineering Department in 1986. In 1997, the present department was established as the Department of Environmental Engineering for postgraduate studies. Undergraduate studies were included in 2005 making the Department a full-fledged one at the College of Engineering.

Comprehensive curricula were prepared for the undergraduate studies to ensure that basic theoretical and applied aspects of environmental engineering are covered. The B.Sc. degree awarded by the department well-prepares its holder for his/her professional or academic career. Graduates are cautioned though that there is no substitute for experience. Their degrees are being gate-passes for the long arduous road engineering capability. Success in achieving this goal will depend not only on hard work but also on proper utilization of acquired engineering principles and knowledge as well as the systematic methodology to problem tackling. This approach results in proactive graduates willing to serve both state and society in various environmental engineering fields.

The Scientific Specialties and the Awarded Degrees

The department offers engineering programs leading to the degree of Bachelor of Science (B.Sc.), Master of Science (M.Sc.) and Degree of Philosophy (Ph.D.) in Environmental Engineering.

The annual system of study is followed in the department for the (B.Sc.) undergraduate study. The study period is 4 years with 158 units distributed over the four years of study. For the postgraduate study, the semester's system of study is followed in the department. The minimum period of study is 2 years for the M.Sc. and 3 years for the Ph.D. degrees. The first year for both studies is for courses with two semesters. The second year for M.Sc. is for thesis work. The second and third years for Ph.D. are for dissertation work. The Ph.D. students had to pass a comprehensive exam before they can register on a dissertation.

Educational program and Department policy

The main department educational program is to convert the student’s way of thinking to well organized and more practical in handling engineering problem. The student prepared to face any engineering problem in any field and solves the problem in a scientific engineering manner .In addition, the department provides the student with a principle base of knowledge.

The Department of Environmental Engineering aspires to be renowned in Iraq and the region through setting and working hard to achieve the following goals regarding students, members of

staff, cooperation with state/society and interaction with universities/ institutes in developed countries.

Students

- Instilling high ethical and professional standards over and above the aforementioned engineering science quality.
- Enhancing leadership tendencies through encouragement of team-work, inter-discussions and amicable behavior.
- Encouraging and rewarding scientific and technical quest useful to social needs.
- Appreciating and caring for students with outstanding potential / achievements.
- Emphasizing a conductive environment for work, study, discussions and exchange of information.

Faculty members

- Attracting capable academic / managerial personnel to join the department.
- Enhancing quality of staff members with respect to accomplishments.
- Encouraging scientific research work; giving priority to sound applied research of practical use.
- Utilization of individual staff members according to qualification, capability and experience.
- Encouraging staff members to interact with state / society regarding various aspects of environmental engineering.

Cooperation with State / Society

- Continuing education seminars for staff members of state establishments.
- Consultations for state establishments / private sector.
- Basic, detailed and designs checking and overseeing execution of environmental engineering projects.
- Evaluation of scientific research works and patents.
- Undertaking the resolution of specific practical problems through contractual agreement with concerned state establishments via postgraduate research work.
- Establishment of a special committee within the department to activate, coordinate and follow-up all aspects of cooperation with state / society.

Interaction with Foreign Universities / Institutes

The department intends to sign partnership agreements with universities and institutes in developed countries to exchange staff, knowledge, experience and most important to keep up with the rapid pace of development in the increasingly crucial field of the environment.

Organization and Department Management
Department Structure

Figures (I) and (II) represent diagrams of the structure of the Environmental Engineering Department.

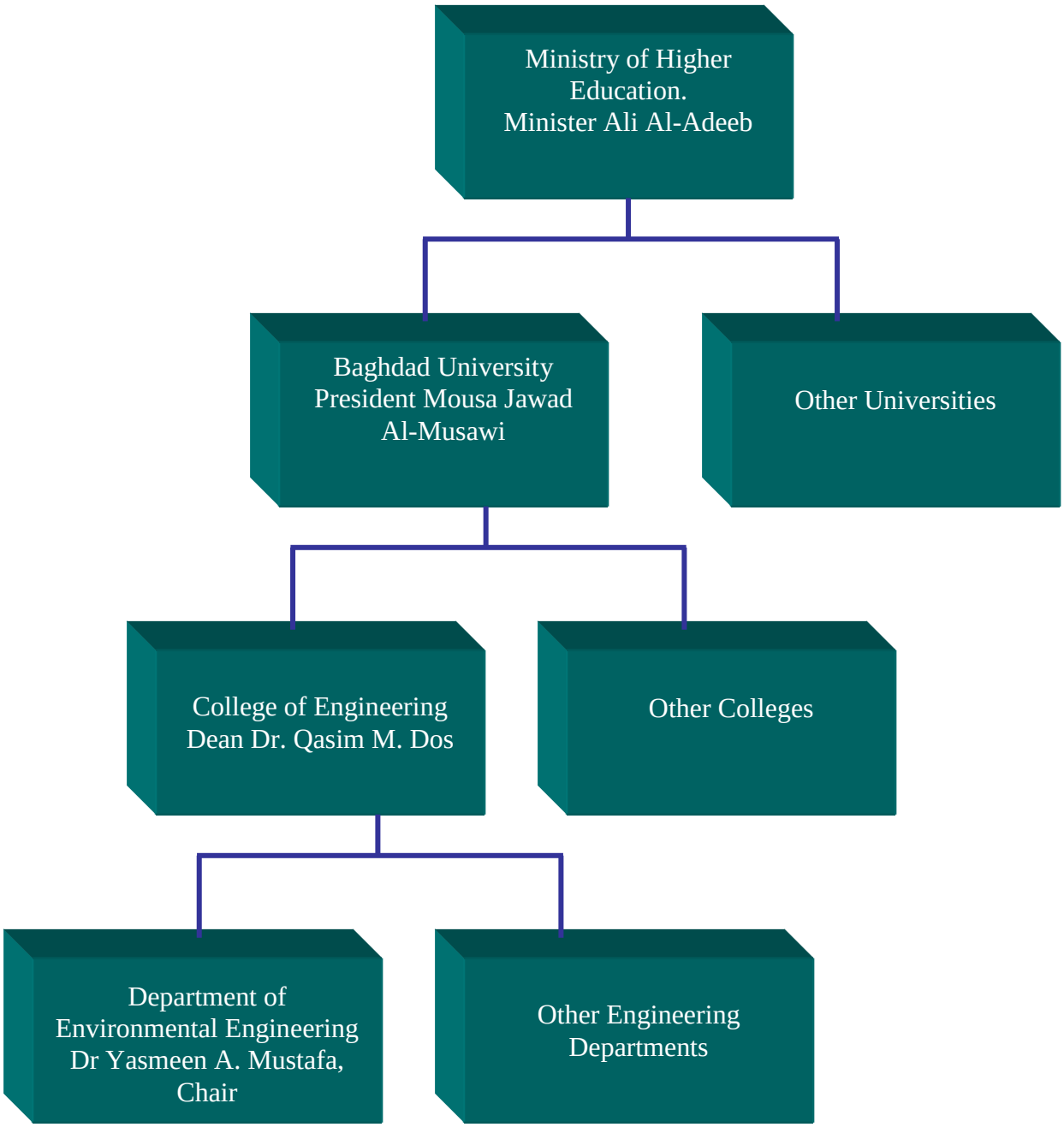

Fig (I): The Structure represents the junction between the Institutes and the Ministry of Higher Education and Scientific Research

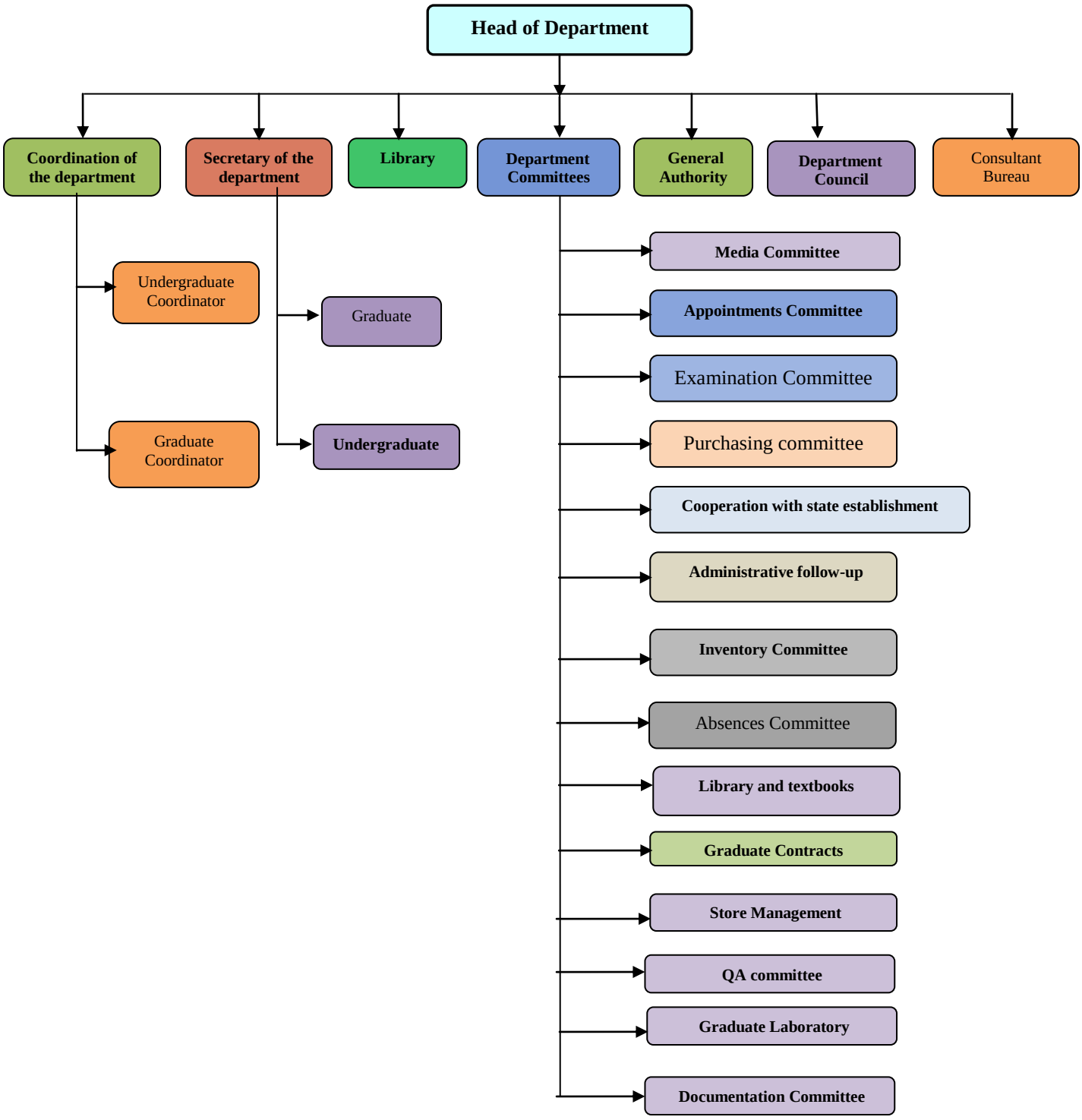

Fig (II): The Structure of the Environmental Engineering Department

Each person in this structure has his duties and responsibilities that are specifically defined so that the department may achieve its objectives and perform its work ideally as a result of the integration between the personal.

The scientific committee in the Department is formed annually and requires activation work better in many aspects, including follow-up completed courses by faculty, follow-up activities of students, holding regular meetings to raise specific recommendations to the College Counsel. Also, follow the curriculum and is consistent with global developments

Evaluate the effectiveness of the administrative organization of the department and informal practices

Performance is monitored in the organizational structure through administrative leadership in the department and employee performance is evaluated annually. This evaluation contains speed of performance and quality in work and complies with the instructions and several other points.

Comparison the administrative work in the Department with those in other countries, such as Europe and the United States

No face comparison between this and that, work is administrative in Iraqi colleges doomed being represented an episode of the Iraqi state and therefore must undergo to the instructions of the Ministry of Higher Education and Scientific Research. While, the work in foreign universities, especially in Europe and United States, subjected to the policy of supply and demand and the independence of Universities and therefore foreign universities are in a constant state of evolution to serve the community and students.

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Self Assessment Report

The report outlines the assessments, analysis and recommendations for changes and improvements. The criteria fall into General criteria, applicable to any engineering program, numbered 1-8, and Program criteria, specific criteria (Criterion 9), which are particular to each type of program. A summary of the general criteria includes:

1. Students, including student performance, advising, and evaluation;
2. Program Educational Objectives, which must be published, consistent with the program mission, based on the needs of the program's constituents (the profession), and be periodically assessed and evaluated;
3. Program outcomes, a set of eleven skills and knowledge sets that engineering students are expected to have upon graduation;
4. Continuous improvement;
5. Curriculum, including a year of basic sciences and mathematics, one and a half years of engineering topics, a general education component, and a major design experience that uses the knowledge and skills gained earlier;
6. Faculty, including faculty competence, appropriate qualifications, sufficient Authority, and sufficient numbers;
7. Facilities, including enough classrooms, laboratories, and associated equipment to safely meet program objectives; and
8. Support, including sufficient funding and auxiliary staffing (secretaries, technicians, information technology, etc.) to support the program.

The program specific criterion (Criterion 9) varies with each discipline, but generally includes some additional specifics on the curriculum and/or the faculty.

CRITERION 1. STUDENTS

Undergraduate students

Student Admissions

An applicant for admission to an undergraduate program of Environmental Engineering Department, College of Engineering, University of Baghdad, must satisfy the following minimum requirements:

- The applicant should have an Iraqi secondary school certificate, or its equivalent, and majored in natural or technological sciences. The students must obtain high rate qualification for admission at engineering colleges.

-Acceptance is centrally controlled by the Ministry of Higher Education and Scientific Research.

-Distribution of students to the 12 engineering departments of the college of engineering, including the Department of Environmental Engineering, is made according to the capacity plan of the departments and the rating average of the applicants and their will. The capacity plan of the Department of Environmental Engineering in the last three years was 30 students. The number of students accepted in the Department is determined by the College Council based on the capacity and resources of the College.

-An applicant who has graduated from a secondary school outside Iraq must have completed twelve years of combined primary and secondary school studies from a recognized school. He or she is also required to provide an equivalency certificate from the Iraqi Ministry of Education.

Enrollment

Since 2005-2006, Environmental Engineering Program enrollment has ranged from 17 to 28 students. Table (1-1) shows the standardized test score and high school rank data for incoming students at Environmental Engineering Department for the last four years.

Table 1-1: History of admissions standards for freshmen admissions for past four years

Academic Year	Percentile Rank in High School (min)	Percentile Rank in High School (average)	Plan to accept students	Number of New Students Enrolled	Female to male ratio	Number of Transfer Students Enrolled	Number of Graduated Students
2010-2011	87.20	87.63	40	17	2:1	2	16
2009-2010	87.43	87.94	30	28	3:1	7	9
2008-2009	87.86	88.28	30	21	2:1	-	18
2007-2008	92.29	92.48	20	20	3:1	3	-

Evaluating Student Performance

Overview

Student performance in each course is evaluated by the faculty members, culminating with the assignment of a grade for that course. The number and types of graded assignments vary according to what is most appropriate for the course in question. These assignments are generally a combination of examinations, quizzes, homework, and/or laboratory reports. Projects and/or

oral presentations are required for some courses. Certain assignments are graded by a group of the faculty or instructors. The student also gives an oral presentation of his project work.

Educational Program

Credit Hour Definition

The Environmental Engineering Department follows the university wide standard definition of a credit hour. Environmental Engineering program has the annual system of study which is followed for all subjects, that is; the number of hours which is assigned for each subject is the same for both the first semester and the second semester. Excluding the final examination week, one semester credit hour represents one class hour per week with a stipulated duration of 50 minutes. Based on the definition of a 30-week per year, a typical three-credit hour class consists of 90 hours of contact hours.

Participant and Graduation Trends

Table (1-2) shows numbers of students and rate of success for the last four academic years.

Table 1-2: Number of the participant students and rate of success in Environmental Engineering Department for the last four academic years

Class	2010-2011		2009-2010		2008-2009		2007-2008	
	No. of students	Success Rate %	No. of students	Success Rate %	No. of students	Success Rate %	No. of students	Success Rate %
1st Class	12	92	26	92	26	92	22	91
2nd Class	22	91	28	89	18	94	10	100
3rd Class	15	93	17	94	10	100	18	100
4th Class	16	100	11	91	18	100	-	-
Total	65		82		72		50	

Monitor the Progress of Students

A student's progress is monitored by faculty advisors and the Examination Committee, they turn in final grades at the end of the academic year to the Examining Committee, and each student's transcript is checked to ensure that he / she remains in good academic position. If the cumulative average is below 50%, the student is failed and repeats the academic year. Grades are also forwarded to advisors, to assist them in monitoring student progress.

Advising of Students

Full-time faculty member in the Department of Environmental Engineering advise students. Each stage has one advisor. All new students are assigned to the program's undergraduate coordinator upon entering the program.

Table (1-3) shows ratio of the faculty members and their qualifications to the number of students during the last four academic years. Table (1-4) shows ratio of the faculty members according to their scientific rank to the number of students.

Table 1-3: Ratio of the faculty members and their qualifications to the number of students

Academic Year	Number of Students	Number of students per 1 faculty member (Ph.D.)	Number of students per 1 faculty member (M.Sc.)
2011-2012	67	5:1	11:1
2010-2011	65	5:1	8:1
2009-2010	82	6:1	10:1
2008-2009	72	6:1	9:1
2007-2008	50	4:1	6:1
2006-2007	40	7:1	5:1
2005-2006	22	2:1	3:1

Table 1-4: Ratio of faculty members according to their scientific rank to the number of students

Academic Year	Number of Students	Number of students per 1 professor	Number of students per 1 assistant professor	Number of students per 1lecturere	Number of students per 1 assistant lecturer
2011-2012	67	67:1	10:1	7:1	22:1
2010-2011	65	22:1	11:1	11:1	13:1
2009-2010	82	27:1	14:1	14:1	16:1
2008-2009	72	:24:1	12:1	12:1	14:1
2007-2008	50	17:1	8:1	8:1	10:1
2006-2007	40	13:1	7:1	7:1	8:1
2005-2006	22	7:1	4:1	4:1	4:1

Opinion of Students

During periods of the academic year, the student is required to meet with a faculty advisor and to review his/her progress. The Department of Environmental Engineering determined that a standardized advising process needed to be developed and posted to make students aware of the

correct procedures for being advised. The faculty meets and discusses one-on-one with the student about the long-term strategy of his/her curriculum.

Input from all four stages students were collected during 2012. The data show information of students regarding courses and professional advising by the program faculty. This form also provides feedback to the department about advising quality. The advising process and survey will be modified as necessary and adapted for regular use.

Transfer Students and Transfer Subjects

Admission of transfer students is done centrally by the college through a committee chaired by the Assistant Dean for Student Affairs and worked according to laws and legislations made by the Ministry of Higher Education and Scientific Research MOHESR. The transfer students are subjected to a scientific cut-off for the subjects taken at their institutions or universities. The Scientific Committee of the Department converts the subjects from the other institutions to actual Environmental Engineering subject numbers and posts them to the student's EE transcript.

If there are any questions regarding the suitability of a substitution or transfer subject, the transfer committee contacts the department. The department reviews the syllabus, subject description and other material to determine whether the subject is equivalent to one in our curriculum. The answer is sent to the Office of the Assistant Dean for Student Affairs for approval and placement in the student's permanent file. Table (1-5) shows the number of transfer students enrolled in the department over the past three academic years.

Table (1-5): Transfer Students for Past Four Academic Years

Academic Year	Number of Transfer Students Enrolled
2011-2012	-
2010-2011	2
2009-2010	7

Graduation Requirements

The student performance is determined through the process of assignment of academic status. A student's academic status will be determined at the end of academic year and will appear on the transcript that shows his / her achievements throughout his / her undergraduate study. To become eligible for a Bachelor of Science degree in an engineering program, a student must fulfill the academic status which includes the following requirements:

-Passing the four academic years successfully within the allowed study period (7 years).

-Passing the summer training successfully.

The College Records Office, Graduation Records and Examination Committees of the department maintain a complete file on the academic program and progress of each student. This file contains all academic records and related correspondence and documents for the student, including the following:

-Transcript, updated at the completion of the senior year with 36 Subjects and 158 Units.

-Computer-generated degree audit sheet tailored to the environmental engineering curriculum, which shows subjects completed in required categories and separate sections detailing math and science, humanities, engineering major, and other credits.

-Copies of all correspondence of an academic nature with the student, including letters of admission to the College of Engineering.
-Any exceptions to the rules filed by the student and any action taken on those exceptions.
-Any comments or instructions included by the student's faculty advisor, department chair, Engineering Records Office, or other pertinent source.
-Any supplementary information used in transcript evaluations of transfer credit.
-Staff of the Department maintains all files and other pertinent records for the academic program. They also provide assistance in reviewing files to ensure that students are following their program and meeting any conditions of their enrollment, such as reduced hours for students on probation.

Graduate Students

MSc Studies

An applicant for admission to MSc program of Environmental Engineering Department, College of Engineering, Baghdad University, must satisfy the following minimum requirements:

The applicant should have a bachelor degree (BSc) in:

1- Environmental Engineering
2- Chemical Engineering
3- Civil Engineering
4- Water Resources Engineering
5- Energy Engineering

This was followed for the past years. Starting from this year the Department will accept applicants have a bachelor degree in Environmental Engineering only.

-An exam held in the Department in about 10 subjects of the undergraduate courses taught during the 4 years. The final grade of the applicant divided to 20% for the exam 60% for the applicant grades in the BSc, 10% for the IC3 and TOEFL exams, and finally 10% for the creation (e.g., publishing a paper in International Journal with impact factor). The final competition grade is 100%.

-Acceptance is centrally controlled by the Ministry of Higher Education and Scientific Research

PhD Studies

An applicant for admission to PhD program of Environmental Engineering Department, College of Engineering, Baghdad University, must satisfy the following minimum requirements:

-The applicant should have MSc in Environmental Engineering.

-An exam held in the department in about 8 subjects. The final grade divided to 20% for the exam, 60% for the grades the student got in the MSc, 10% for the IC3 and TOEFL exams, and finally 10% for the creation (e.g., publishing a paper in International Journal with impact factor). The final competition grade is 100%.

-Acceptance is centrally controlled by the Ministry of Higher Education and Scientific Research.

SWOT Analysis

Strengths

-Student Admissions at relatively high rates (over 90%) in the Department indicates usually good at the scientific level of the students in the preparatory stage.
- The existence of committees and educational guidance for students in each stage of undergraduate classes.
- The Department encourages the participation of the students in artistic exhibitions and sports activities held in the College.
- There is a printed guide containing the contents information for students in general and new students in particular of the department and its laboratories, curriculum, faculty members, etc.
- A questionnaire students annually opinions about faculty members and curriculum.
- The presence of a health center within the university students can benefit from its services.
- Seminars held periodically in the Department for the graduated students during the research period.
- The existence of multiple centers of Internet services within the university.
-A good experience in academic education and a good number of the faculty members.
-The department tends to develop the study plan by increase the number of incoming students applying for undergraduate study. As well as increase the number of laboratories.
-The graduation projects that are completed by the fourth year students in the department include evaluations and solutions of realistic environmental problems in Iraq.
-The researches of the graduate students are studies for real environmental problems due to the contracts set up with different governmental ministries and Institutes.
-The scientific visits directed by the Department to the industrial institutes help the students to enhance their academic knowledge.
-Summer training for the third year students in the Governmental ministries and Institutes contributes in combining between the theoretical and the practical knowledge.
-There must be an external examiner (from other Engineering Colleges) in each examination committee for the researches of post graduate students; one for the MSc committee and two for the PhD committee.

Weaknesses

-Since the admission of students is centrally by the Ministry under the grades they received in the Secondary school.
- There is no division or unit sponsoring Alumni Affairs and communicate with them.
- The lack of regular meetings for students with engineers in the labor field.
- The absence of active relations between our Department and corresponding colleges regionally and globally in the form of agreements and MOU, where the existence of such agreements enable exchange experiences and increase the efficiency of students.
-There is no way to assess students except exams.
-Inadequate language preparation
- Economic issues for graduated students.
- Course portfolio is not followed in the Department (although the first step will start this year for each faculty member with Strategies for Achieving Learning Outcomes and Assessment Methods)
- No alumni questioner (but the Department prepared the questioner sheet and will send it to different Governmental Ministries and Institutes soon).

-Because the jurisdiction of the Environmental Engineering from the modern disciplines in Iraq and the lack of adequate environmental awareness in the community, that led to the unwillingness of some students coming from high schools to record in the Department of Environmental Engineering.

Opportunities

-Identify the training programs announced by the Arab and international Universities and directing students to take advantage of them in order to participate in the development of their personalities and their abilities within these training programs.
-Institutions of the Government and the private sectors in Iraq need environmental engineers.
-Graduate student from the department that gets on the rate of 65% or more can apply for Master's study and compete with the other applicants submitting for MSc study.
- The Ministry of Higher Education and Scientific Research supported the PhD students financially to finish part of there study in the International Universities for a period of 6 months to one year.
- Graduate students can access to real environmental problems through the field work and their studies deal with real problems exists.

Threats

- Increased competition from private Colleges, Arab and International Universities, in special programs
-Lack in understanding the importance of Environmental Engineering in all fields of community life. Also because the jurisdiction of the Environmental Engineering from the modern disciplines in Iraq and the lack of adequate environmental awareness in the community, that led to the unwillingness of some students coming from high school to submit to the Department of Environmental Engineering.
- Weaknesses in general level of scientific awareness of society.
- Inadequate public awareness for engineering profession and job opportunities.

Recommendations

-Improve the English language preparation for the undergraduate and graduate students. (There is a Committee in the College is working on that)
-Support the graduated students financially.
-The need of scientific programs for the training of the students.
-Appreciating and caring for students with outstanding potential / achievements.
-Emphasizing a conductive environment for work, study, discussions and exchange of information.
-Develop and improve summer training.
-Improve teaching and learning through continuous assessment
-Continuous development of the Department infrastructure
-The Scientific Committee discussed holding a meeting for the alumni.
-Encourage the team work between students.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

Vision

Environmental Engineering Departments looks forward to a leading role to promote education and scientific research and community service in the field of environmental engineering.

The department plays a big role to be a pattern of distinction in providing high-quality education supported locally and globally and keep pace with the times by providing academic environment where students and faculty interact to create appropriate educational ambience.

Mission

The mission of the Environmental Engineering Department is to provide a premium and contemporary education to prepare graduates as professionals capable of identifying, evaluating, and solving complex and multi-layered problems in the field of environmental science and engineering, to conduct and encourage fundamental and applied research with a focus of designing and implementing sound, feasible, and sustainable engineering solutions to the environmental real-world issues, to build-up the proficient expertise with a global, inter-disciplinary, and innovative perspective, to be a competent actor coordinating with the public administration, the industry, and the other local, national and, international bodies for implementation of the generated sustainable solutions.

Goals

The Environmental Engineering Department will:

-Create, disseminate and integrate knowledge of engineering, science and technology that expands our environmental engineering knowledge base, which in turn enables the betterment of human society.

-Develop and transfer innovative applications of engineering, science and technology to improve environmental engineering practice.

-Recognized by our peers as a highly effective leader in the conducted interdisciplinary research and the development of innovative approaches to solve environmental engineering problems.

-Attract and welcome undergraduate students to our Bachelor of Science program in Environmental Engineering, and to graduate B.S. students who are innovative problem solvers, who become leaders in their organizations, and who possess the knowledge and skills required for a wide range of careers and career changes.

-Attract and welcome graduate students into advanced study and to graduate Master of Science and Doctoral students who possess both breadth and depth in their chosen focus area and are heavily recruited by industry and academia for their academic strengths and their leadership skills.

-Maintain an intellectually challenging, yet supportive and welcoming environment that encourages and enables our students, faculty and staff to achieve their best in a diverse community.

-Concentrating on scientific research and its leading role in helping to serve the society and solving its problems through conducting application researches.

-Continuous development of curricula and studying plans for all stages and levels of studying at the Department to keep up with the latest developments in environmental engineering.

-Cooperating with related public sector institutions to supply scientific and engineering advice, and preparing different training courses in the development and capacity building for their engineering staffs.

Program Educational Objectives

The Department of Environmental Engineering provides opportunities to obtain the knowledge, skills and professional perspective needed for:

1- Graduate Environmental Engineers to serve in all sectors such as Ministries of Environment, Industry, Petroleum, and others. Also, to provide entry to environmental engineering practice and the pursuit of advanced studies.
2- Provide students with a sound foundation in the basic principles and engineering in the field of design and engineering analysis.
3- Develop the theoretical study and skills to enable students to apply these skills in the areas of work such as real solutions to real problems and the ability to make appropriate decisions.
4- Ensure that there is awareness of the importance of environmental protection in all industrial sectors, and develop methodologies to work out, in addition to search for legal ways to apply them.
5- Improve the teaching and research skills of the faculty members to meet international standards and the goals of the Department by joining training programs abroad and continuing professional development through gaining leadership skills in order to provide career success.
6- Improve the abilities of administration and technical supporting staff.
7- Maximum use of resources and potentials of the department.
8- Encourage the cooperation with Universities and Academic Centers in developed countries.
9- Encourage the cooperation with local Governmental Institutes.
10- Encourage the publishing in International Journal with impact factors.

Program Constituencies

The program constituents are those who must be satisfied with the performance of the Environmental Engineering program, and they are:

a. ***Faculty:*** Faculty members are involved on regular basis in the assessment processes. The faculty members are a congenial group who work as a team to improve the education in the Department. They are committed to the undergraduate program and producing graduates who will be active. Many of the faculty members are currently engaged in their particular field of expertise outside the College setting as consultants, and most faculty members are engaged with researches.

b. ***Students:*** Students are interested in whether the program adequately prepares them for future employment. The students in the program are motivated to become successful engineers.

c. ***Alumni:*** This group consists of recent graduates and graduates who have been employed for 3 to 5 years. Graduates with work experience of 3 to 5 years constitute a key part of the assessment process. They should have the incentives to assess the quality of PEOs based on their career achievements.

d. ***Employers:*** (Government, Industry and Universities): Employers' satisfaction with our students' education provides measure of the program success. Their satisfaction translates to employment opportunities for our students.

Process for Establishing Program Educational Objectives

PEO Definition

The PEOs were implemented in the Environmental Engineering Department practically along its long history. The PEOs are drawn up in an engaging process involving constituents within the broader context of the institutional mission who are the Department, the College and the University. The mission of the University, College, and department were to instill in its graduates a solid foundation of mathematical, scientific, and engineering knowledge in addition to developing the intellectual skills essential for excelling in their careers. The PEOs were discussed with all faculty members in several departmental meetings.

Objectives 1, 2, 3, and 4 provides students with a solid background in the Environmental Engineering discipline and design methodologies through emphasis on the application of mathematics, and engineering principles. It provides the students with the knowledge of proper professional practices relevant. Objective 5 focus on the improvement, development and qualification of the faculty members. Objective 6 concentrates on the development and improvement of the technical and administrative staff capabilities. Objective 7 consider the maximum use of the department facilities and resources.

Objective 8 are basically related to the cooperation with the foreign developed universities and institutes to gain educational and scientific skills. Objectives 9 focuses on the cooperation with the local ministries and institutes and work with them to solve field environmental problems and finally objective 10 concentrate on encouraging the faculty members to publish their scientific research in International journals with impact factor specially the Iraqi Government established a low that any researcher publish in an international journal with impact factor will gain 4million Iraqi Dinars.

Program Educational Objectives Evaluation

The evaluation of the Environmental Engineering program is through the following assessment:

1. Employer’s survey.
2. Faculty discussion.
3. Student’s survey.
4. Industry consultations.

Achievement of Program Educational Objectives

The assessment process of Environmental Engineering Program objectives is achieved continuously and periodically through many channels, such as employers and students’ questioners process, faculty members’ opinions, … etc. Starting from the academic year 2010-2011, a systematic documentation for a number of questioners was made.

SWOT Analysis

Strengths

- The mission and vision of the University and the College posted on their websites.
- The Educational Objectives of the University and the College are posted on their websites too.

Weaknesses

-Lack of adequate security situation to visit the audit committees of organizations granted accreditation.
-There are no mission and vision for the educational program level.
-There are no goals for the educational program level.
-No measurement criterion for achievement of the goals.

Opportunities

- The leaders in the Ministry of Higher Education and Scientific Research are interested to obtain accreditation.

Threats

-The security situation in Iraq.

Recommendations

-Formulation objectives for each subject.
-A clear strategy for measuring criterion for goal achievements should be drawn and followed.
-A clear mission, vision, goals must be written for the educational program level.
-A clear strategy for measurement criterion for achievement of the goals

CRITERION 3. PROGRAM OUTCOMES (POS)

Establishing the Program Outcomes

The process of defining the PEOs and POs is made practically in the Environmental Engineering program along its history during the informal and non-documented self assessment process undertaken by the Department. The broad objectives of the undergraduate program in the Department were to instill a solid foundation of mathematical, scientific, and engineering knowledge in the graduate students, in addition to developing the intellectual skills essential for prosperity and success in their careers. Once the Program Educational Objectives were derived based on input of all program constituents, POs were also determined to cover the PEOs, and in the same informal non-documented manner.

Program Outcomes

The current program outcomes are listed below. A graduate who has successfully gained all of the skills, knowledge, and behaviors present in the following outcomes to achieve the program's objectives. Each Industrial and Systems Engineering student will have demonstrated the following:

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 sustainable constrains.
d- An ability to function on multi-disciplinary teams to analyze and solve problems.
e- An ability to identify, formulates, and solves engineering problems.
f- An understanding of the Environmental Engineering impacts in professional and ethical manner.
g- An ability to communicate effectively in different ways.
h- The broad education necessary to understand the impact of engineering solutions on community and surrounding environment.
i- The understanding of the up-to-date engineering tools and knowledge is the base of learning in the Department.
j- Knowledge of contemporary issues, which is the most important part in the study of Environmental Engineering because the environmental problems is a big threat to the community.
k- An ability to use the techniques, skills, and modern engineering tools necessary for practice of Environmental Engineering such as treatment plant design industrial and hazardous waste management, etc.

Relationship between Program Outcomes and Program Educational Objectives

The tight correlation between program outcomes and program educational objectives is illustrated in Table (3-1) and Table (3-2). By meeting the program's outcomes students gain the tools necessary to join the professional world. These skills in turn allow graduates to achieve the program's educational objectives by succeeding after graduation and reaching their long-term goals.

Table 3-1: Matrix of POs to PEOs

PEOs	POs										
	a	b	c	d	e	f	g	h	i	j	k
PEO1	X	X	X	X	X	X	X	X	X	X	X
PEO2	X	X	X		X				X		X
PEO3				X	X			X			X
PEO4			X			X			X		
PEO5						X	X	X	X		X
PEO6							X	X			X
PEO7			X			X			X	X	X
PEO8							X	X			
PEO9							X	X		X	
PEO10							X				

Table 3-2: Correlation between program outcomes and program education objectives

Program Education Objectives	Program Outcomes
1- Graduate Environmental Engineers to serve in all sectors such as Ministries of Environment, Industry, Petroleum, and others. Also, to provide entry to environmental engineering practice and the pursuit of advanced studies.	1- a, b, c, d, e, f, g, h, i, j, and k
2- Provide students with a sound foundation in the basic principles and engineering in the field of design and engineering analysis.	2- a, b, c, e, i, and k
3- Develop the theoretical study and skills to enable students to apply these skills in the areas of work such as real solutions to real problems and the ability to make appropriate decisions.	3- d, e, h, and k
4- Ensure that there is awareness of the importance of environmental protection in all industrial sectors, and develop methodologies to work out, in addition to search for legal ways to apply them.	4- c, f, and i
5- Improve the teaching and research skills of the faculty members to meet international standards and the goals of the Department by joining training programs abroad and continuing professional development through gaining leadership skills in order to provide career success.	5- f, g, h, i, and k
6- Improve the abilities of administration and technical supporting staff.	6- g, h, and k
7- Maximum use of resources and potentials of the department.	7- c, f, i, j and k
8- Encourage the cooperation with Universities and Academic Centers in developed countries.	8- g and h
9- Encourage the cooperation with local Governmental Institutes.	9- g, h, and j
10-Encourage the publishing in International Journal with impact factors	10- g

Documentation

Starting from the academic year 2012-2013, the department starts for the first time the process of making subjects portfolio, which are designed to include the documentation for the entire program outcomes for all Environmental Engineering subjects. The following documents are planned to be accessible for review.

i. Subjects portfolios for some of subjects.
ii. Department of Mechanical Engineering Guide.
iii. College of Engineering Catalog.
iv. Minutes of some Committees meetings in the Departmental.

The course portfolio for a certain subject includes, in it, all the necessary information, pertinent to that particular subject. These are;

a. Subject contribution to the program outcome.
b. Subject assessment reports.
c. Faculty/ Subject self-assessment reports.
d. Detailed subject syllabus.
e. Subject objectives.
f. Subject Learning Outcomes.
g. Student Grade Distribution.
h. Subject student evaluation.
i. Three samples of students graded work (tests, final exam, quizzes, and assignments.
j. Original copy of tests, exam, quizzes, and assignments.

It should be noted here that all of the contents of each course portfolio have to be updated each year.

SWOT Analysis

Strengths

- The mission and vision of the University and the College posted on their websites.
- The Educational Objectives of the University and the College are posted on their websites too.

Weaknesses

-Lack of adequate security situation to visit the audit committees of organizations granted accreditation.
-The lack of methods for measuring and evaluating the learning outcomes.

Opportunities

- The leaders in the Ministry of Higher Education and Scientific Research are interested to obtain accreditation.
- The signing of Memorandum of Understanding with different Universities.
- Institutions of the state and the private sectors in Iraq need environmental engineers.

Threats

-The security situation in Iraq.
-Lack in understanding the importance of environmental engineering in all fields of community life.
-Lack in understanding the size of the environmental problems in the country.

Recommendations

-Starting to prepare the course portfolio for all the faculty members.
-Proposing a measurement and evaluation strategy of program outcome for each subject.
- Help the faculty members in preparing the program outcome and the educational objectives for the subjects they taught by the QA committee in the Department, in order to continue the course portfolio.
-Educate faculty members about learning outcome and program educational objectives.

CRITERION 4. CONTINUOUS IMPROVEMENT

Introduction

The Environmental Engineering Department at Baghdad University offers program leading to a bachelors of Science degree in Environmental Engineering. A comprehensive assessment program to evaluate the program objectives and the student outcomes to improve the program on a continuous basis has been initiated. This document outlines the procedure with which the outcomes and objectives are assessed and the results are evaluated and then benchmarked against targeted goals and how the curriculum and/or program requirements are changed to meet these goals. The continuous improvement process is based upon the assessment, evaluation and comparison to targeted levels of performance and then feedback to changes in the curriculum.

Review of Program Outcomes and Student Objectives

The program outcomes will be periodically reviewed (every other year) with the faculty and the related committees in the department. To support the program, the Department is planning to made questioners to different state offices, firms, companies and also private sector companies asking them about their opinions in the department graduates and their suggestions to improve the program.

Responsibilities of Assessment, Evaluation, and Continuous Improvement Process

Faculty members are responsible for writing the rubrics for embedded assessment and for determining level of acceptable performance. They are responsible for keeping track of the assessment and for offering changes to the program, if needed based upon the results of assessment.

The related Committees have been formed to perform a yearly internal audit of the continuous improvement process. These committees will meet annually. Action plans resulting from this annual meeting will be presented depending upon the action plan.

The College of Engineering developed a questioner process to make students aware of the correct procedures for being advised, this questioner process is shown in Figures (4-1) and (4-2) for the students opinion about curriculum and faculty, respectively.

Table (4-1): Students Opinion Questionnaire about Curriculum

Environmental Engineering Department

Students Opinion Questionnaire about Curriculum

Department: _____ Academic year: ___Classification (check one): 1st ___ 2nd __ 3rd __ 4th ___

Curriculum Name: _____ Code No.: ___ Faculty member's name: ____ ____ ____

Dear Students: For the development of the educational process at the university, we hope to express your opinion by answering accurately with mark √ in the place which reflects your opinion taking into consideration the accuracy and objectivity.

Score		1	2	3	4	5
No.	**Question**	**Strongly Agree**	**Agree**	**I don't know**	**Disagree**	**I don't agree at all**
1	Overall, this Curriculum subject is good and useful					
2	Lecture time is sufficient to cover the contents of the article					
3	The content of article commensurate with the objective of Curriculum					
4	Subject content is an interdependent information					
5	Textbooks and references are available and meaningful					
6	available of References helpful for stimulate and thinking					
7	The book is free of grammatical errors Printing					
8	Contents of the book of outdated information					
9	The book contains a variety of examples and exercises					
10	The evaluation of the subject system is appropriate (test method)					
11	Exams reflect the content of the subject					
12	Number of exams be exhaustive of the content subject					
13	Examinations and assignments helped to absorb the subject					
14	Examinations and exercises in line with the objective of subject					
15	Examinations and exercises help to think of more conservation					
16	Number of exams and the their recurrence appropriate					
17	The case of equipped lecture halls satisfactory					
18	Capabilities and laboratories appropriate and effective					

Table (4-2): Students Opinion Questionnaire about faculty member

Environmental Engineering Department

Students Opinion Questionnaire about Faculty Member

Department: _____ Academic year: ____ Classification (check one): 1st ___ 2nd ___ 3rd ___ 4th _

Curriculum Name: _____ Code No.: _____ Faculty member's name: ____ ____ _____

Is the plan of teaching the subject was distributed from the beginning of the semester? Yes_ No _ I don't know__

Is the faculty member is committed to the specific office hours of the subject? Yes_____ No _____ I don't know__
If the answer is (No) explained that_____

Dear Students: For the development of the educational process at the university we hope to express your opinion by answering accurately with mark √ in the place which reflects your opinion taking into consideration the accuracy and objectivity.

Score		1	2	3	4	5
No.	**Question**	**Strongly agree**	**Agree**	**I don't know**	**Disagree**	**I don't agree at all**
1	Has the ability to communicate scientific material in a smooth and easy way					
2	Keen to use the tools and techniques of modern education					
3	Illustrates the theoretical aspects in the subject with examples from the reality					
4	Gives the scientific material in a manner covering the time of the lecture					
5	Committed to the dates of lectures					
6	Improve in the management ranks and give equal opportunities to students in dialogue and discussion					
7	Motivates students and encourages them to think and research					
8	Puts exam questions clearly					
9	Corrects test papers and return them back to students					
10	Follow up activities and duties to put the evaluation weights					
11	Talks about issues outside the scope of the scientific method					
12	The relationship between Lecturer and students based on mutual respect and taking their views and suggestions					
13	The Lecturer has a special personality					

Figure (4-1) represents percentages of students' answers, while, figures (4-2 and 4-3) show graphical representations of some of the questions.

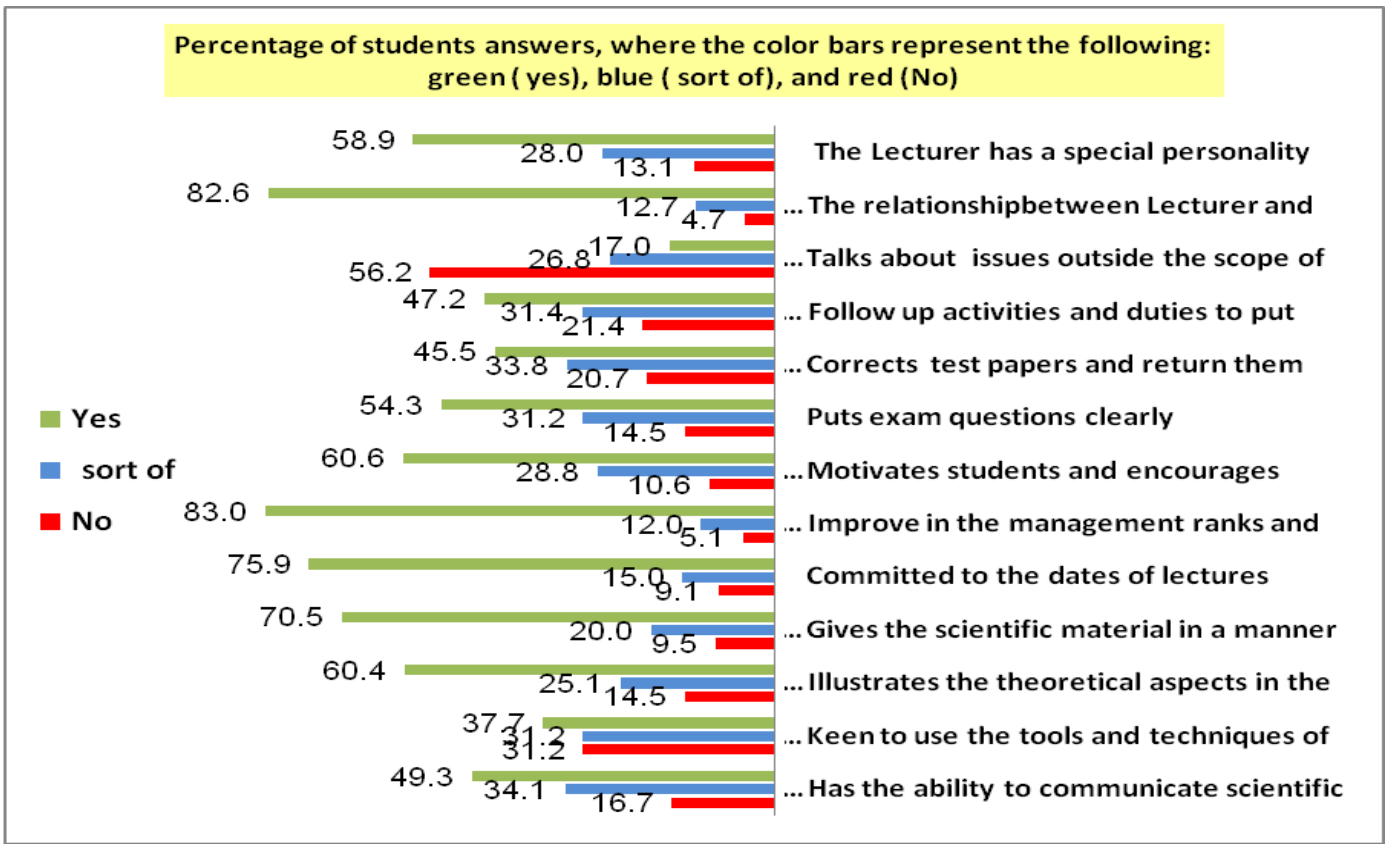


Figure (4-1): Percentage of students answers

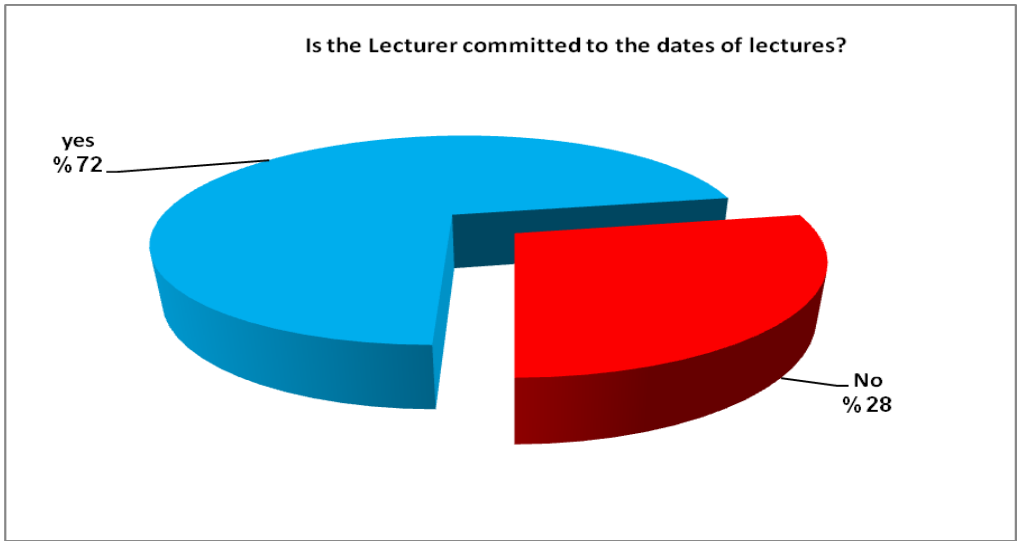


Figure (4-2): Graphical reprentation of one of the questions

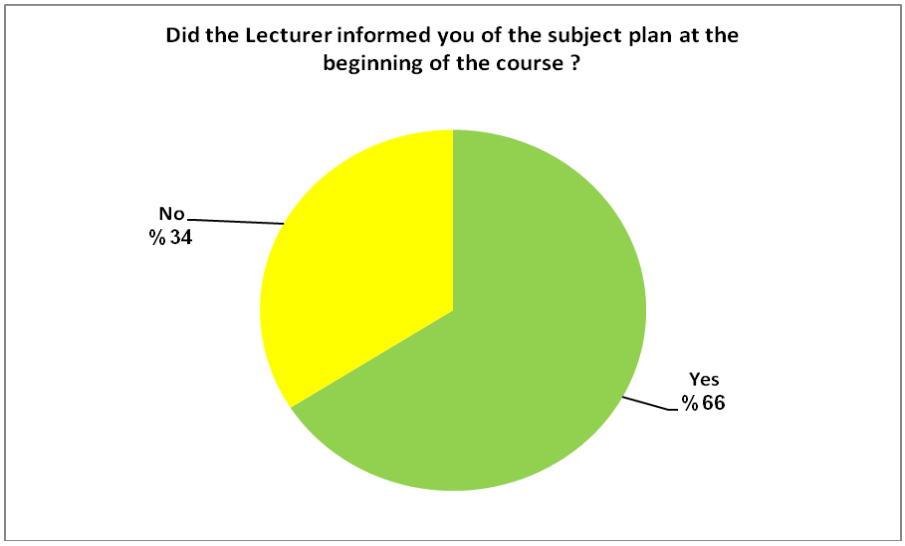


Figure (4-3): Graphical reprentation of another question

Data Collection and Analysis

1. Direct assessment data

- Will be collected during the academic year and analyzed at the end of each academic year.
- Analysis will be discussed by faculty.
- Department head will be sought the inputs after the initial analysis of data by faculty, depending upon the level of action.

2. Indirect assessment data

- Will be collected on a proposed timescale.
- The analysis will be performed by the related committees.
- Analysis will be discussed with the faculty, the Department Head, and depending upon the situation, students, and suggested action will be solicited and implemented.

Actions to Improve the Department

Continuous improvement of the program is the main goal in the department and that achieved through the followings:

-It is expected from the instructors to continuously improve the performance of students in his / her subjects.

-Continuous improvement of faculty through training programs.

-Purchasing a laboratory equipments and instruments.

-Purchasing books for the library of the department.

-Purchasing computers.

-Increase in activities for students such as setting up scientific conferences and seminars.

-Increase the activities of the faculty such as set up lectures, meetings, and seminars

SWOT Analysis

Strength

-The Department started the assessment, evaluation, and continuous improvement process
- The course portfolio preparation started through lectures and continuous advising to the faculty by the QA committee in the Department and the Dean office.

Weakness

-There are weaknesses as shown in Figure (4-1) in two points related to the correction of the tests and the use of the tools and techniques in teaching and learning.
-The lack for more smart boards and data shows in the classrooms.

Opportunities

-The College provided each Department with Data show and smart boards, although the Department needs more tools.
- The continuous encourage and support of the Dean office and the Dean personally to the Departments.
-The continuous support of the University and the Ministry of Higher Education and Scientific Research.

Threats

-The lack in the financial support
-The lack in tools, instruments, and modern techniques used in teaching and learning.

Recommendations

-There is a serious interest to solve these weaknesses through the instructions from the Dean sent to each Department some of these instructions are: returning the exam papers to the students after few days and explain the answers in the class. For the second weakness there will be training for each Department in the College by experts to introduce the new techniques of teaching and learning to the faculty members and encourage the faculty members to use them.
-Increase the financial support for the Department.

CRITERION 5. CURRICULUM

Environmental Engineering Program Curriculum Review

The curriculum requirements specify subject areas appropriate to engineering. The professional component must include:

a. A combination of mathematics and basic sciences general education component (Some with experimental experience) appropriate to the discipline.

b. Engineering topics, consisting of engineering sciences and engineering design.

Table (5-1) represents the curriculum for undergraduate studies in the department.

Table 5-1: Curriculum for the undergraduate study in Environmental Engineering Program

Year; Semester or Quarter	Course (Department, Number, Title)	Category (Units)			
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other
First year					
Year	EnE, 101, Calculus I & II	5			
	EnE, 102,Analytical Chemistry	6			
	EnE, 103,Organic Chemistry	6			
	EnE, 104,Physics for Environmental Engineering	3			
	EnE, 105,Environmental Microbiology	3			
	EnE, 106,Computer Programming	4			
	EnE, 107,Engineering Drawing		4		
	EnE, 108,Technical English			4	
Semester	EnE, 109,Workshop Technology				2
	GS, 110,Human Rights			2	
Second year					
Year	EnE , 201, Engineering Statistics		4		
	EnE , 202,Calculus III	5			
	EnE , 203,Environmental Hydrology		4 (√)		
	EnE , 204,Environmental Geology		3		
	EnE , 205,Thermodynamics		6 (√)		
	EnE , 206,Ecology		2		
Semester	EnE , 207,Static & Strength of Materials		6		
	EnE , 208,Computer Programming	4			
	EnE , 209,Engineering Economic		2		
	GS , 210, Freedom & Democracy			2	
Third year					
Year	EnE , 301, Engineering Analysis		7		
	EnE , 302, Numerical Analysis		3		
	EnE , 303, Fluid Mechanics		8 (√)		

	EnE , 304, Mass Transfer		6 (√)		
Semester	EnE , 305, Solid Wastes		3 (√)		
	EnE , 306, Hazardous Wastes		3		
	EnE , 307, Soil Science & Pollution		6 (√)		
	EnE , 308, Industrial Psychology	2			
Fourth year					
Year	EnE , 401,Industrial processes wastewater		7 (√)		
	EnE , 402, Geodesy & GIS	3			
	EnE , 403, Air Pollution		6 (√)		
	EnE , 404, Ground water Pollution		4 (√)		
	EnE , 405, Env. Eng. Control System		6 (√)		
	EnE , 406, Environmental Management		3 (√)		
Semester	EnE , 407, Water Supply & Sewage treatment		6 (√)		
	EnE , 408, Env. Eng. Projects Design		8 (√)		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		**41**	**107**	**8**	**2**
OVERALL TOTAL FOR DEGREE	**158**				
PERCENT OF TOTAL		**25.95%**	**67.72%**	**5.06%**	**1.27%**

Program syllabus

BSc degree in Environmental Engineering

Tables (5-2) to (5-5) show the syllabus, units and weekly hours of B.Sc. degree in Environmental Engineering covers the theoretical and practical studies in different environmental areas.

Table 5-2: Syllabus, units and weekly hours for the first year in Environmental Engineering Department

Subject Code	Subject	Units	Weekly hours for first semester			Weekly hours for second semester		
			Lecture	Lab.	Other (Tutorial)	Lecture	Lab.	Other (Tutorial)
EnE 101	Calculus I & II	5	2	-	1	2	-	1
EnE 102	Analytical Chemistry	6	2	3	-	2	3	-
EnE 103	Organic Chemistry	6	2	3	-	2	3	-
EnE 104	Physics for Environmental Engineering	3	2	3	-	-	-	-
EnE 105	Environmental Microbiology	3	-	-	-	2	3	-
EnE 106	Computer Programming	4	1	2	-	1	2	-
EnE 107	Engineering Drawing	4	1	3	-	1	3	-
EnE 108	Technical English	4	2	-	-	2	-	-
EnE 109	Workshop Technology	2	-	3	-	-	3	-
GS 110	Human Rights	2	1	-	1	1	-	1
	Total	39	13	17	2	13	17	2
Weekly hours			32			32		

Table 5-3: Syllabus, units and weekly hours for the second year in Environmental Engineering Department

Subject Code	Subject	Units	Weekly hours for first semester			Weekly hours for second semester		
			Lecture	Lab.	Other (Tutorial)	Lecture	Lab.	Other (Tutorial)
EnE 201	Engineering Statistics	4	3	-	2	-	-	-
EnE 202	Calculus III	5	2	-	1	2	-	1
EnE 203	Environmental Hydrogeology	4	2	-	-	2	-	-
EnE 204	Environmental Geology	3	-	-	-	2	3	-
EnE 205	Thermodynamics	6	2	-	2	2	-	2
EnE 206	Ecology	2	-	-	-	2	-	-
EnE 207	Static & Strength of Materials	6	2	-	2	2	-	2
EnE 208	Computer Programming	4	2	3	-	2	3	-
EnE 209	Engineering Economic	2	2	-	-	-	-	-
GS 210	Freedom & Democracy	2	1	-	1	1	-	1

Table 5-4: Syllabus, units and weekly hours for the third year in Environmental Engineering Department

Subject Code	Subject	Units	Weekly hours for first semester			Weekly hours for second semester		
			Lecture	Lab.	Other (Tutorial)	Lecture	Lab.	Other (Tutorial)
EnE 301	Engineering Analysis	7	3	-	1	3	-	1
EnE 302	Numerical Analysis	3	2	-	2	-	-	-
EnE 303	Fluid Mechanics	8	3	3	1	3	3	1
EnE 304	Mass Transfer	6	2	-	2	2	-	2
EnE 305	Solid Wastes	3	3	-	-	-	-	-
EnE 306	Hazardous Wastes	3	-	-	-	3	-	-
EnE 307	Soil Science & Pollution	6	3	-	-	3	-	-
EnE 308	Industrial Psychology	2	-	-	-	2	-	-
	Summer training	satisfied	-	-	-	-	-	-
	Total	38	16	3	6	16	3	4
Weekly hours			25			23		

Note: Summer training is one month for third year must be applied.

Table 5-5: Syllabus, units and weekly hours for the fourth year in Environmental Engineering Department

Subject Code	Subject	Units	Weekly hours for first semester			Weekly hours for second semester		
			Lecture	Lab.	Other (Tutorial)	Lecture	Lab.	Other (Tutorial)
EnE 401	Industrial processes wastewater	7	3	-	1	3	-	1
EnE 402	Geodesy & GIS	3	-	-	-	2	3	-
EnE 403	Air Pollution	6	3	-	-	3	-	-
EnE 404	Ground water Pollution	4	2	-	-	2	-	-
EnE 405	Env. Eng. Control System	6	2	2	1	2	2	1
EnE 406	Environmental Management	3	3	-	-	-	-	-
EnE 407	Water Supply & Sewage treatment	6	2	2	1	2	2	1
EnE 408	Env. Eng. Projects Design	8	2	4	-	2	4	-
	Total	43	17	8	3	16	11	3
Weekly hours			28			30		

Figures (5-1) and (5-2) show the number of units, subjects and the weekly hours of study for all stages in undergraduate study. Figure (5-3) shows the percentage of units and subjects distributed according to the requirements of the university, basic sciences, general specialty and specific specialty.

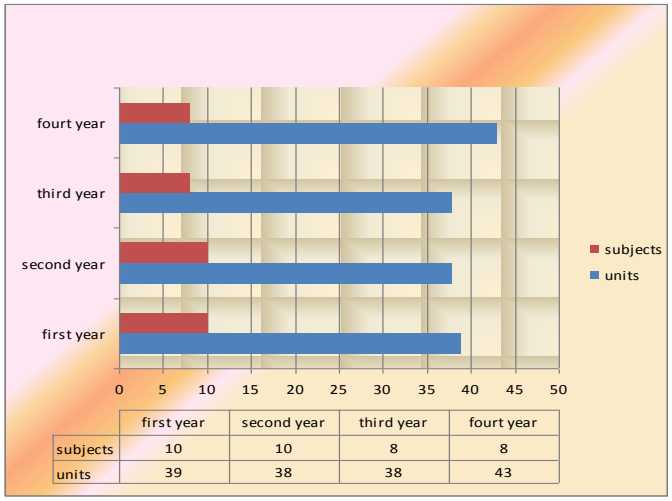
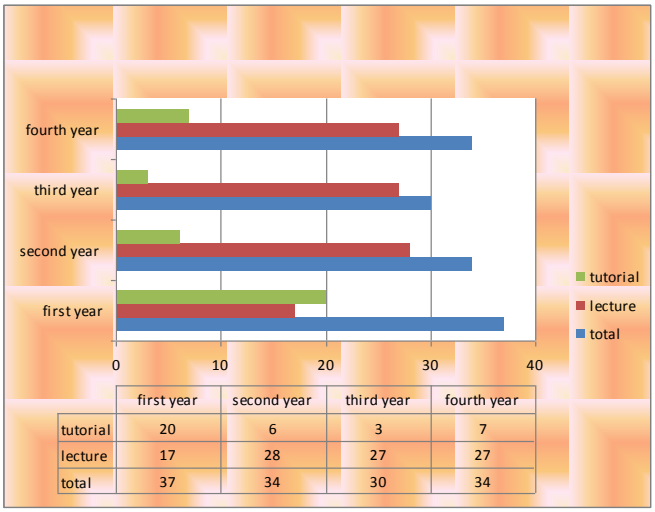


Fig (5-1): Number of subjects and units for the four years of study for undergraduate study



	first year	second year	third year	fourth year
tutorial	20	6	3	7
lecture	17	28	27	27
total	37	34	30	34

Fig (5-2): Number of weekly hours for the undergraduate study

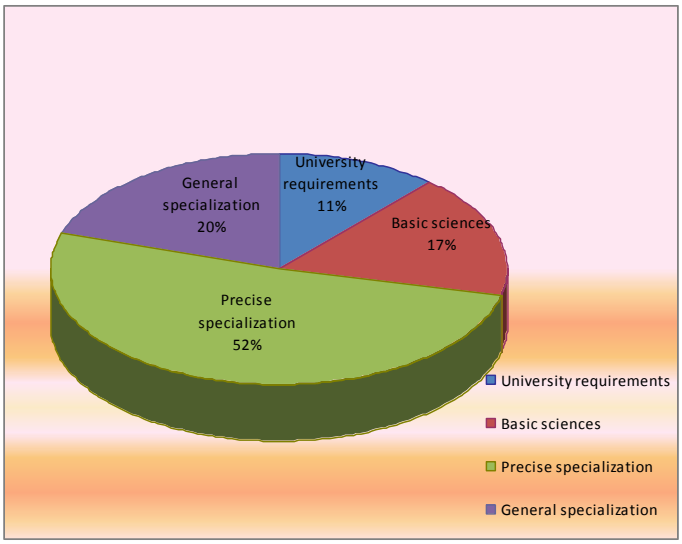


Fig 5-3: Percentage breakdown of 158 units according to categories

To enable the student to follow the curriculum and study vocabulary and assimilated well, he or she must abide by the attendance on a regular basis and do not repeat his absence. Table (5-6) shows the percentage of the students' attendance for four academic years for undergraduates study in Environmental Engineering Department.

Table 5-6: Percentage of the student's attendance for four academic years for undergraduates study in Environmental Engineering Department

Class	2010-2011		2009-2010		2008-2009		2007-2008	
	No. of students in the class	Attendance at lectures %	No. of students in the class	Attendance at lectures %	No. of students in the class	Attendance at lectures %	No. of students in the class	Attendance at lectures %
1st Class	12	100	26	92	26	92	22	95
2nd Class	22	91	28	93	18	94	10	100
3rd Class	15	100	17	100	10	100	18	94
4th Class	16	100	11	100	18	94	-	-

MSc. degree in Environmental Engineering

Table (5-7) shows the syllabus, units and weekly hours of M.Sc. degree in Environmental Engineering covers the theoretical and practical studies in different environmental areas.

Table (5-7): Syllabus, units and weekly hours for MSc degree in Environmental Engineering

Preparatory Academic Year:

Semester	Subject Code	Subject	Weekly Hours	Units
1st Semester	EnE 501	Surface and Ground water pollution	3	3
	EnE 502	Hazardous Waste Management	3	3
	EnE 503	Advanced Statistics	3	3
	EnE 504	Treatment Plant Design	3	3
	GE 505	English Language	2	1
Total			14	13
2nd Semester	EnE 506	Industrial Waste Water	3	3
	EnE 507	Solid Waste Mnagement	3	3
	EnE 508	Air Pollution Control 60%	5	3
	EnE 509	Air Pollution 40%		
	EnE 510	Advanced Numerical Method	2	3
	GE 505	English Language	2	1
Total			15	13

Second Academic Year:

Thesis		8
Total	29	34

Ph.D. degree in Environmental Engineering

Table (5-8) shows the syllabus, units and weekly hours of Ph.D. degree in Environmental Engineering covers the theoretical and practical studies in different environmental areas.

Table 5-8: Syllabus, units and weekly hours for PhD degree in Environmental Engineering

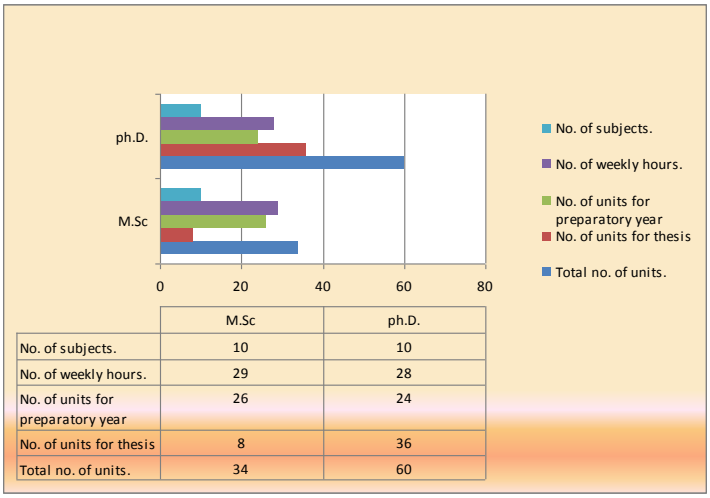
Preparatory Academic Year:

Semester	Subject Code	Subject	Weekly Hours	Units
1st Semester	EnE 601	Global Environmental Problems	3	3
	EnE 602	Advanced Mathematics	3	3
	EnE 603	Multiphase Fluid Flow	3	3
	EnE 604	Radiological Pollution	3	3
	GE 605	English Language	2	1
Total			14	13
2nd Semester	EnE 606	Optimization	3	3
	EnE 607	Finite Elements	3	3
	EnE 608	Advanced Fluid Flow	3	3
	EnE 609	Environmental Management	3	3
	GE 605	English Language	2	1
Total			14	13

Second and Third Academic Year:

Thesis		36
Total	28	62

Figure (5-4) shows the number of units, subjects and the weekly hours of study for M.Sc. and Ph.D. studies.



	M.Sc	ph.D.
No. of subjects.	10	10
No. of weekly hours.	29	28
No. of units for preparatory year	26	24
No. of units for thesis	8	36
Total no. of units.	34	60

Fig 5-4: Number's of subjects, hours, and units for postgraduate studies

There are three PhD dissertation had mutual co supervision with Prof. Dr. Adel Sharif from Surrey University, UK, one already finished and the others started.

Environmental Engineering Department Assessment

The Environmental Engineering Department employs several methods to assess the quality and direction of the BSc program that are offered by the department. Assessments are made prior to graduation by measuring the performance of students in each stage. In addition, the results of the exams, senior exit interviews, and faculty reviews of student portfolios are used. Assistance from outside reviewers is also obtained in making the assessment.

Assessment methods used for the Environmental Engineering Programs:

The assessment methods provide information on the direction of the B.S. programs toward their stated objectives. Information is provided here on the assessment measures for each program. The assessment methods are:

-Pre-Graduation Assessment and Post-Graduation Assessment.
-Grades Assigned by Professors.
-Student Report Portfolios.
-Student Performance of the Exams.
-Evaluations of Student Extracurricular Activities.
-Class Evaluations.
-Outcome Team Surveys, End of Semester Surveys and Exit Interview Surveys.

How the Curriculum Aligns with the Program Educational Objectives

The faculty has complete authority to define, revise, implement, and achieve program educational objectives. The major role of the faculty is to create, revise, and evaluate subjects for the program as well as define and revise program educational objectives and ensure achievement of student outcomes. Therefore, the above process ensures alignment of the curriculum with Program Educational Objectives as shown in various tables. The Department faculty insures that the students receive all the engineering analysis within the context of engineering program. Table (5-9) represents the curriculum mapped to the Program Educational Objectives.

Table (5-9): Required Subjects and Their Emphasis on Program Educational Objectives

Outcome		1	2	3	4	5	6	7	8	9	10
Subject no.	Subject name										
EnE 101	Calculus I & II	×	×	×							
EnE 102	Analytical Chemistry	×		×							
EnE 103	Organic Chemistry	×		×							
EnE 104	Physics for Environmental Engineering	×		×	×						
EnE 105	Environmental Microbiology	×		×	×						
EnE 106	Computer Programming	×	×	×							
EnE 107	Engineering Drawing	×	×	×							
EnE 108	Technical English	×	×	×							
EnE 109	Workshop Technology	×	×	×							
GS 110	Human Rights	×									
EnE 201	Engineering Statistics	×	×	×							
EnE 202	Calculus III	×	×	×							
EnE 203	Environmental Hydrogeology	×		×	×						
EnE 204	Environmental Geology	×		×	×						
EnE 205	Thermodynamics	×		×							
EnE 206	Ecology	×		×	×						
EnE 207	Static & Strength of Materials	×		×							
EnE 208	Computer Programming	×	×	×							
EnE 209	Engineering Economic	×		×							
GS 210	Freedom & Democracy	×									
EnE 301	Engineering Analysis	×	×	×							
EnE 302	Numerical Analysis	×	×	×							
EnE 303	Fluid Mechanics	×		×							
EnE 304	Mass Transfer	×		×							
EnE 305	Solid Wastes	×		×	×						
EnE 306	Hazardous Wastes	×		×	×						
EnE 307	Soil Science & Pollution	×		×	×						
EnE 308	Industrial Psychology	×		×	×						
	Summer training	×	×	×	×						
EnE 401	Industrial processes wastewater	×	×	×	×						
EnE 402	Geodesy & GIS	×	×	×							
EnE 403	Air Pollution	×	×	×	×						
EnE 404	Ground water Pollution	×	×	×	×						
EnE 405	Env. Eng. Control System	×	×	×	×						
EnE 406	Environmental Management	×		×	×						
EnE 407	Water Supply & Sewage treatment	×	×	×	×						
EnE 408	Env. Eng. Projects Design	×	×	×	×						

×: Compatible

Blank: Incompatible

Curriculum Relationship with the Program Outcomes

The learning outcomes of the curriculum are mapped to the Program Outcomes as shown in table (5-10).

Table (5-10): Required Subjects and Their Emphasis on Program Outcomes

Outcome		a	b	C	d	e	f	g	h	i	J	k
Subject no.	Subject name											
EnE 101	Calculus I & II	×										
EnE 102	Analytical Chemistry	×										
EnE 103	Organic Chemistry	×										
EnE 104	Physics for Environmental Engineering	×					×				×	
EnE 105	Environmental Microbiology	×										×
EnE 106	Computer Programming	×	×	×	×					×		
EnE 107	Engineering Drawing		×	×								×
EnE 108	Technical English	×						×				
EnE 109	Workshop Technology		×	×	×							×
GS 110	Human Rights											
EnE 201	Engineering Statistics	×			×							×
EnE 202	Calculus III	×										
EnE 203	Environmental Hydrogeology	×										×
EnE 204	Environmental Geology	×			×							×
EnE 205	Thermodynamics	×			×							×
EnE 206	Ecology	×					×					
EnE 207	Static & Strength of Materials	×			×							×
EnE 208	Computer Programming	×	×	×	×					×		×
EnE 209	Engineering Economic	×										×
GS 210	Freedom & Democracy								×			
EnE 301	Engineering Analysis	×	×	×		×						×
EnE 302	Numerical Analysis	×	×	×		×						×
EnE 303	Fluid Mechanics	×	×	×		×						×
EnE 304	Mass Transfer	×	×	×		×						×
EnE 305	Solid Wastes	×				×			×			×
EnE 306	Hazardous Wastes	×				×			×			×
EnE 307	Soil Science & Pollution	×				×			×			×
EnE 308	Industrial Psychology	×				×	×	×	×			
	Summer training	×					×	×	×	×	×	×
EnE 401	Industrial processes wastewater	×	×	×		×						×
EnE 402	Geodesy & GIS	×	×			×				×		×
EnE 403	Air Pollution	×	×			×						×
EnE 404	Ground water Pollution	×	×			×						×
EnE 405	Env. Eng. Control System	×	×	×		×						×
EnE 406	Environmental Management	×				×						×
EnE 407	Water Supply & Sewage treatment	×	×	×		×						×
EnE 408	Env. Eng. Projects Design	×	×	×	×	×	×	×	×	×	×	×

×: Compatible
Blank: Incompatible

Skills Acquired by Students and Methods of Measurement

Table (5-11) represents Skills Acquired by Students and Methods of Measurement

Table (5-11) Skills Acquired by the Students and Methods of Measurement

Acquired skills	Lessons by which acquisition of skills	Method of assessing the skills of some lessons
a. An ability to apply knowledge of mathematics, science, and engineering		
Use mathematics to solve engineering problems Applied mathematics and engineering science in engineering matters, evaluation, planning, engineering design	EnE 101, EnE 102, EnE 103, EnE 104, EnE 105, EnE 106, EnE 108, EnE 201, EnE 202, EnE 203, EnE 204, EnE 205, EnE 206, EnE 207, EnE 208, EnE 209, EnE 301, EnE 302, EnE 303, EnE 304, EnE 305, EnE 306, EnE 308, EnE 401, EnE 402, EnE 403, EnE 404, EnE 405, EnE 406, EnE 407, EnE 408	Homework's & Assignments Quizzes Lab. Experiments Examinations
b. An ability to design and conduct experiments, as well as to analyze and interpret data.		
Design and conduct experiments to verify the presence of engineering problem Conduct experiments with different scales to obtain data Simulated reality Use of appropriate methods of analysis of the data collected and provide an explanation of the results	EnE 106, EnE 107, EnE 109, EnE 208, EnE 301, EnE 302, EnE 303, EnE 304, EnE 401, EnE 402, EnE 403, EnE 404, EnE 405, EnE 407, EnE 408	Lab. Experiments Projects Writing Reports Examinations & Quizzes Extracurricular activities
c. An ability to design a system, component, or process to meet sustainable constrains.		
Determine the design requirements Explain the selection of design parameters Determine the possibility of multiple solutions for one design and demonstrate best choice for design Clarify the functions of the final design to meet the requirements	EnE 106, EnE 107, EnE 109, EnE 208, EnE 301, EnE 302, EnE 303, EnE 304, EnE 401, EnE 405, EnE 407, EnE 408	Homework's Reports Graduation Projects Examinations Quizzes Extracurricular activities
d. An ability to function on multi-disciplinary teams to analyze and solve problems.		
Learn basic concepts related to collective action, such as leadership, cooperation, objectives, and results Knowledge of basic concepts related to team disputes such as differences in attitudes, personal goals, dependency and lack of participation. Learn basic concepts related to the management team such as managing effective meetings, listening skills and positive communication, setting goals, and assess the level of progress Clarify the ability to organize and good management of the project team with different specialties	EnE 106, EnE 109, EnE 201, EnE 204, EnE 205, EnE 209, EnE 408	Reports Graduation Projects Extracurricular activities

Acquired Skills	Lessons by Which Acquisition of Skills	Method of Assessing the Skills of Some Lessons
e. An ability to identify, formulates, and solves engineering problems.		
The ability to identify issues that can be resolved through engineering concepts and models.	EnE 301, EnE 302, EnE 303, EnE 304, EnE 305, EnE 306, EnE 307, EnE 308, EnE 401, EnE 402, EnE 403, EnE 404, EnE 405, EnE 406, EnE 407, EnE 408	Homworks Quizes Examination
The ability to develop standards and specifications with solutions identify the determinants of issues		
The successful application of engineering techniques to solve engineering problems		
f. An understanding of the Environmental Engineering impacts in professional and ethical manner.		
Understanding engineering profession and responsibility	EnE 104, EnE 206, EnE 308, EnE 408	Meetings and direct dialogues between students and faculty
Knowledge engineering responsibility in terms of risk assessment and safety, honesty and reliability, loyalty and opposition in the workplace		
g.An ability to communicate effectively in different ways.		
Possess technical writing skills	EnE 108, EnE 308, EnE 408	Reports discussions Graduation Projects Extracurricular activities
Possession oral skills that make it able to effectively communicate his knowledge of technical information about the planning and engineering design		
The ability to communicate complex ideas or engineering designs for people from outside		
h. The broad education necessary to understand the impact of engineering solutions on community and surrounding environment.		
Application of knowledge and engineering skills needed to deal with engineering issues and their impact on the cultural and ethical factors	GS 210, EnE 305, EnE 306, EnE 307, EnE 308, EnE 408	Meetings and direct dialogues between students and faculty
Understand the positive and negative effects of the engineering and technology on society and how these effects associated with economic reality and political		
i. The understanding of the up-to-date engineering tools and knowledge is the base of learning in the Department.		
Take advantage of the learning opportunities outside the formal classroom activities by attending professional lectures, seminars, and training courses	EnE 106, EnE 208, EnE 402, EnE 408	Meetings and direct dialogues between students and faculty
Approximate limits apply theory to practice site		
j. Knowledge of contemporary issues, which is the most important part in the study of Environmental Engineering because the environmental problems is a big threat to the community.		
Identify and describe the challenges faced by engineers today	EnE 104, EnE 408	Meetings and direct dialogues between students and faculty discussions Graduation Projects
Clarify important trends and issues in the field		
Determine the potential applications of knowledge engineering in the design and analysis of contemporary engineering operations		
k. An ability to use the techniques, skills, and modern engineering tools necessary for practice of Environmental Engineering such as treatment plant design industrial and hazardous waste		

management, etc.		
The ability to use modern methods of analysis and design in modern engineering applications The ability to use equipment correctly The ability to use computer programs in engineering applications	EnE 105, EnE 107, EnE 109, EnE 201, EnE 203, EnE 204, EnE 205, EnE 207, EnE 208, EnE 209, EnE 301, EnE 302, EnE 303, EnE 304, EnE 305, EnE 306, EnE 307, EnE 401, EnE 402, EnE 403, EnE 404, EnE 405, EnE 406, EnE 407, EnE 408	Lab. Experiments Homworks Quizes Examinations

SWOT Analysis

Strength

- Modern curriculum
- Modern scientific references
- Good engineering science components
- Availability of a good variety of education subjects.
- A combination of college level mathematics and basic sciences (some with experimental experience) are appropriate to the discipline.
- Engineering topics consisting of engineering sciences and engineering design appropriate to the student's field of study.
- A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.
- Students prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.
- The teaching methods enhance student learning in the Department
- In the Department of Environmental Engineering, a committee to evaluate and review the curriculum, the members of this committee write their proposals, if any, to develop the curriculum.
- The curriculum is part of the PEOs and the POs.
-The Department of Environmental Engineering is the first department in the Iraqi universities, which gives the degree of a doctorate in environmental engineering.
- The degree of the Environmental Engineering in Iraq is one of the modern disciplines.

Weakness

-Central control of curriculum development by a central committee in the ministry, and the possibility of changes in the curriculum only in a limited rate.
- The curriculum does not help the students to learn the principal of team work.
- Lack in the learning of modeling and computer program applications in most subjects.
- Course portfolio is not followed in the Department (although the first step will start this year for each faculty member with Strategies for Achieving Learning Outcomes and Assessment Methods).
- The absence of a written plan for review update curricula every four years, and the absence of mechanisms to take the views of those involved in the labor market in the program.

Opportunities

- Prevalence of quality assurance concepts with academic leaders in the Ministry of Higher Education, University and thus obtain convictions for the relentless pursuit for academic accreditation.
- Coordination with the faculties of International Universities with accreditation for there programs in order to shorten the time and effort to reach an advanced stage in the development of curricula
-New teaching methods.
-Re-designing curriculum to allow multi-disciplinary teaching and learning.

Threats

- Failure to meet the requirements of the changing labor market and development through the curriculum because of the rapid developments in all fields.
-Low quality of students (language, thinking, motivation).

Recommendations

-The control of curriculum development should be more flexible and controlled by the College generally.
-The curriculum should include the principal of team work.
-Strength the learning of modeling and computer program applications in most subjects.
- The faculty members should start preparing the course portfolio.

CRITERION 6. FACULTY

Leadership Responsibilities

The Head of the Environmental Engineering Department is responsible for all aspects of leadership and management of the department. The Head works with the faculty, the Dean of the College of Engineering, and other department heads to ensure program success.

Authority and Responsibility of Faculty

The department faculty is responsible for course creation, modification, and evaluation. The course descriptions are written by the department faculty and approved by the University.
Our faculty members frequently discuss any weaknesses are seen in student performance in our courses. Then, changes are made in order to overcome these weaknesses.

Faculty

We currently have a faculty of 20 members. Thirteen members hold a terminal PhD degree in Environmental Engineering and Chemical Engineering from different countries but most of them are graduated from Iraqi Universities. Two of the faculty PhD holders and one of the MSc holders got their degrees from the United Kingdom. Two of the PhD holders finished part of there dissertation in the United Kingdom for a period of six months. Five members hold master degree in Environmental Engineering and two of them are preparing their PhD in the Department. The last master holder got master in English language. Table (6-1) and (6-2) represent the staff members of the Environmental Engineering Department.

Table 6-1: Environmental Engineering Department Faculty Members

No.	Names	Degree	General Specialization	Specialization	Position	Teaching activities percent	Research activities percent	Other activities percent*
1	Assis. Prof. Dr. Yasmeen Abdul-Aziz Mustafa	PhD	Environmental Engineering	Air Pollution	Assis. Prof. Head of the Department	50	25	25
2	Prof. Dr. Adel Al-Hemiri	PhD	Chemical Engineerin	Transport Phenomena	Prof	25	50	25
3	Assis. Prof. Dr. Zainab Ziad Ismail	PhD	Environmental Engineering	Water Pollution	Assis. Prof.	50	25	25
4	Assis. Prof. Dr. Ahmed Abed Mohammed	PhD	Chemical Engineering	Transport Phenomena	Assis. Prof	50	25	25

5	Assis. Prof. Dr. Ayad Abdul Hamza Faisal	PhD	Environmental Engineering	Soil and ground water pollution	Assis. Prof Undrgraduate Coordinator	50	25	25
6	Assis. Prof. Dr. Abdul-Fattah Mohammed Ali	PhD	Chemical Engineering	Heat Transfer	Assis. Prof	100		
7	Assist. Prof. Dr. Shahlaa Esmail Ebrahim	PhD	Environmental Engineering	Hazardous waste Pollution/Adsorption	Assis. Prof /Graduate Studies coordinater	50	25	25
8	Dr.Jathwa Abdoul Karim	phD	Environmental Engineering	Solid Waste/ Water Pollution	Lecturer	50	25	25
9	Dr. Abeer Ibrahim Al-Wared	PhD	Environmental Engineering	Water Pollution	Lecturer	50	25	25
10	Dr. Hayder Mohammed Abdul-Hameed	PhD	Environmental Engineering	Industrial Wastewater Pollution	Lecturer	50	25	25
11	Dr. Hatem Asal Gzar	PhD	Environmental Engineering	Air Pollution/Soil Pollution	Lecturer	50	25	25
12	Mrs. Muna Yousif Abdul-Ahad	M.Sc	Chemical Engineering	Chemical Reaction Engineering	Assis. Prof	50	25	25
13	Dr. Mohanad Jasim Ridha	PhD	Environmental Engineering	Air Pollution	Lecturer	75		25
14	Dr. Hussein Majeed	PhD	Environmental Engineering	Industrial Wastewater Pollution	Lecturer	75		25
15	Dr. Tariq Jwad	PhD	Environmental Engineering	Water Pollution	.Lecturer	75		25
16	Ms. Muna Faiq Ali	M.Sc	Environmental Engineering	Water Pollution	Lecturer	75		25
17	Ms Nagham Ali	MA	English		Lecturer	75		25

18	Mr. Ziad Tariq	M.Sc	Environmental Engineering	Water Pollution	Assis.Lecturer	75		25
19	Mr. Mohammed Bahjet	M.Sc	Environmental Engineering	Water Pollution/RO system	Assis.Lecturer	100		25
20	Ms Saba Waleed Kadhim	MSc	Environmental Engineering	Water Pollution	Assis.Lecturer	75		
21	Miss Farah Al-Damalogy	MSc	Environmental Engineering	Water Pollution	Assis.Lecturer	75		25

* Other activities mean committees inside and outside the department within the Ministry of Higher Education and Scientific Research or other Ministries.

Table 6-2: Engineers and administration staff members

Names	**Occupation**	Degree
Mrs Rasha Talib	Engineer	BSc / Computer Engineering
Mr Faaq Khadom Obeed	Engineer	B.Sc./ Mechatronics Engineering
Mr. Ahmed Esam	Biologist	BSc/ Biological Science
Miss Nahla Shadid Ajeel	Assis. Biologist	Secretary

Fig (6-1) represents the percentage breakdown of faculty according to scientific rank, while Fig (6-2) represents percentage breakdown of faculty' qualifications.

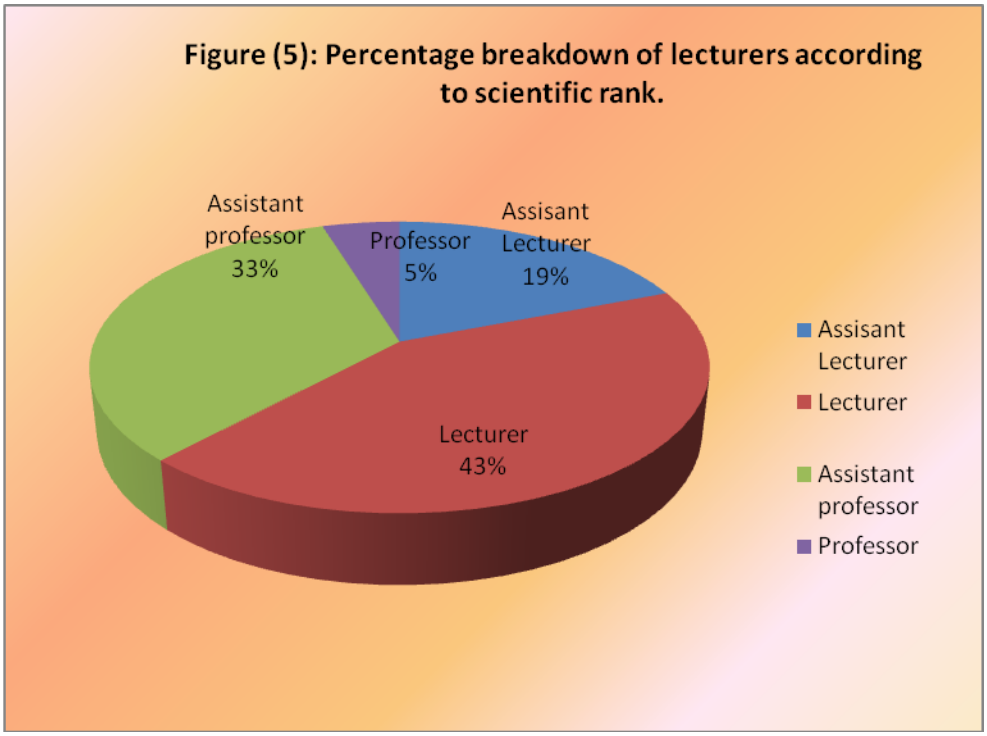


Fig (6-1): Percentage breakdown of faculty according to scientific rank

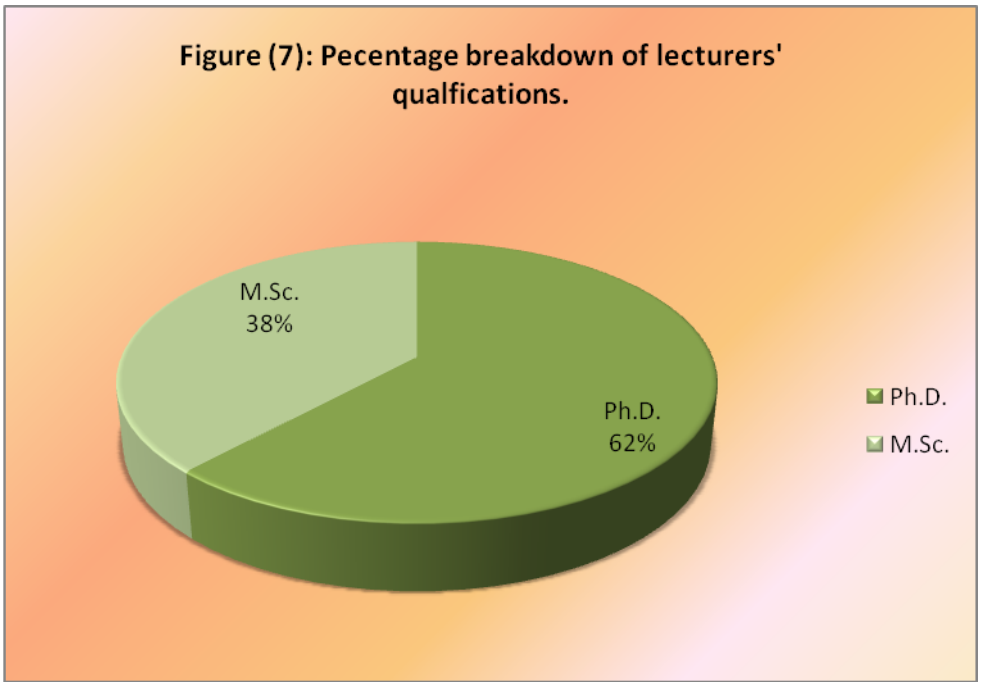


Fig (6-2): percentage breakdown of faculty' qualifications

Table (6-3) represents the Environmental Engineering faculty workload summary. Figure (6-3) represent percentage breakdown of faculty rank according to specialization.

Table 6-3: Environmental Engineering Faculty Workload Summary

Name	Type of academic appointment FT or PT	Highest Degree	Institution of highest degree and year	Years of experience		Level of activity (Consultant , or working with consultant bureaus (Low, Medium, High, None)			
				Gov./ Industry	faculty	L	M	H	N
Assis. Prof. Dr. Yasmeen Abdul-Aziz Mustafa	FT	PhD	Baghdad University (2004)	10	26		×		
Prof. Dr. Adel Al-Hemiri	FT	PhD	Aston University (UK)(1974)	5	34			×	
Assis. Prof. Dr. Zainab Ziad Ismail	FT	PhD	Baghdad University (2003)	17	10	×			
Assis. Prof. Dr. Ahmed Abed Mohammed	FT	PhD	Baghdad University (2004)	16	8		×		
Assis. Prof. Dr. Ayad Abdul Hamza Faisal	FT	PhD	Baghdad University (2006)		12		×		
Assis. Prof. Dr. Abdul-Fattah Mohammed Ali	FT	PhD	Aston University (UK)(1976)	24	10				×
Assist. Prof. Dr. Shahlaa Esmail Ebrahim	FT	PhD	Baghdad University (2008)	2	24	×			
Lecturer Dr.Jathwa Abdoul Karim	FT	PhD	University of Technology (2003)	26	6		×		
Lecturer Dr. Abeer Ibrahim Al- Wared	FT	PhD	Baghdad University (2009)		5		×		
Lecturer Dr. Hayder Mohammed Abdul- Hameed	FT	PhD	Baghdad University (2009)	6	13			×	

Lecturer Dr. Hatem Asal Gzar	FT	PhD	Baghdad University (2010)	3.5	12		×		
Assist. Prof. Muna Yousif Abdul-Ahad	FT	MSc	UMIST (UK) (1982)		37				×
Lecturer Dr. Mohanad Jasim Ridha	FT	PhD	Baghdad University (2011)		6		×		
Lecturer Dr. Hussein Majeed	FT	PhD	Baghdad University (2012)	13	7	×			
Lecturer Dr. Tariq Jwad	FT	PhD	Baghdad University (2012)		6		×		
Lecturer Ms. Muna Faiq Ali	FT	MSc	University of Technology (2003)		6				×
Lecturer Miss Nagham Ali	FT	MSc	Baghdad University (2007)		4				×
Assist. Lecturer Mr. Ziad Tariq	FT	MSc	Baghdad University (2007)	17	3				×
Assist. Lecturer Mr. Mohammed Bahjet	FT	MSc	Baghdad University (2007)		14				×
Assist. Lecturer Ms Saba Waleed Kadhim	FT	MSc	Baghdad University (2012)		6				×
Assist. Lecturer Miss Farah Al-Damalogy	FT	MSc	Baghdad University (2009)		9				×

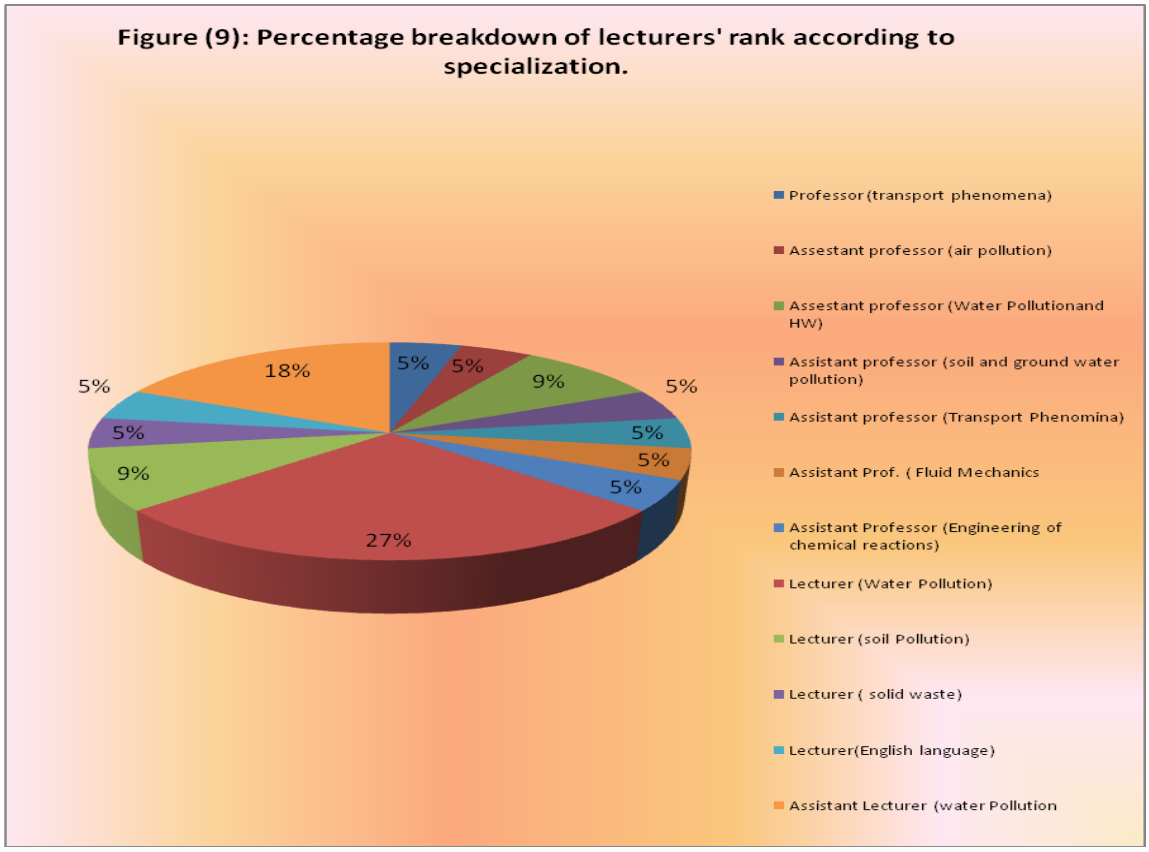


Fig 6-3: Percentage breakdown of faculty rank according to specialization

Faculty Competencies

The Environmental Engineering faculty members are extremely well qualified by virtue of education and professional experience. They have had sustained industry experience and interaction. They are, without exception, active scholars with multiple referenced publications each year and one or more on-going sponsored projects (research grants). They are involved with professional societies, publications, and conferences and reviewing.

We match faculty special interests and abilities to courses, so that every course in our curriculum is basically taught by a specialist. Some of the courses are rotated among the faculty if there are multiple faculty members who are interested in that particular topic. The faculty work load for the fulltime of the academic year 2012-2013 is shown in Table (6-4).

Table 6-4: Faculty Teaching Load Summary for undergraduate study (Academic Year 2012/2013)

No.	Faculty Member (Name)	FT or PT	Classes Taught (Course No. /Credit Hrs.) Fulltime Academic Year
1	Yasmeen Abdul-Aziz Mustafa	FT	EnE 403 (6)
2	Zainab Z. Ismail	FT	EnE 401 (7)
3	Ahmed Abed Mohammed	FT	EnE 304 (6), EnE 209(2)
4	Ayad Abdul Hamza Faisal	FT	EnE 307 (6), EnE 407(6)
4	Abdul-Fattah Mohammed Ali	FT	EnE 301 (7), EnE 405(6)
5	Shahlaa E. Ebrahim	FT	EnE 204 (3), EnE 302(3)
6	Jathwa Abdoul Karim	FT	EnE 102 (6), EnE 305(3)
7	Abeer Ibrahim Al- Wared	FT	EnE , 202 (5),), EnE , 404(4)
8	Hayder Mohammed Abdul- Hameed	FT	EnE , 303 (8), EnE , 306(3)
9	Hatem Asal Gzar	FT	EnE, 104 (3), EnE , 205(6), EnE , 206(2)
10	Muna Yousif Abdul-Ahad	FT	EnE, 107 (4), EnE , 207 (6)
11	Mohanad Jasim Ridha	FT	EnE, 101 (5), EnE , 203(4), EnE , 406(3)
12	Hussein Majeed	FT	EnE, 103 (6), EnE , 201(4), EnE , 308(2)
13	Tariq Jwad	FT	EnE, 106 (4), EnE , 208(4), EnE , 402(3)
14	Muna Faiq Ali	FT	EnE, 105 (3)
15	Nagham Ali	FT	EnE, 108 (4)

Faculty Size

Our faculty members either have open-door policies or post office hours during which they are available to students. We have a professional academic advisors (the two Coordinators) who advises all undergraduate and graduate students in the department; however faculty members are available for advising as well. All of our faculty members participate in service and professional development activities.

Some of the faculty members are consultant in some Ministries, such as the Ministry of Environment, Ministry of Health, and Ministry of Industry. Also, some of the staff members are part of committees in the Ministry of Higher Education and Scientific Research.

Most of the faculty members work with the Consultant Bureau of the Environmental Engineering Department. Some of the faculty member has spent time in Government Organizations as a full time employee during his or her career. Organizations include Ministry of Industry, Iraqi Atomic Energy Organization, and Ministry of Environment.

We have many avenues of collaboration with industry including Senior Design projects, Masters Projects, PhD projects, sponsored research projects, consulting, outreach through the university, and outreach through Consultant Bureau. There is opportunity for faculty and student interaction with industry and this is through the contracts of PhD and MSc students with different Ministries such as:

-Ministry of Petroleum.
-Ministry of Environment.
-Ministry of Water Resources.
-And others.
-Some of faculty members collaborated with International Institutes

Faculty Development

The main responsibilities of the faculty member are:
– Adequate levels of student-faculty interaction.
– Student advising and counseling.
– University service activities.
– Professional development.
– Interactions with industrial / professional practitioners and employers of students.
- Must have competencies to cover all program curricular areas.
- Faculty must have appropriate qualifications.
- Faculty must have and demonstrate sufficient authority to ensure proper program guidance.
Develop and implement processes for the department is to:
- Evaluate.
- Assess.
- Continual improvement.
- Including educational objectives and outcomes.
The faculty overall competence may be judged by:
– Education.
– Diversity of backgrounds.
– Engineering experience.
– Teaching effectiveness and experience.
The faculty overall competence may be judged by:
– Ability to communicate.
– Enthusiasm for developing more effective programs.
– Level of scholarship.
– Participation in professional societies.
– Licensure as Professional Engineers.

Faculty members are supported in several ways for professional development. Travel to professional conferences is included in faculty start up packages (part of the expenses funded by the University). Sabbatical leave is offered per the university guidelines.

New faculty members take part in a one month development program in Baghdad University Development and continuous Education Center, in order to Improve a quality & efficiency of education and Enhancing creativity and innovation, at all levels of education. The new faculty reviewed orally Committee before start teaching in the Department.

SWOT Analysis

Strengths

-The members of the faculty in the department provide environmental consulting to Government Institutions, companies and private sector factories.
-The academic staff supports the administration staff to accomplish the work.
-Provides a full-time teaching staff appropriate in number and diversity of experience and competencies.
- Members of the faculty cover all fields of knowledge of the specialty.
-Academic qualification for new faculty members.

-Academic Development continued to faculty members to follow the new developments.
-The impact of scientific research of the faculty members on the educational process.
The members of the faculty in the department provide environmental consulting to state institutions, companies and private sector factories.
- Versatile academic backgrounds.
- Suitable number of faculty members comparing with the students' number.
- Increase the number of Ph.D. holders.
- Increase the academic participating in conferences, seminars and workshops, regional and global.

Weaknesses

- Shortage in Professors in the Department
-No wide support to the training of the faculty members in the International Universities.
- No serious support to the faculty members to contribute or attend the international conferences.
- The limited electronic scientific libraries (e.g., Science direct) within the IVSL (Iraq Virtual Science Library).
- The only training for the new faculty is by attending a one month development program in Baghdad University Development and continuous Education Center.
- Very limited support to the scientific researches by the University and the Ministry of Higher Education and Scientific Research.
- There is no Advisory Institutes within the University to improve the learning and teaching skills of the faculty members.

Opportunities

- Sabbatical leave (but with restricted conditions).
- The training of some faculty members in the International Universities is due to personal efforts.
-A training for the faculty members in the International Universities for a period of one month supported financially by the Ministry of Higher Education and Scientific Research (also with restricted conditions).

Threats

-The security conditions which is of great threat to the life of the faculty members.
- The migration of some of the faculty members abroad because of the security conditions.

Recommendations

-Support and encourage the training of the faculty members in the International Universities.
-Support the faculty members to contribute or attend the international conferences financially.
-Improve the IVSL (Iraq Virtual Science Library).
-Improve the Learning and Teaching skills of the faculty by following the modern methods of teaching (e.g., E-learning, using minute paper, and muddiest point paper, etc.).
-There must be an Advisory Institutes within the University or the College to improve the learning and teaching skills of the faculty members.

-Enhancing leadership tendencies through encouragement of team-work, inter-discussions and amicable behavior.

-Attracting capable academic / managerial personnel to join the department.

-Enhancing quality of staff members with respect to accomplishments.

-Activate relations with field work.

-Create a strong relationship with industry to cooperate in advancement of the country's economy.

-Develop the infrastructure.

CRITERION 7. FACILITIES

Space

The Department includes several classrooms, laboratories, faculty offices, department library, and network access facilities. We have one large (35 chairs) meetings and conference room, equipped with computer integrated projection equipment (LCD and / or Data Show) and a smart board. We also have a coffee break room equipped with sufficient requirements. The network access facilities are in the form of a Wireless LAN network available in all university buildings. Five terminals are available now in the department.

Faculty Offices

The faculty offices are for two faculty members each, and some are for more members. The offices have adequate furniture, and air-conditioned. Some of the faculty members have computers in their rooms. There are only five internet connections in the Department. The average faculty office space is about 10 square meters.

Classrooms

In the Environmental Engineering Department there are four classrooms for undergraduate students and two classrooms for graduate students. The size of two of the undergraduate classrooms is 8 m x 10 m for an area of 80 m^2; the area can accommodate 50 seats. The two other undergraduate classroom measure 6 m x 7 m for an area of 42m^2. These classrooms can accommodate 30 seats but the number of students was twenty-two. All classrooms equipped with air conditioning systems.

The size of two classrooms of the graduate students is 6 m x 5 m for an area of 30 m^2. These classrooms can accommodate 20 seats but the number of students for the MSc classroom was ten and six at the PhD classroom. All classrooms equipped with air conditioning.

Three classrooms in the department were located on the ground floor and the other three on the first floor of the Environmental Engineering Building.

In each classroom there are Individual chairs for seating, blackboards, a lecture podium, and ceiling fans.

The percentage of the number of computers per student in the department is 3 students per 1 computer, and the percentage of the number of books in the library for each student in the department is about 15 books per 1 student.

Laboratories

It is a known fact that scientific experiments are important in engineering education; it translates to tangible facts the theoretical principles of engineering knowledge in addition to equations and laws which the students study.

Faculty members in Environmental Engineering Department despite their limited available resources in the laboratories, try to accomplish as much as possible from our objectives in performing laboratory experiments, these objectives are summarized as follows:

-The student will obtain experience in dealing with devices practically.

-Teaching the student how to register correctly the readings and obtain information from measuring devices.

-Teaching the student how to write reports, draw curves and organize tables scientifically.

-Teaching the student how to discuss the results scientifically and to reach important conclusions in this discussion.

Laboratories that studied by the undergraduate students within the curriculum of Environmental Engineering program are:

1- Environmental Physics lab.
2- Computer lab.
3- Microbiology lab.
4- Analytical chemistry lab.
5- Organic chemistry lab.
6- Environmental Geology lab.
7- Fluid mechanics lab.
8- Water Supply & Sewage treatment lab.
9- Environmental Engineering Control System lab.

Only one laboratory (Computer lab) belongs to the Environmental Engineering Department, three laboratories belong to the college of Science, and five laboratories to other departments in the College of Engineering (Chemical Engineering, Water Resources, Petroleum Engineering and Civil Engineering). Table (7-1) represents laboratories survey. Appendix A represents photos of undergraduate studies labs while; Appendix B represents the equipment of the graduate laboratory in the Department.

Table 7-1: Laboratories Survey

Description	Computer lab	Microbiology lab	Analytical and Organic chemistry lab	Environmental geology lab	Fluid mechanics lab	Water supply and sewage treatment lab	Environmental Engineering control lab
Location	Env. Eng. Dept	College of Science, Bio. Dept.	Chemical Eng. Dept.	Petroleum Eng. Dept.	Water Resources Dept.	Civil Eng. Dept.	Chemical Eng. Dept.
Size	6×9 m	6×8 m	8 ×20 m	8.5×12 m	20×8 m	25×8 m	8×15 m
No. of students	18	30	30	36	25	30	15
No. of seats	19	30	34	36	25	30	8
No. of Computers	18	None	None	1	None	1	None
Condition scale (1-5)	3	3	2	3	2	2	2
Ventilation	None	None	None	None	None	None	None
Air conditioning	3	None	None	None	None	2	None

1-5 scale: starting from 1 bad, 2 medium, 3 good, 4 v. good, 5 excellent

For the postgraduate studies there are two laboratories in the Department located in the ground floor of the Department building. One lab is equipped with some devices bought from the local market and as the budget of the engineering college allows for acquisition. The other lab room is

in preparation stage. This lab contains some analysis devices such as Ultra Violate (UV), Atomic absorption spectrophotometer, HPLC. Some of the experiments of postgraduate researches are conducted in the laboratory of graduate studies in the Department and others are conducted in the laboratory of Graduate Studies in the Chemical Engineering Department at the same college.

The Department's Library

This library is offers services to the students, faculty members, engineering and technical staff of the department. Besides, the library is also accessible to students and researchers from other departments in the college and from other colleges inside and outside the university, and also for researchers from various government offices and ministries. In brief, the library has the following facilities:

- Area of the library (24 m^2)
- 172 Thesis and Dissertation
- 406 Books
- 68 CDs
- 1 Internet Assess Terminal
- 411 Books for undergraduate students

The College's Library

The Library of Engineering College is one of the oldest scientific libraries in the University of Baghdad. It was established in 1941, and then developed well in the later years to become one of the mother libraries in engineering and contains more than (74901 books) and (1450 periodicals titles). The library offers its services to the students, faculty members, and researchers from inside and outside the college. Lastly, the library finished the documentation of all books, periodicals, theses and dissertations in a complete data base to facilitate the accessing process for students and researchers. The library continuously organizes and / or participates in book fairs.

The University's Library

The Central Library of the Baghdad University is one of the main oldest libraries in Iraq. It was established in 1959. The library offers services to users through many sources of information; such as books, periodicals, thesis and dissertations, films, laser CDs, audio labs, maps, internet services. .etc. The library now has two buildings, one in the Al-Jadiriyah Campus and the other in Bab Al-Muaatham Campus. The following is a brief description of the facilities and activities of the library:

-Area of the library (20549 m^2)

- 319142 Books
- 20784 Periodicals
- 4 Reading Halls, (549 m^2) each
- 210 Reading Seats
- 3 m^2 / Person for Reading
- 62 Computers for Office Work
- 544 CDs & 35 Flash Ram
- 791 Scientific Films
- 35 Internet Service Terminals

- 35 Hours / Week Access
- 356 Books / Day Circulating
- Continuous Organization of Book Fairs
- Continuous Learning Courses
- Installing WIN-ISIS Electronic Systems for Offices Work
- Number of Employees (131)

SWOT Analysis

Strength

-New analysis devices supplied to the graduate studies laboratory

Weakness

-Financial allocations to be allocated to the Environmental Engineering Department are usually limited according to the engineering college budget allows for acquisition. The money allocated to the department is not enough.

-The Department of Environmental Engineering needs additional infrastructure such as classrooms, laboratories, and furniture to support research, teaching and learning activities.

-Central of the decisions by the University and the Ministry which limits the possibility of development.

- Insufficient funding for maintaining and upgrading facilities.

Opportunities

-The use of Information Technology

-The increase of government financial support for official universities.

-Encourage the principal of self financing through building service laboratories or others.

Threats

- No laboratories available for undergraduate students inside the Department

- Competition by new and private colleges with higher financial support compared to the College of Engineering, because of the low level of infrastructure.

- Lack because of administration laws and low financial support.

Recommendations

-The Environmental Engineering Department needs additional infrastructure such as classrooms, laboratories, and furniture to support research, teaching and learning activities.

CRITERION 8. INSTITUTIONAL SUPPORT

Program Budget Process

Environmental Engineering Department budget is part of the overall College of Engineering budget. Table (8-1) shows details of the budget allocated to exchange department for fiscal year 2011.

Table 8-1: Department Expenditure (Fiscal year 2011)

Sequence	Paragraphs relating to the financial aspect	Amount in ID	
1	The total budget allocated to the department.	600,000,000	
2	Total salaries of faculty members	500,134,168	
3	Total salaries of administration staff and technical staff	36,634,340	
4	Additional wages lectures for faculty members	18,780,000	
		Apportionment	Amount spent
5	Total funds allocated for maintenance of buildings and equipment.		2,688,000
6	Sum of the amounts allocated for equipment, materials and supplies.		24,536,642
7	Total funds allocated for the purchase of books and periodicals and references.		1,000,000
8	Sum of the amounts allocated for conferences and seminars.		-
9	Sum of the amounts allocated for the purposes of scientific research and graduate studies.		-
10	Sum of the amounts allocated to train faculty and staff in the administrative apparatus.	Within university assignments	
11	Sum of the amounts allocated to the purposes and other expenses such as exhibitions, and other celebrations.	Within university assignments	
12	Sum of the amounts allocated to the workshops.	Within university assignments	
13	The total amounts allocated to student services.		200,000
14	The total amounts allocated to scientific dispatch.	Within university assignments	
15	Total funds allocated for the purchase of textbooks		3,500,000

Sources of Financial Support

University of Baghdad and its colleges are supported from government institution, with the entire budget coming from the Iraqi government. It also receives some grants and gifts from some state offices, institutions, some international organizations, and civil society organizations. However, such contributions amount to only a small fraction of the government allocations. Thus, the main source of departmental financial support is from government allocations.

Additional sources of departmental financial support come indirectly from faculty funded research grants, experimental tests made in some laboratories for various state organizations, and industry consultations. All these activities are covered by the Central Cooperation Mechanism Committee of the university, which is working according to the law of cooperation mechanism.

Inadequacy of Budget

The Environmental Engineering Department has great shortage and inadequacy in budget to build the labs it needed, to achieve its program's outcomes, and to support the faculty's teaching and scholarly activities.

Support of Facilities and Equipment

The allocation of office space and laboratory facilities is the responsibility of the college and university with suggestions and recommendations from the department. On the other hand, the scheduling of classrooms is the responsibility of the department.

College maintenance department is responsible for all maintenance related. The college maintenance department accepts maintenance requests from the departments through written orders. In general, the support of facilities and equipment is inadequate to achieve program's outcomes in a perfect manner.

The Environmental Engineering Departmental budget is part of the overall College of Engineering budget. The departmental budget is mainly dominated by the laboratory budget. Additional budget items include furniture, rehabilitations of university buildings, books, supplies… etc. Table (8-2) represents the Department Expenditure during 2011-2012

Table 8-2: Department Expenditure for the year 2011-2012

Item	Price in ID
Atomic Absorption Device	45,000,000
HPLC Device	50,000,000
UV Device	10,000,000
Laboratory Benches	12,000,000
Books	5,000,000

The College of Engineering purchasing committee provided the Environmental Engineering Department with other facilities during 2011-2012 as presented in table (8-3)

Table (8-3): Other facilities provided to the Department during 2011-2012

Item	Number
Scanner	1
Printer	3
Personal Computers	7
Smart board	1
Thermal paper compressor	1

SWOT Analysis

Strength

- Good salaries and wages for the staff.

Weakness

-Complicated decision-making process at the College level.
-Complicated and restrictive purchasing procedures.
-Complicated and restrictive hiring human resources procedures.
-Insufficient funding for; research, teaching improvement, maintaining and upgrading facilities

Opportunities

-The presence of government financial support for official universities

Threats

-Administrative and financial corruption.

Recommendations

--Starting self-financing sources
-Increase funding for infrastructures, buildings and laboratories.

CRITERION 9.SCIENTIFIC RESEARCH AND OUTBOARD RELATIONSHIP

Research helps in contemporary knowledge being passed onto the student. This is a relationship where the excitement of engaging with the development of the knowledge base of the discipline itself contributes to student learning.

The Department of Environmental Engineering linked financially with the College of Engineering, and this college financially linked with the University of Baghdad, which is in turn linked with the Ministry of Higher Education and Scientific Research.

Financial allocations to be allocated to the Environmental Engineering Department are usually limited according to the engineering college budget allows for acquisition. The money allocated to the department is not enough, especially the department looking forward to:

- Purchase of laboratory equipment and set up advanced laboratories.
- Development of teaching aids.
- Send faculty members to the advanced countries, participation in training courses in order to keep pace with scientific development in those countries.
- Purchase of modern books and journals.

Relation between Scientific Research and Teaching

Scientific research and teaching are interdependent and interacted. Teaching and scientific research was a dialectical unit. Teaching is the basis of scientific research, scientific research contribute to the development and upgrading of teaching. From the teacher point of view, engaged in scientific research activities is the most important way to improve their own academic standards and research capabilities. The updates of textbook content, the experiences and methods, are all contributed to the process in the scientific research.

Faculty Researches

Most of the faculty members had published there researches abroad in an important scientific journals. Table (9-1) shows the name of the faculty members, name of researches, journals, and the year of publication.

Table 9-1: Name of faculty members in the Environmental Engineering Department published in abroad Scientific Journals

No.	Name of faculty member	Name of research	Journal	Year of publication
1	**Adel A. Hemiri,** Nada S. Ahmedzeki	Development of heat transfer coefficient model via experimental validation	Chemical Product and Process Modeling	2008
2	**Adel A. Hemiri,** Nada S. Ahmedzeki	Prediction of the heat transfer coefficient in bubble column using an artificial neural network	International Journal of chemical reactor engineering	2008
3	**Zainab Z. Ismail**, Enas A. AL-Hashmi	Reuse of waste iron as a partial replacement of sand in concrete	Waste Management*	2008
4	**Zainab Z. Ismail**, Enas A. AL-Hashmi	Use of waste plastic in concrete mixture as aggregate replacement	Waste Management*	2008

5	Abbas H. Sulaymon, Abdul-Fattah M. Ali, Saadi K. Al-Naseri	Natural organic matter removal from Tigris River water in Baghdad, Iraq	Desalination *	2009
6	**Zainab Z. Ismail**, Enas A. AL-Hashmi	Recycling of waste glass as a partial replacement for fine aggregate in concrete	Waste Management*	2009
7	Abbas H. Sulaymon and Shahlaa E. Ebrahim	Saving amberlite XAD4 by using inert material in adsorption process	Desalination and Water Treatment*	2010
8	**Abbas H. Sulaymon , Shahlaa E. Ebrahim, Tariq Al-Muasawi,** and Sama Mohammad	Removal of lead, cadmium, and mercury ions using biosorption	Desalination and Water Treatment*	2010
9	**Adel A. Hemiri,** Heaven E. Mahmoud	Removal of zinc ions from water using emulsion liquid membrane	International Journal of Chemical Reactor Engineering	2010
10	**Zainab Z. Ismail**, Ulas Tezel, Spyros G. Pavlostathis	Sorption of quaternary ammonium compounds to municipal sludge	Water Research*	2010
11	**Abbas H. Sulaymon, Hatem Asal Gzar**	Experimental investigation and numerical modeling of light nonaqueous phase liquid dissolution and transport in a saturated zone of the soil	Journal of Hazardous Materials*	2011
12	**Abbas H. Sulaymon, and Abeer I. Alwared**	Experimental determination of the virtual mass coefficient for two spheres accelerating in a power law fluid	Journal of Fluid Engineering, ASME*	2011
13	**Abbas H. Sulaymon, and Ahmed A. Mohammad**	Separation and Hydrodynamic performance of Air kerosene-water system	International Journal of Chemical Reactor Engineering*	2011
14	**Abbas H. Sulaymon, Abdul-Fattah M. Ali**, Saadi K. Al-Naseri	Mathematical models application for natural organic matter adsorption onto activated carbon	Desalination and Water Treatment*	2011
15	**Abbas H. Sulaymon, and Hayder M. Abdulhameed**	A comparative study between Adam-Bohart and Herkins-Jura models for activated carbon	International Journal for Science and technology (Jordan)	2011
16	**Abbas H. Sulaymon, and Hayder M. Abdulhameed**	The adsorption of Cd(II) and Pb(II) from aqueous solution by sea shell	International Journal for Science and technology (Jordan)	2011
17	**Abbas H. Sulaymon, and Hayder M. Abdulhameed**	Competitive adsorption of cadmium, lead, and mercury ions onto activated carbon in batch adsorber	J. Int. Environmental Application Science	2011
18	**Abbas H. Sulaymon, and Shahlaa. E. Ebrahim**	Evaluation of Adsorbents for Removal of Phenol and Methylene Blue from Wastewater	J. Int. Environmental Application Science	2011
19	**Yasmeen A. Mustafa** and Maysoon J. Zaiter	Treatment of radioactive liquid waste (Co-60) by sorption on zeolite Na-A prepared from Iraqi kaolin	Journal of Hazardous Material*	2011
20	**Waleed M. Salih, and Ayad A. Faisal, and**	Influence of clay lens on migration of light non-aqueous phase liquid in	ASCE*	2011

	Tamara K. Hussien	unsaturated zone		
21	**Zainab Z. Ismail**, Enas A. Al-Hashmi	Assessing the recycling potential of industrial wastewater to replace fresh water in concrete mixes: application of polyvinyl acetate resin wastewater	Journal of Cleaner Production*	2011
22	Zhaojie Cui, Hou yannan, Jinglan Hong, **Zainab Z. Ismail**	Life cycle assessment of coated white board: a case study in China	Journal of Cleaner Production*	2011
23	Abbas H. Sulaymon, and **Yasmeen A. Mustafa**	Aerosol filtration using quartz sand filter	American journal of environmental science*	2012
24	Abbas H. Sulaymon, Shahlaa E. Ebrahim, and Mohanned J. M. Ridha	Equilibrium, kinetic, and thermodynamic biosorption of Pb(II), Cr(III), and Cd(II) ions by dead anaerobic biomass from synthetic wastewater	Environmental science and pollution research*	2012
25	Abbas H. Sulaymon, and Shahlaa E. Ebrahim	saving activated carbon by using intert meterial in adsorption process	J. Int. Environmental application & science	2012
26	**Yasmeen A. Mustafa,** and Sinan Jaafar	Measurement of ground level ozone at different locations	American Journal of Environmental Science*	2012

-The red color refers to the faculty members in the department.
- The star (*) refer to journals with impact factor

Researches supported financially by Government ministries and Institutes

Some of the faculty members have contracts with the Ministry of Higher Education and Scientific Research, Research and Promotion Office.

There are a lot of MSc and PhD researches supported financially by different ministries. The budgets are between 2 to 12million Iraqi Dinar and the budget divided between the Supervisor, Student, and the University. Table (9-2) shows the number of students had contracts with different ministries during the year 2011-2012.

Table 9-2: Contracts with Iraqi Ministries for the current year (2011-2012)

No.	Ministries	No. of M.Sc. and Ph.D. students
1	Ministry of Environment	9
2	Ministry of Petroleum	5
3	Ministry of Water Resources	3
4	Ministry of Municipal and Public Work	3
5	Contracts with different Ministries and Institutes such as Ministry of Technology, Ministry of Industry ,Babylon University and others (supporting the students by using equipment, materials, analysis devices and others)	10

Points of strength and challenges

The researches of the Environmental Engineering Department is important to solve the problems in different government institutes as shown in table (21) and most of these researches published in a valuable journals with impact factor as shown in table (20).

The most important challenges the department faces is the lack in the financial support for scientific research, lack in laboratory equipments, and there is no financial support for publishing abroad or participating in International Scientific Conferences.

Supporting the postgraduate students

The College of Engineering has no financial allocation to support the researches of postgraduate students in buying equipments or help them in the cost of analysis; but the College pays part of the cost of printing and binding the student's graduating thesis.

The Relationship with the Dean's Office and Other Departments

The relationship with the dean's office is through the following:

a- The dean of the college and his personal office. Connected directly to the head of the department.

b- The Dean's assistant for scientific affairs and postgraduate studies. Connected to the department via the head of the department and the Coordinators.

The Dean's assistant for management and financial affairs connected to the department via the head of the department and the purchasing committees and the department's coordinator for undergraduate studies.

The Dean's assistant for student's affairs connected to the Department via the head of the department and the undergraduate coordinator.

The most important thing in the relationship with the Dean office is the continuous connection and pursuit regulations and their execution according to those agreed upon. Also the Dean's office must be constantly informed in written documents of the department's resolutions and the steps taken on different levels and from different centers and following up on the dean's office comments concerning these resolutions.

As for the relationship with other departments, it is basically based on the principle of respect and mutual cooperation to serve the motion of scientific progress on the level of undergraduate and postgraduate studies together. This can be done by teaching some subjects to other departments and vice verse, or through the use of the department's laboratories by undergraduate and postgraduate students of other departments or vice verse, or through joining the defense committees for the graduated students and others.

The Relationship with Society and State Offices

The department has contributed in providing numerous services to different national offices and private sectors. These services included different activities, such as engineering consultancy, performing primary and final designs, inspecting designs, evaluating researches & inventions, research contracts for postgraduate students with state offices and other activities. These activities are usually conducted either through the Environmental Engineering Consulting Bureau / Baghdad University, or through the cooperation mechanism committee of the

department. The department has taken care and still does in the teachers' participation as well as its personal in as much a fair manner as possible.

The Relationship with International Universities

The faculty members of the Environmental Engineering Department had been visited a number of International Universities as a Visiting Professors, Table (9-3) shows these visits.

Table 9-3: Faculty members of the department scientific visits

No.	Faculty member	University	Country	Year
1	Prof. Dr. Abbas H. Sulaymon	Iraqi Academy of Science, London	United Kingdom	2003, 2005
2	Prof. Dr. Abbas H. Sulaymon	Surrey University	United Kingdom	2009
3	Prof. Dr. Abbas H. Sulaymon	Insubria University	Italy	2010
4	Prof. Dr. Adel Al-Hemiri	Surrey University	United Kingdom	2010
5	Assistant Prof. Dr. Zainab Z. Ismail	Georgia University	United States of America	2006
6	Assistant Prof. Dr Shahlaa E. Ebrahim	Cardiff University (finished part of her PhD research)	United Kingdom	2007
7	Assistant Prof. Dr Shahlaa E. Ebrahim	Oregon State University (Training on Sustainability with Michael Scott Mater Foundation)	United States of America	2009
8	Assistant Prof. Dr Shahlaa E. Ebrahim	Michigan State University (Fulbright Visiting Scholar)	United States of America	2010
9	Assistant Prof. Dr Ayad A. Fasal	Milano University	Italy	2010
10	Lecturer Dr Abeer Ibrahim Alwared	Cardiff University (finished part of her PhD research)	United Kingdom	2007
11	Dr. Hayder M. Abdulhameed	Hiroshima University	Japan	2010
12	Dr. Hayder M. Abdulhameed	Fukushima University	Japan	2012

The Ministry oh Higher Education and Scientific Research sponsored the Iraqi MSc and PhD students and their supervisors to finish part of their study abroad in the International Universities . Two of the PhD students went to the United Kingdom, Cardiff University for a period of six months at the year 2007 and they finished the experimental part of the project there (both of them are now faculty members), and five MSc students went to Canada, Dalhousie University for a period of four months.

SWOT Analysis

Strengths

- Increasing the chances of getting a PhD from foreign universities through fellowships and scholarships.
- Increase the number of research published in International Journals.
- Increasing opportunities for the participation of faculty members in regional and international conferences, although few in number.
-The members of the faculty in the department provide environmental consulting to state institutions, companies and private sector factories.
- The contracts with the Governmental Institutes.
- The Dean office follows up the performance of the graduate students periodically.
- The ratio of the faculty members to the graduate students is within the limits.
- There are an interaction between the faculty and the graduate students through the Seminars held periodically in the Department.
- The researches that are completed by the graduate students (Ph.D. & M.Sc students) in the department are studies for real environmental problems and then present suggestions and solutions to those problems.
- The graduation projects that are completed by the fourth year students in the department include the study / evaluation/treatment plant design to realistic environmental problems in Iraq.
- Most of the researches in the department published in valuable foreign scientific Journals with impact factors such as ASCE, ASME, Elsevier Journals, etc.
-There is co-supervision with a Professor in Surry University, United Kingdom.
-There is a contribution by experts in the International University to improve the syllabus of the graduate and undergraduate studies.
-There must be an external examiner (from other Engineering Colleges) in each examination committee for the researches of post graduate students; one for the MSc committee and two for the PhD committee.

Weakness

- The lack of a clear plan for scientific research reflect the requirements of the labor market
- The small number of joint research with professors from foreign universities
-The lack in the financial support to the graduate students researches by the Department, College, University, and the Ministry of Higher Education and Scientific Research.
- The lack in the Laboratories and instruments to support the researches.
- Spread the misconception that individual researches is better than joint researches
-No programs for the training of the students and faculty members.

Opportunities

- Develop a plan or strategy for scientific research by the authorities responsible for coordination with the department.
-The Ministry of Higher Education and Scientific Research sponsored the PhD student's financially to finish part of there research abroad in the International Universities.

The Ministry of Higher Education and Scientific Research, Research and Promotion Office sponsored financially faculty and graduate students' researches.
- ASTF (Arab Science and Technology Foundation) sponsored Iraqi academic researchers financially (two projects accomplished in the Department through contracts with this Foundation).
- The Ministry of Higher Education and Scientific Research, Research and Promotion Office sponsored financially faculty and graduate students' researches.
- ASTF (Arab Science and Technology Foundation) sponsored Iraqi academic researchers financially (two projects accomplished in the Department through contracts with this Foundation).

Threats

- Conduct research not fruitful for labor markets
-Electrical power failure
-Lack in laboratories and financial support for the researches
-Administrative and financial corruption.

Recommendations

-Encouraging scientific research work; giving priority to sound applied research of practical use.

-Encouraging staff members to interact with state / society regarding various aspects of environmental engineering.

-Continuing education seminars for staff members of state establishments.

-Consultations for state establishments / private sector.

-Basic, detailed and designs checking and overseeing execution of environmental engineering projects.

-Evaluation of scientific research works and patents.

-Establishment of a special committee within the department to activate, coordinate and follow-up all aspects of cooperation with state / society.

-Increase and support of the scientific researches by the University and the Ministry of Higher Education and Scientific Research.

-The formation of joint committees between the research institution and the beneficiaries of research to develop the necessary plans to implement specialized research develop solutions to engineering problems.

-Encouraging and rewarding scientific and technical quest useful to social needs

Appendix A
Photos of the undergraduate studies labs

Fig 1: Computer Lab (Environmental Engineering Department)

Fig 2: Analytical Organic and Chemistry Lab (Chemical Engineering Department)

Fig 3: Microbiology lab (College of Science, Biology Department)

Fig 4: Geology lab (Petroleum Engineering Department)

Fig 5: Fluid mechanics lab (Water resources lab)

Fig 6: Water supply and sewage treatment lab (Civil Engineering Department)

Fig 7: Environmental Engineering control lab (Chemical Engineering Department)

Appendix B
Equipment of the Graduate Laboratory

Fig 1: Atomic Absorption device (GBC)

Fig 2: BOD Analyzer (Lovibond)

Fig 3: COD Analyzer with Thermo reactor

Fig 4: Dissolved Oxygen Meter (Mi605)

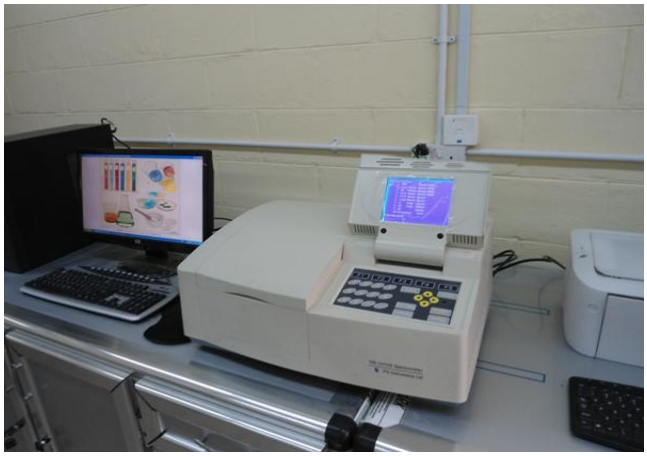


Fig 5: UV Spectrophotometer (T80 UV-VIS)

Fig 6: Microscope

Fig 7: Incubator (Lovibond)

Fig 8: Furnace and Oven

Fig 9: Electric heater (FALC)

Fig 10: Centrifuge (PLC)

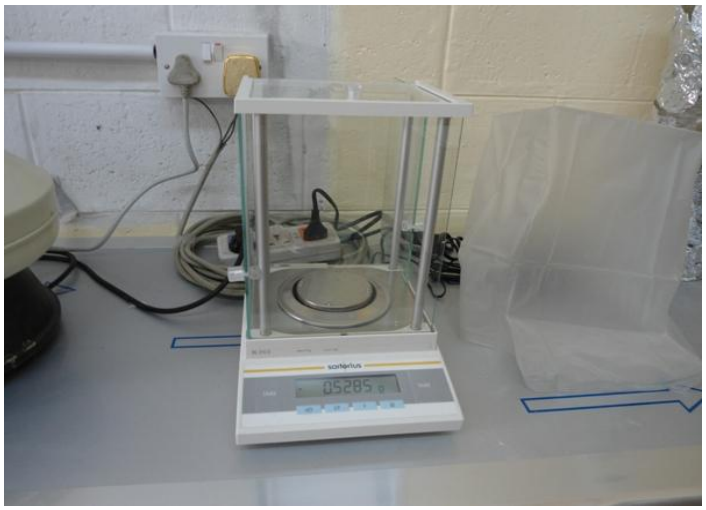


Fig 11: Balance 4 digits