

Ministry of Higher Education & Scientific Research

University of Baghdad

College of Engineering

Environmental Engineering Department



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

September 2011

Shawal 1432

Website: <http://www.coeng.uobaghdad.edu.iq>

Preface

The present report is the first self-assessment report written for the Environmental Engineering Department- College of Engineering – University of Baghdad. The report supported by the College of Engineering and University of Baghdad to achieve the first step in Quality Assurance in accordance with international standards, under the guidance and support of the Iraqi Ministry of Higher Education and Scientific Research.

The report includes in its first part a brief description of the vision, mission, goals, and the policy of the department. While, the second part deals with organization and department management, structure, and program history.

The third and fourth parts include information about the undergraduate and graduate students, student admissions, evaluation of student performance, educational program, credit hours, advising students, curriculum, program syllabus, and department assessment,

The fifth part deals with the faculty members, leadership responsibilities, faculty competencies, faculty size, faculty development, ratios of faculty members to the students. The sixth part covers the laboratories, classrooms, and infrastructure in the department.

Finally the seventh and eighth parts describe 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 part of the report includes the SWOT analysis for the (Strengths, Weaknesses, Opportunities, and Threats) of the department. 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.

Prepared by:

Assist. Prof. Dr. Shahlaa Esmail Ebrahim
Higher Studies Coordinator
Environmental Engineering Department
College of Engineering
University of Baghdad
E-mail:
shahlaa.ebrahim@fulbrightmail.org
shahlaaaga@yahoo.com

&

Dr. Hatem Asal Gzar
Head of Examination Committee
Environmental Engineering Department
College of Engineering
University of Baghdad
E-mail:
hatam_asal@yahoo.com

Table of Contents

Article

Preface	2
Table of contents	3
1-Introduction	5
Vision	5
Mission	5
Goals	5
The Scientific Specialties and the Awarded Degrees	6
Educational program and department policy	6
Students	7
Members of staff	7
Cooperation with State / Society	7
Interaction with Foreign Universities / Institutes	8
Program Outcomes	8
Educational Objectives	8
Relationship of Program Outcomes to Program Educational Objectives	10
Actions to Improve the Department	10
2-Organization and Department Management	11
Forward	11
Department Structure	12
Program History	14
SWOT Analysis	14
3-Students	15
Undergraduate students	15
Student Admissions	16
Enrollment	16
Evaluating Student Performance	16
Overview	16
Educational Program	17
Credit Hour Definition	17
Participant and Graduation Trends	17
Monitor the Progress of Students	17
Advising of Students	18
Opinion of Students	19
Graduate Students	19
SWOT Analysis	20
4-Curriculum	21

Environmental Engineering Program Curriculum Review	21
Program syllabus	23
BSc degree in Environmental Engineering	23
MSc degree in Environmental Engineering	26
PhD degree in Environmental Engineering	27
Environmental Engineering Department Assessment	28
SWOT Analysis	29
5-Faculty	30
Leadership Responsibilities	30
Authority and Responsibility of Faculty	30
Faculty	30
Faculty Competencies	33
Faculty Size	33
Faculty Development	34
Ratios of faculty members to the students	35
SWOT Analysis	36
6- Laboratories, classrooms and infrastructure	37
Classrooms	37
Laboratories	38
SWOT Analysis	39
7-Scientific Research	40
Relation between Scientific Research and Teaching	40
Faculty Researches	41
Researches supported financially by Government ministries and Institutes	45
Points of strength and challenges	45
Supporting the postgraduate students	46
SWOT Analysis	46
8-Outboard Relationship	47
The Relationship with the Dean's Office and Other Departments	47
The Relationship with Society and State Offices	47
The Relationship with International Universities	48
SWOT Analysis	49

1-Introduction

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 conduct interdisciplinary research and the development of innovative approaches to solving 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.

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 work with two semesters. The second year for M.Sc. is for thesis work, with two semesters also. The second and third years for Ph.D. are for dissertation work, with four semesters. 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 education program is to convert the student's way of thinking to well organized and more practical in handling engineering problems . The student prepared to faces 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 conducive environment for work, study, discussions and exchange of information.

Members of Staff

- 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 and design 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.

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:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet sustainable constraints.
- An ability to function on multi-disciplinary teams to analyze and solve problems.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of the Environmental Engineering impacts in professional and ethical manner.
- An ability to communicate effectively in different ways.
- The broad education necessary to understand the impact of engineering solutions on community and surrounding environment.
- The understanding of the up-to-date engineering tools and knowledge is the base of learning in the Department.
- Knowledge of contemporary issues, which is the most important part in the study of Environmental Engineering because the environmental problems is a big thread to the community.
- 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.

Educational Objectives

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

-Entry to environmental engineering practice and the pursuit of advanced studies;

-Life-long learning;

-Continuing professional development and leadership all leading to career success.

The undergraduate curriculum, courses, organizations and activities prepare graduates to:

-Apply mathematics, science and contemporary methods to the formulation and solution of engineering problems;

-Specify and conduct standard laboratory analyses, interpret data, formulate recommendations based on test results, and build understanding through experimentation;

- Design systems, components and processes that conform to specifications and produce the intended benefits;
- Employ interpersonal and social skills required for working on a team, in an organization, and with the general public;
- Honor professional ethics;
- Respect societal and environmental impacts of engineering; and
- Understand contemporary issues in engineering practice.

These educational objectives are promoted and supported by a departmental community of students, faculty and staff characterized by integrity and by respect for individuals, society, the environment, the engineering profession, and engineering education and institutions.

At the graduate level, separate degrees are offered in environmental engineering and related interdisciplinary areas. Graduate study in the environmental area prepares students with undergraduate background in engineering to deal with current and emerging environmental problems. Heavy emphasis is placed on understanding the behavior of environmental contaminants of industrial origin. This includes focusing on the treatment technologies and processes that affect the fate, effects, and movement of contaminants in the environment and on understanding the theory and design of water and wastewater treatment processes. In addition to the MS and Ph.D. in environmental engineering, students can also enter the joint environmental engineering/environmental toxicology field.

Students in environmental engineering who wish to further specialize may select from such areas as environmental chemistry, environmental microbiology, environmental fluid mechanics, environmental/geotechnical engineering, or hazardous waste management. MS students must also complete a thesis. MS graduates find employment with public agencies, consulting firms, and universities. Graduates of the doctoral program are more likely to work for universities and research-intensive agencies and firms.

Relationship of Program Outcomes to Program Educational Objectives

The tight correlation between program outcomes and program educational objectives is illustrated in Table (1). 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.

Actions to Improve the Program

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.
- Establishment of network access facilities provided by the Computer Center of Baghdad University in the form of a Wireless LAN network with 8 terminals available now in the department.
- 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

Table 1: Correlation between program outcomes and program objectives

Program Outcomes	Program Objectives
<p>a-An ability to apply knowledge of mathematics, science, and engineering.</p> <p>b-An ability to design and conduct experiments, as well as to analyze and interpret data.</p> <p>c- An ability to design a system, component, or process to meet sustainable constrains.</p> <p>d-An ability to function on multi-disciplinary teams to analyze and solve problems.</p> <p>e-An ability to identify, formulates, and solves engineering problems.</p> <p>f-An understanding of the Environmental Engineering impacts in professional and ethical manner.</p> <p>g-An ability to communicate effectively in different ways.</p> <p>h-The broad education necessary to understand the impact of engineering solutions on community and surrounding environment.</p> <p>i-The understanding of the up-to-date engineering tools and knowledge is the base of learning in the Department.</p> <p>j- Knowledge of contemporary issues, which is the most important part in the study of Environmental Engineering because the environmental problems is a big thread to the community.</p> <p>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.</p>	<p>Entry to environmental engineering practice and the pursuit of advanced studies (a, b, d, e, k)</p> <p>Life-long learning (f, g, h, j, k)</p> <p>Continuing professional development and leadership (c, i, j, k)</p>

2-Organization and Department Management

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 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.

Department Structure

Figures (1) and (2) represent diagrams of the structure of the Environmental Engineering Department.

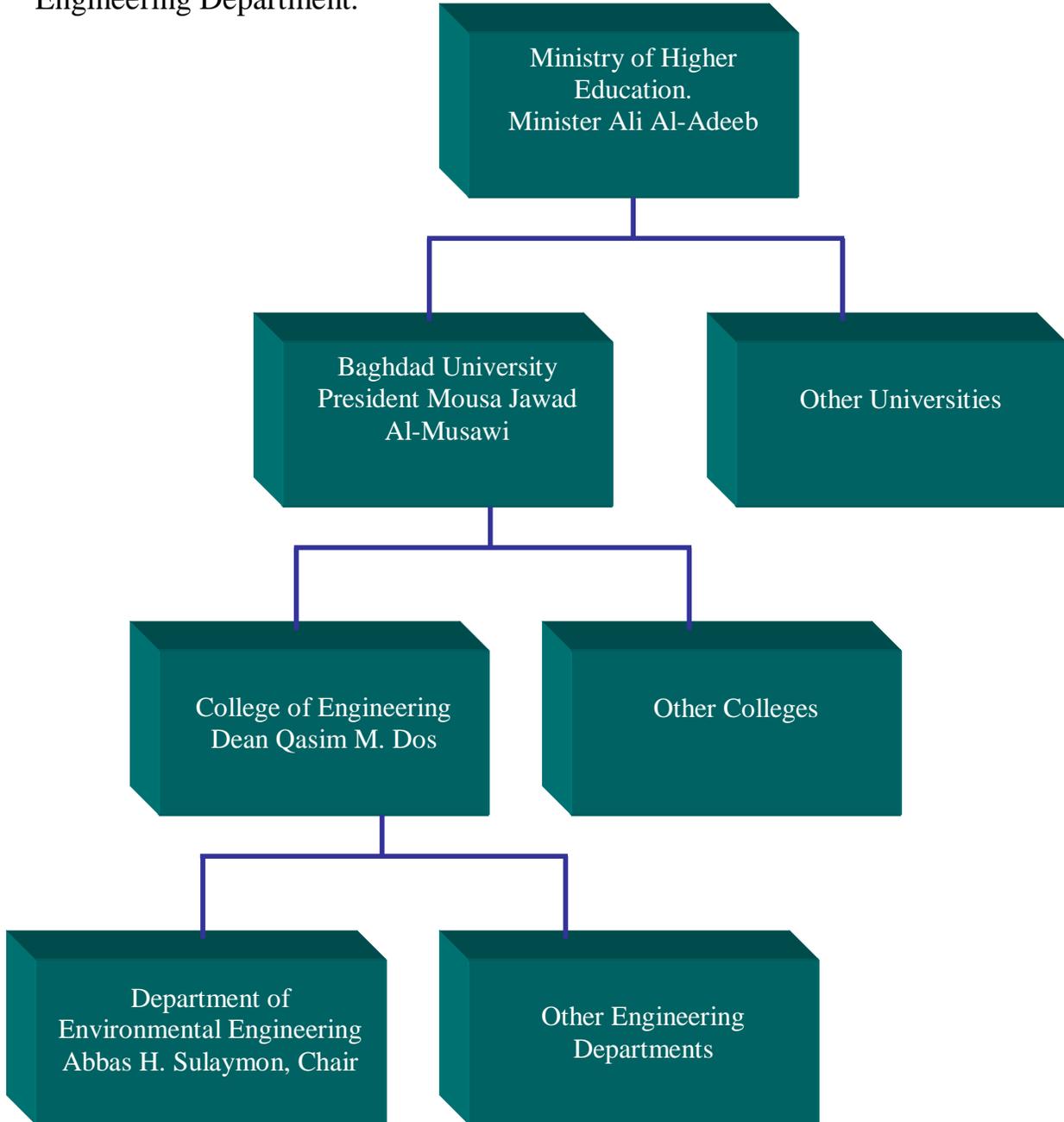


Fig (1): The Structure represents the junction between the Institutes and the Ministry of Higher Education and Scientific Research

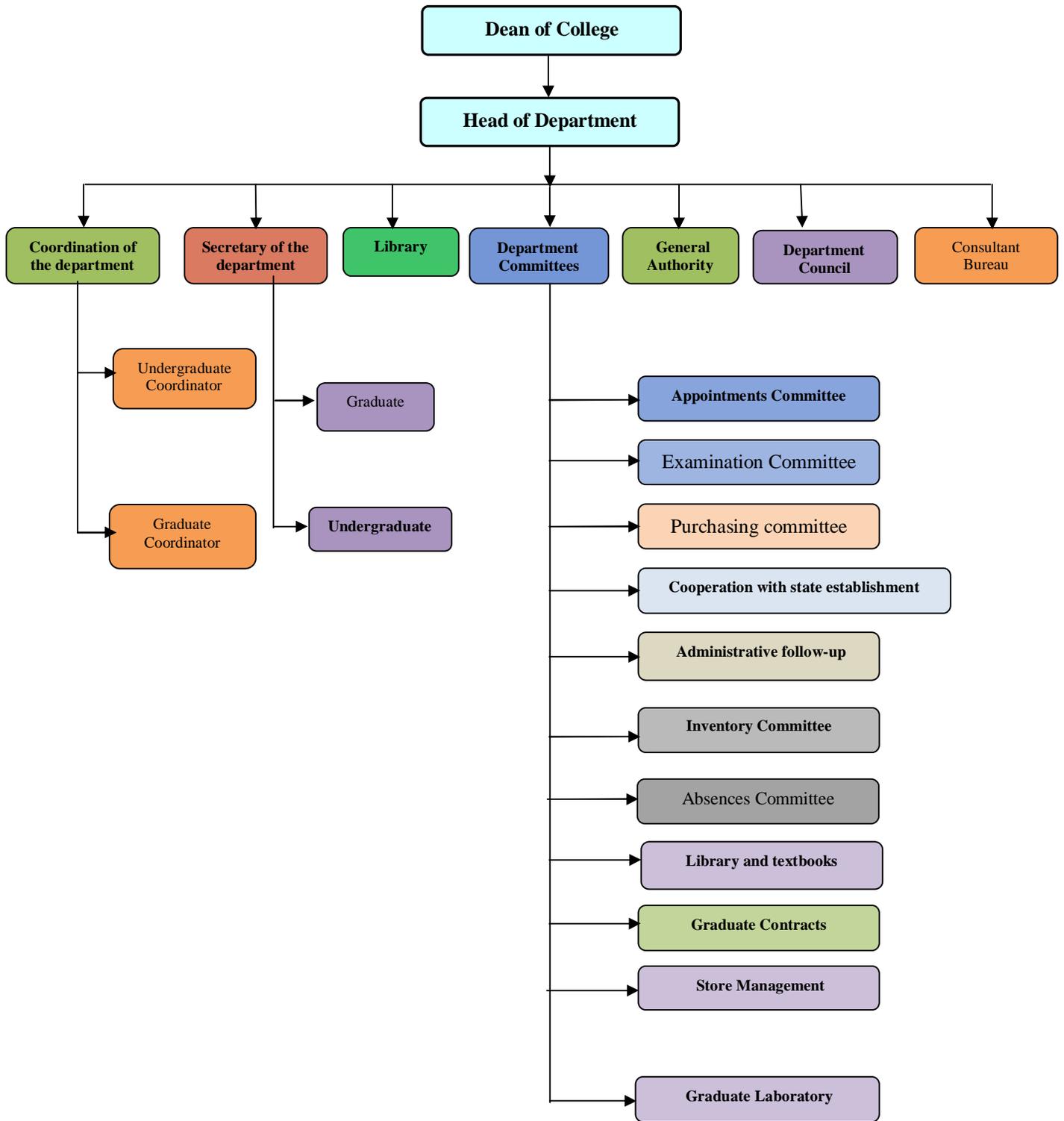


Fig (2): The Structure of the Environmental Engineering Department

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.

Program History

Environmental engineering 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.

SWOT Analysis

Internal Academic Strengths and Weakness

Strengths

- The Department of Environmental Engineering is the only department in the Iraqi universities, which gives the jurisdiction of a doctorate in environmental engineering.
- The jurisdiction of the Environmental Engineering in Iraq is one of the modern disciplines, and that the country in need of this specialty.
- The members of the faculty in the department provide environmental consulting to state institutions, companies and private sector factories.
- The academic staff supports the administration staff to accomplish the work.

Weaknesses

- The department need to modern and advanced laboratories.
- 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 record in the Department of Environmental Engineering.
- The limited administration staff in the department.

External Academic Opportunities and Threats:

Opportunities

- Institutions of the state and the private sector in Iraq need environmental engineers.
- Graduate students can access to real environmental problems through the field work and their studies deal with real problems exists.
- 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 fellows.

Threats

- Fast development in technology
- 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.

3. 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 a high rate qualifies for admission to 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 is limited to the number of seats available as decided by the College Council based on the capacity of resources at 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 (2) shows the standardized test score and high school rank data for incoming students at Environmental Engineering Department for the last four years.

Evaluating Student Performance

Overview

Student performance in each course is evaluated by the faculty members,

Table 2: 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	-	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	-

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,

homeworks, 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, and answer questions on it.

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 (3) shows number of the participant students and rate of success for the last four academic years.

Table 3: 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 %						
1 st Class	12	92	26	92	26	92	22	91
2 nd Class	22	91	28	89	18	94	10	100
3 rd Class	15	93	17	94	10	100	18	100
4 th 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 Registrar's Office, they turn in final grades at the end of the academic year to the Registrar's Office, and each student's transcript is checked to ensure that he or she remains in good academic standing. Students who do not maintain an adequate in first semester to

remain in good academic standing are placed on probation for the second semester. If the student in the second semester is again below the minimum for that probationary semester, and the cumulative is below 50%, the student is suspended. Grades are also forwarded to advisors, to assist them in monitoring student progress.

Advising of Students

Full-time faculty members in the Department of Environmental Engineering advise students. All new students are assigned to the program's undergraduate coordinator upon entering the program.

During the middle of the first semester, they are assigned to various faculty members within the program. The assignment is random and based on balancing the workload among faculty members.

Thus, a new student coming to the department will be assigned to the faculty member with the smallest number of advises. This assignment is continued throughout the student's academic program to provide continuity and consistent advising for the student. Table (4) shows ratio of the faculty members and their qualifications to the number of students during the last four academic years. Also table (5) shows ratio of the faculty members according to their scientific rank to the number of students.

Table 4: 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.)
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

Table 5: 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 1 teacher	Number of students per 1 assistant teacher
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

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 2011. 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.

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 one of the following specialist:
 - 1- Environmental Engineering
 - 2- Chemical Engineering
 - 3- Civil Engineering
 - 4- Water Resources Engineering

5- Energy Engineering

- An exam held in the department in about 10 subjects of the undergraduate courses taught during the 4 years. The final grade divided to 30% for the exam and 70% for the grades the student got in the BSc (e.g., 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 of the MSc courses. The final grade divided to 30% for the exam and 70% for the grades the student got in the MSc (e.g., the final competition grade is 100%).
- Acceptance is centrally controlled by the Ministry of Higher Education and Scientific Research.

SWOT Analysis

Strengths

- 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.

Weaknesses

- Inadequate language preparation
- Economic issues for graduated students.

Opportunities

- Institutions of the state and the private sector in Iraq need environmental engineers.
- Graduate students can access to real environmental problems through the field work and their studies deal with real problems exists.
- 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 fellows.

Threats

- 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 record in the Department of Environmental Engineering.
- Weaknesses in general level of scientific awareness of society.
- Inadequate public awareness for engineering profession and job opportunities.

4. Curriculum

Environmental Engineering Program Curriculum Review

Table (6) represents the curriculum for undergraduate studies in the department.

Table 6: 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					
OVERALL TOTAL FOR DEGREE	158	41	107	8	2
PERCENT OF TOTAL		25.95%	67.72%	5.06%	1.27%

Program syllabus**BSc degree in Environmental Engineering**

Tables (7) to (10) 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 7: 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 8: 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 9: 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 10: 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 wastewater processes	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 (3) and (4) show the number of units, subjects and the weekly hours of study for all stages in undergraduate study. Figure (5) shows the percentage of units and subjects distributed according to the requirements of the university, basic sciences, general specialty and specific specialty.

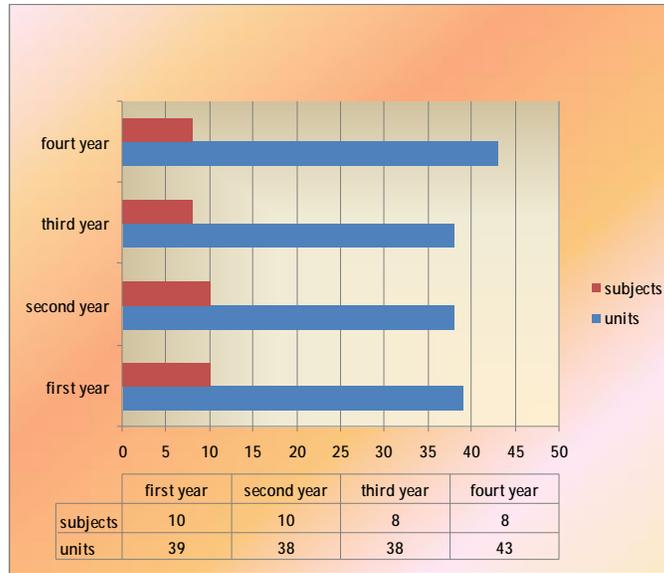


Fig (3): Number of subjects and units for the four years of study for undergraduate study

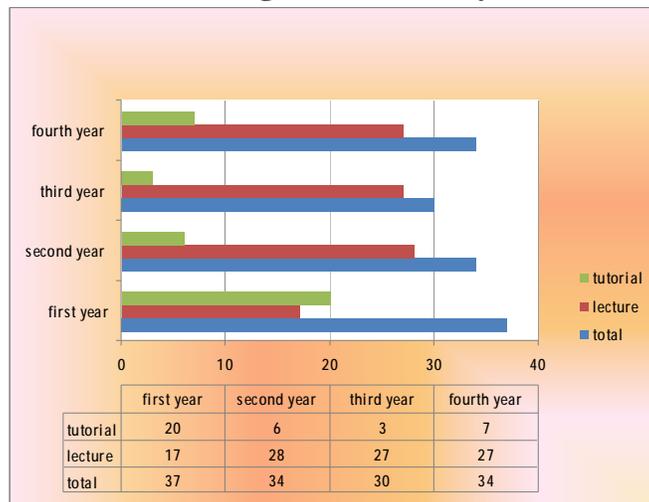


Fig (4): Number of weekly hours for the undergraduate study

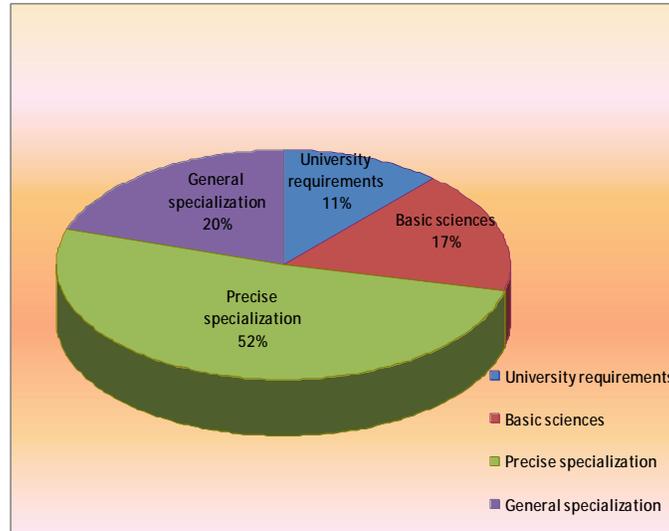


Fig (5): Percentage breakdown of 158 units according to categories

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 (11) shows the percentage of the students' attendance for four academic years for undergraduates study in Environmental Engineering Department.

Table 11: 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 %
1 st Class	12	100	26	92	26	92	22	95
2 nd Class	22	91	28	93	18	94	10	100
3 rd Class	15	100	17	100	10	100	18	94
4 th Class	16	100	11	100	18	94	-	-

MSc. degree in Environmental Engineering

Table (12) 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 (12): Syllabus, units and weekly hours for M.Sc degree in Environmental Engineering

Preparatory Academic Year:

Semester	Subject Code	Subject	Weekly Hours	Units
1 st 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
2 nd Semester	EnE 506	Industrial Waste Water	3	3
	EnE 507	Solid Waste Mngement	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 (13) 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 13: Syllabus, units and weekly hours for PhD degree in Environmental Engineering

Preparatory Academic Year:

Semester	Subject Code	Subject	Weekly Hours	Units
1 st 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
2 nd 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 (6) shows the number of units, subjects and the weekly hours of study for M.Sc. and Ph.D. studies.

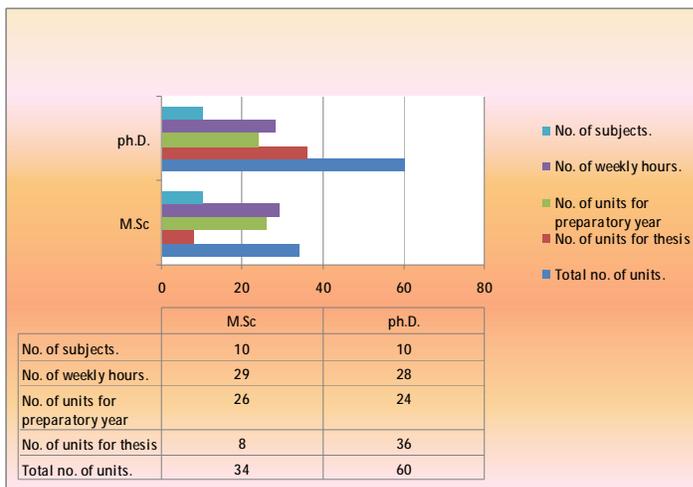


Fig (6): Number’s of subjects, hours, and units for postgraduate studies

Environmental Engineering Department Assessment

The Environmental Engineering Department employs several methods to assess the quality and direction of the B.S. programs that are offered by the department. Assessments are made prior to graduation by measuring the performance of students in each class. 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.

SWOT Analysis

Strength

- Strong 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 must be 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.

Weakness

- Central control of curriculum development by the pectoral committee in the ministry, and the possibility of changes in the curriculum only in a limited rate.
- The curriculum do not help the students to learn the principal of team work.
- Lack in the learning of modeling and computer program applications in most subjects.

Opportunities

- New teaching methods.
- Re-designing curriculum to allow multi-disciplinary teaching and learning.

Threats

- Low quality of students (language, thinking, motivation).

5-Faculty

Leadership Responsibilities

Assistant Prof. Dr. Yasmien Abdul-Aziz Mustafa is the chair of the Environmental Engineering Department and is responsible for all aspects of leadership and management of the department. She works with the faculty, the Dean of the College of Engineering, and other department heads to ensure program excellence.

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 seen in student performance in our courses. Then, changes are made to the courses that feed to the courses where the weaknesses are seen.

Faculty

We currently have a faculty of 20 members. Twelve members hold a terminal PhD degree in Environmental Engineering and Chemical Engineering from different countries but most of them are graduated from Iraqi Universities. Four of the faculty PhD holders got their degrees from the United Kingdom. Six members hold master degree in Environmental Engineering and two of them are preparing their PhD in the Department. The last two of the master holder faculty staff are one in chemical engineering and the other hold a master in English language. Table (14) and (15) represent the staff members of the Environmental Engineering Department.

Table 14: Environmental Engineering Department Staff Members

No.	Names	Degree	General Specialization	Specialization	Position	Teaching activities percent	Research activities percent	Other activities percent*
1	Prof. Dr. Abbas Hamid Sulaymon	PhD	Chemical Engineering	Transport Phenomena	Head of Department	25	50	25
2	Prof. Dr. Walid Mohamed Salih Kassim	PhD	Chemical Engineering	Fluidization and Particles/Fluid Interaction	Prof.	50	50	
3	Prof. Dr. Adel Al-Hemiri	PhD	Chemical Engineerin	Transport Phenomena	Prof	25	50	25
4	Assis. Prof. Dr. Yassmin Abdul-Aziz Mustafa	PhD	Environmental Engineering	Air Pollution	Assis. Prof.	50	50	
5	Assis. Prof. Dr. Zainab Ziad Ismail	PhD	Environmental Engineering	Water Pollution	Assis. Prof.	50	25	25
6	Assis. Prof. Dr. Ahmed Abed Mohammed	PhD	Chemical Engineering	Transport Phenomena	Assis. Prof	50	50	
7	Assis. Prof. Dr. Ayad Abdul Hamza Faisal	PhD	Environmental Engineering	Soil and ground water pollution	Assis. Prof Undrgrada te Coordinator	50	25	25
8	Assis. Prof. Dr. Abdul-Fattah Mohammed Ali	PhD	Chemical Engineering	Heat Transfer	Assis. Prof	75	25	
9	Assist. Prof. Dr. Shahlaa E. Ebrahim	PhD	Environmental Engineering	Hazardous waste Pollution/Adso	Assis. Prof /Higher Studies	50	25	25

				reption	coordinater			
10	Dr.Jathwa Abdoul Karim	phD	Environmental Engineering	Solid Waste/ Water Pollution	Lecturer	50	25	25
11	Dr. Abeer Ibrahim Al-Wared	PhD	Environmental Engineering	Water Pollution	Lecturer	50	25	25
12	Dr. Hayder Mohammed Abdul-Hameed	PhD	Environmental Engineering	Industrial Wastewater Pollution	Lecturer	75	25	
13	Dr. Hatem Asal Gzar	PhD	Environmental Engineering	Air Pollution/Soil Pollution	Lecturer	75		25
14	Mrs. Muna Yousif Abdul-Ahad	M.Sc	Chemical Engineering	Chemical Reaction Engineering	Assis. Prof	75		25
15	Mr. Hussein Majeed	M.Sc	Environmental Engineering	Industrial Wastewater Pollution	Assis. Lecturer	100		
16	Mr. Tariq Jwad	M.Sc	Environmental Engineering	Thermal Pollution	.Lecturer	100		
17	Mrs. Muna Faiq Ali	M.Sc	Environmental Engineering	Water Pollution	Assis. Lecturer	25		75
18	Ms Nagham Ali	MA	English		Assis. Lecturer	100		
19	Mr. Ziad Tariq	M.Sc	Environmental Engineering	Water Pollution	Assis.Lecturer	100		
20	Mr. Mohammed Bahjet	M.Sc	Environmental Engineering	Water Pollution/RO system	Assis.Lecturer	100		

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

Table 15: Engineers and administration staff members

Names	Occupation	Degree
Mrs Saba Waleed Kadhim	Assistant Engineer	B.Sc./Environmental Engineering
Mr Faaq Khadom Obeed	Assistant Engineer	B.Sc./ Mechatronics Engineering
Miss Nahla Shadid Ajeel	Assis. observance	Secretary

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.

Faculty Size

The faculty size, supplemented by part-time qualified instructors, is adequate for teaching our required courses at least once per year as well as the electives that we offer each semester.

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 the 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 full time faculty member has spent time in either industry or government 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.

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 by a College Committee before start teaching in the Department.

Ratios of faculty members to the students

Table (16) shows ratio of the faculty members and their qualifications to the number of students during the last six academic years. Also table (17) shows ratio of the faculty members according to their scientific rank to the number of students.

Table 16: 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.)
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 17: 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 1 teacher	Number of students per 1 assistant teacher
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

SWOT Analysis

Strengths

-The members of the faculty in the department provide environmental consulting to state institutions, companies and private sector factories.

-The academic staff supports the administration staff to accomplish the work.

by:

-Provides a full-time teaching staff appropriate in number and diversity of experience and competencies.

-Cover members of the faculty all fields of knowledge of the specialty.

-Academic qualification for new faculty members.

-Academic Development continued to faculty members to keep abreast of new developments.

-The impact of scientific research to faculty members on the educational process.

Weaknesses

-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 directories (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

- Limited spatial leave with restricted conditions.
- The training of some faculty members in the International Universities is due to personal efforts.

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.

6. Laboratories, classrooms and infrastructure

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 m², the area can accommodate 50 seats but the number of students at the current year was sixteen. The two other undergraduate classroom measure 6 m x 7 m for an area of 42m². These classrooms can accommodate 30 seats but the number of students was twenty-two. All classrooms equipped with air conditioning.

The size of two classrooms of the graduate students is 6 m x 5 m for an area of 30 m². 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 about 15 books per 1 student.

Laboratories

It is a known fact that scientific experimentation is 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. It helps the student first to absorb the theoretical part, and secondly he will trust what he is taught.

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 to 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 Department of Environmental Engineering, three laboratories belonging to the college of Science, and five laboratories to other departments in the College of Engineering (Departments of Chemical Engineering, Mechanical Engineering, and Civil Engineering).

For the postgraduate study there are two laboratories belonging to the Environmental Engineering Department at the ground floor of the department building. One lab is equipped with some devices bought from the local market and budget of the engineering college allows for acquisition. The other lab room is in preparation stage. Some of experiments and samples analyses for postgraduate researches are conducted in the laboratory of graduate in Environmental Engineering Department and others are conducted in the laboratory of Graduate Studies in the Department of Chemical Engineering at the same college. In addition some analysis for samples is done at the state institutions.

SWOT Analysis

- 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.

Strength

None

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, 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.

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

- Insufficient funding for Maintaining.

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

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

- 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.

7-Scientific Research

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 their researches abroad in an important scientific journals. Table (18) shows the name of the faculty members, name of researches, journals, and the year of publication. There are three PhD students had mutual co supervision with Prof. Dr. Adel Sharif from Surrey University, one already finished and the others started.

Table 18: Name of faculty members in the Environmental Engineering Department published in abroad Scientific Journals

Number	Name of faculty member	Name of research	Journal	Year of publication
1	Ali H. Abbar, Abbas H. Sulaymon , Moayyed G. Jalhoom	Scale-up of a fixed bed electrochemical reactor consisting of parallel screen electrode used for p-aminophenol production	Electrochemical Acta	2007
2	Abdullah Abbas Kendoush, Abbas H. Sulaymon , Sawsan A.M. Mohammed	Experimental evaluation of the virtual mass of two solid spheres accelerating in fluids	Experimental Thermal and Fluid Science	2007
3	Abbas H. Sulaymon , Balasim A. Abid, Jenan A. Al-Najar	Removal of lead copper chromium and cobalt ions onto granular activated carbon in batch and fixed-bed adsorbers	Chemical Engineering Journal	2009
4	Abbas H. Sulaymon , Abdul-Fattah M. Ali , Saadi K. Al-Naseri	Natural organic matter removal from Tigris River water in Baghdad, Iraq	Desalination	2009

5	Abbas H. Sulaymon and Shahlaa E. Ebrahim	Saving amberlite XAD4 by using inert material in adsorption process	Desalination and Water Treatment	2010
6	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
7	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
8	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
9	Abbas H. Sulaymon, and Ahmed A. Mohammad	Separation and Hydrodynamic performance of Air kerosene-water system	International Journal of Chemical Reactor Engineering	2011
10	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
11	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
12	Abbas H. Sulaymon, and Hayder M. Abdulhameed	The adsorption of Cd(II) and Pb(II) from aqueous	International Journal for Science and	2011

		solution by sea shell	technology (Jordan)	
13	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
14	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
15	Abbas H. Sulaymon	Hydrodynamic characteristics of mixing in three phase non-Newtonian liquid-gas-solid fluidized beds	Emirates Journal for Engineering Research	2010
16	Yasmen A. Mustafa and Maysoun J. Zaiter	Treatment of radioactive liquid waste (Co-60) by sorption on zeolite Na-A prepared from Iraqi kaolin	Journal of Hazardous Material	2011
17	Waleed M. Salih, and Ayad A. Faisal, and Tamara K. Hussien	Influence of clay lens on migration of light non-aqueous phase liquid in unsaturated zone	ASCE	2011
18	Adel A. Hemiri, Nada S. Ahmedzeki	Development of heat transfer coefficient model via experimental validation	Chemical Product and Process Modeling	2008
19	Adel A. Hemiri, Nada S. Ahmedzeki	Prediction of the heat transfer coefficient in bubble column using an artificial	International Journal of chemical reactor engineering	2008

		neural network		
20	Adel A. Hemiri , Heaven E. Mahmoud	Removal of zinc ions from water using emulsion liquid membrane	International Journal of Chemical Reactor Engineering	2010
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	Zainab Z. Ismail , Enas A. AL-Hashmi	Recycling of waste glass as a partial replacement for fine aggregate in concrete	Waste Management	2009
24	Zainab Z. Ismail , Enas A. AL-Hashmi	Reuse of waste iron as a partial replacement of sand in concrete	Waste Management	2008
25	Zainab Z. Ismail , Enas A. AL-Hashmi	Use of waste plastic in concrete mixture as aggregate replacement	Waste Management	2008
26	Zainab Z. Ismail , Ulas Tezel, Spyros G. Pavlostathis	Sorption of quaternary ammonium compounds to municipal sludge	Water Research	2010

***The red color refers to the faculty members in the department.**

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. Table (19) shows the number of students who had contracts with different ministries.

Table 19: Contracts with Iraqi Ministries for the current year (2010-2011)

No.	Ministries	No. of M.Sc. and Ph.D. students
1	Ministry of Environment	4
2	Ministry of Petroleum	5
3	Ministry of Water Resources	3
4	With different Ministries and institutes such as Ministry of Technology, Babylon University and others (without financial support)	9

Points of strength and challenges

The researches of the Environmental Engineering Department is of great important to solve the problems in different government institutes as shown in table (19) and most of these researches published in a valuable journals as shown in table (18).

The most important challenges the department faces is the lack in the financial support for scientific research, lack in laboratory equipments where most of the analysis done in other institutes which cost the students and the faculty members financially and effort, and there is no financial support for publishing abroad.

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 supports in printing and binding the student's graduating thesis.

SWOT Analysis

Strengths

- 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 (table 5-3).
- 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 voluble foreign scientific Journals such as ASCE, ASME, Elsevier Journals, etc.

Weakness

- 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 students.

Opportunities

- 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.

Threats

-Electrical power failure

8-Outboard Relationship

The Relationship with the Dean's Office and Other Departments

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

- The dean of the college and his personal office. Connected directly to the head of the department.
- 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 versa, or through the use of the department's laboratories by undergraduate and postgraduate students of other departments or vice versa, 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 (20) shows these visits.

Table 20: 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	Oregon State University	United States of America	2009
7	Assistant Prof. Dr Shahlaa E. Ebrahim	Michigan State University	United States of America	2010
8	Assistant Prof. Dr Ayad A. Fasal	Milano University	Italy	2010
9	Dr. Hayder M. Abdulhameed	Hiroshima University	Japan	2010

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

- There is co-supervision with a Professor in Surry University, United Kingdom.
- There is a contribution from experts in the International University to improve the syllabus of the graduate and undergraduate studies.
- There is an external examiner in each graduated committee one for the MSc and two for the PhD defenses.

Weakness

- No programs for the training of the students and faculty members.

Opportunities

- 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.

Threats

- Administrative and financial corruption.