Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Baghdad
Al-Khwarizmi College of Engineering

AL-Khwarizmi College of Engineering
Prospectus

Dept. of Biomedical Engineering
Dept. of Mechatronics Engineering
Dept, of Information and Communication Engineering
Dept. of Manufacturing Operations Engineering
Dept. of Biochemical Engineering

2011

Al-Khwarizmi College of Engineering

1.A Brief History of Al-Khwarizmi College of Engineering:

Al- Khwarizmi College of Engineering- University of Baghdad (previously known as the College of Engineering , II) was established on the 13th of June 2002, and received the first batch of students in the academic year 2002-2003 after the provision of academic and scientific requirements in collaboration with the College of Engineering / University of Baghdad. The College currently has three main buildings: Deanry and administrative sections, Scientific departments together with their labs, and the Biochemical Engineering department. It is supervised by an elite group of professors of engineering who possess high expertise in engineering education and who aspire to improve the quality of students and make great efforts to raise the scientific standard.

Al-Khawarizmi College of Engineering shoulders major responsibilities for many reasons, the most important of which is that it carries the name of Baghdad University, and Baghdad was the House of Peace and the land of Islam, Arabism, and the capital of Mesopotamia and Islamic caliphate at the peak of scientific developments for more than four centuries. It is an Iraqi college that includes modern engineering sciences and its main aim is to keep pace with the world by building a solid scientific base.

During the beginning of this century, the world will witness a rapid development in the sphere of higher education and scientific research. This development is based on the developments that are taking place in Informatics and Communications, and which in turn are reflected on all scientific specalizations. Many universities have started to create new specilizations which keep pace with scientific developments to meet the needs of the society. In order to keep pace with this development in Iraq, Al- khawarizmi College of Engineering endeavores to fulfill the future

ambitions by including modern specalizations in engineering science and to ensure keeping up with global trends that are consistent with Iraq's future.This entails taking into consideration the availability of human and material resources in their minimum limits that guarantee the achievement of goals. These specalizations are taught in worldwide solid universities, including the United States, Europe, Japan and other countries and such universities were among the first universities in the establishment of these modern scientific departments, at least one or two decades ago.

2. College Mission

The mission of Al - Khwarizmi College of Engineering is to provide the society with distinct engineers and technical staff in modern engineering specalizations. Such staff who possess knowledge and skills in accordance with international , academic and professional standards are able to keep pace with the needs of the labor market through teamwork, innovations and creativity along with the continuation of education, learning, teaching, scientific research , exchange of knowledge and encouragement of technical ans scientific research. They will also contribute to the development of cognitive abilities of the members of the society and its institutions and enable them to pursue education. The aim of the college is also to provide postgraduate programs, engineering consultancies and conduct applied research to serve the requirements of the society and labor market.

3.College Vision

Al - Khwarizmi College of Engineering looks forward to being the pioneer of modern engineering sciences. It also works as an active partner in the national development of engineering education through promotion of research methods and techniques and putting its returns in the service of the society. The college plays a great role in being an example of excellence in providing high-quality education which is recognized locally and internationally so as to keep pace with developments by providing an academic environment where students and instructors can interact to create appropriate educational situations.

4.College Goals

- Preparing specialized engineers in modern engineering fields (Biomedical Engineering, Biochemical Engineering, Information and Communication Engineering, Manufacturing Operations Engineering, Mechatronics Engineering), who are able to put engineering sciences in practice , make decisions, solve problems and have the potentialities to compete under the new international variables so as to create comprehensive development in the society.
- Providing distinct academic programs, which contribute to preparing scholars, thinkers and creators.
- Conducting scientific and applied researches and studies to solve society problems and contribute to enhancing the development programs in Iraq.
- Providing studies , consultative and technical expertise for the bodies , institutions, companies and individuals that will serve the society.
- Supporting and enhancing scientific and cultural ties with academic institutions in Iraqi, Arab and foreign universities.

- Developing mechanisms for continuous updating of curricula and educational programs, as is consistent with the labor market requirements.
- Developing mechanisms to ensure the quality of the educational process for the purpose of obtaining the academic accreditation offered by the College.

5.College Values

Al - Khwarizmi College of Engineering believes in and supports the following values:

- Academic Distinction: attainment of an excellent level of education and curricula quality.
- Creativity and Innovations: the use of all that is scientific and modern to support the process of development in the College.
- A leading Role and Typical Decision- Making: the College committs itself to playing a leading role among other educational institutions whether inside or outside the university through the implementation of the basics of optimal professional and academic conduct.
- Commitment to Quality: Implementation of self-assessment process to obtain academic accreditation.

6.Stages of the Establishment and Emergence of Al-Khwarizmi College of Engineering – University of Baghdad

The first foundationstone of Al- Khwarizmi College of Engineering (previously named the College of Engineering , II)was laid in the College of Engineering / Baghdad University in 1997 with three scientific

engineering departments, namely (Information Engineering, Biomedical Engineering, and Mechatronics Enginreering). The College admits students who have passed from the second stage in the College of Engineering and who wish to study in the above-mentioned three scientific engineering departments. This is done within inputs which suit ,to some extent, the students' continuation of study for obtaining a modern engineering specialization.

- The said scientific engineering departments in the College of Engineering / Baghdad University were split and from which the first seed outgrew and became an Engineering college which specializes in the edges of Engineering Sciences called the College of Engineering II on 13/6/2002 .This college includes five scientific engineering departments: namely (Information Engineering, Biomedical Engineering, Mechatronics Engineering, Manufacturing Operations Engineering and Biochemical Engineering) . The College received the first batch of students in the academic year 2002-2003 after the provision of study and academic requirements and buildings in collaboration with the College of Engineering / Baghdad University, and after being directly supported by the Presidency of the University of Baghdad.
    - From 2002 to 2007 the College admitted students who had passed the second stage of study in Engineering Colleges / universities in the Republic of Iraq and in other countries in the world according to a procedure recommended by the College Board and approved by Baghdad University Board, as shown in the following points:
    - A percentage of 30% of the mark obtained in the Ministerial Exam for secondary schools will be taken into consideration with the exception of privileges.

- A percentage of 30% of the average mark obtained by the student in the first and second years of university study will be taken into consideration.
- A percentage of 30% will be allotted to the mark the student obtained in the competitive test held by the college and taken by all the applicants.
- A percentage of 10% will be allotted to the mark the student obtained provided that he/she has no years of failure in the college in addition to the interview.
- In the academic year 2002-2003 , the first certificate for undergraduate study was awarded in the scientific Departments of Engineering (Information, Biomedical, and Mechatronics) and in the academic year 2004/2005, the first certificate for undergraduate study was awarded in two departments , namely (Manufacturing Operations and Biochemical) was awarded.
- From 2003 to 2005 the academic curricula to be taught in the future to make the study in the college four academic years was extensively considered . This applies to all scientific departments with the exception of the Department of Biomedical Engineering whose period of study is five-years. The study covered discussion of the curriculum and the naming of the scientific departments in the Boards of the scientific departments, the College Board and the Board of Baghdad University and even in all universities of Iraq through the Sectoral Committee for engineering specializations. This also covered all the worldwide advanced universities, including some universities in the United States such as Harphi University , Boston University, Columbia University and the West Point University as well as some UK universities such as the University of

Birmingham and the University of Warwick. Moreover ,the College has also benefited from the information network (the Internet) in the sphere of modern scientific specalizations.in addition to adopting modern scientific curricula, and naming the departments for the year 2005 as shown below:

- Department. of Information and Communications Engineering
- Department of Biomedical Engineering.
- Department.of Mechatronics Mngineering
- Department. ofManufacturing Operations Engineering
- Department. of Biochemical Engineering

- In the year 2003, the Continuing Education Unit was founded at the college, and 124 quanitative courses were organized. Such courses contributed to the development of the skills of the employees of Iraqi Universities and other state institutions in that year.

- In the year 2003, an independent academic library which contained 200 books in engineering sciences was inaugurated at the College .
- In the year 2003 the first Internet Unit was founded with the support of the Presidency of Baghdad University. This Unit offers free information service for teachers and students and in the year2006 an agreement was signed with the Ministry of Communications for a period of three years in order to continue the provision of informatics service for instructors and students and those who are still continuing their study.
- In the academic year 2003-2004 the Postgraduate Studies / Master's degree were opened in the Department of Mechatronics Engineering and the first Post graduate MSc.degree was awarded in the academic year 2005-2006..

- In the year 2004 and after a thorough discussion in the Boards of scientific departments, the College Board and the UniversityBoard , the name of the College was changed from the College of Engineering II to Al- Khwarizmi College of Engineering. This is due to the fact that the college comprises advanced scientific engineering departments created merely by the University of Baghdad(the Mother University) which distinguishes it from other universities in Iraq and other universities in the Arab countries.
- In the year2004, the Engineering Consultation Office was established in the college.
- In the year 2005, the college Journal under the name of Al-Khwarizmi Engineering Journal was published.It is a quarterly refereed, peer- reviewed journal published by Al-Khwarizmi College of Engineering on the recommendation of the Board of Baghdad University / in its session No. (17) for the year 2004.The first edition of the journal under No. (1) vol. (1) was issued in 2005 holding the international indexing under ISIN ISSN :1818-1171 .
- The first scientific conference of the College was held in May 2005 under the slogan of"' Modern Engineering Disciplines and Future Horizons" More than three companies participated in the conference in addition to working papers and scientific engineering research papers.
- In the year 2005, the first College website of the International Information Network / Internet entitled www.kecbu.net was designed.

  - In the academic year 2005-2006, the e-learning system in one of the postgraduate courses at the college /Mechatronics Engineering

Department was adopted in collaboration with the Kowalv Canadaian University .

- In April 2008 the Second Scientific Conference of the College under the slogan of "Modern Engineering Specalized Research" was held.

- In January 2009 the establishment of an independent college building started Al-Jadiriyah Complex and was financed by Baghdad Provincial Council.

Despite the difficulties imposed on our students and academics,as is the case with the rest of the segments of the Iraqi community. Our students and academics have been targeted , the aim of which is to empty our country from the talented and illuminating minds, to stop the wheel of progress and to move our country backward. Despite this, our professors and our students were "really patient", with all the meanings conveyed by the world "patient". These circumstances along with the difficuilties whether on the economic or sevice or security level haven't refrained academics, students, technicians and adminstraitors from performing their tasks and very many achievements have been done , the most important of which are the following:

7.Achievements:

1 - Adopting the Central Admission Plan to admit students to the first stage in the academic year 2007-2008 .Such admission before this year was based on a mechanism which had been adopted by the College Board and approved by the Board of the University of Baghdad.

2 - Furnishing scientific laboratories with instruments and equipment depending on the available financial allocations.

3 - Providing service facilities and proper furniture for the college employees in order to facilitate their work.

4 – Adopting academic curricula to keep pace with the progress that is taking place in the universities of developed countries for undergraduate and postgraduate studies, and being approved by the Presidency of the university and the Sectoral Committee for engineering specalizations.

5 –Developing the teaching staff members of the college through sending them abroad and making them participate in courses outside Iraq, such as the United States, the United Kingdom, South Korea, China, Austria , France, Iran, Lebanon, Jordan, Qatar, United Arab Emirates, Yemen, Egypt, Syria and other countries.

6- Sending some engineers and members of the college teaching staff abroad , namely the United States of America, Germany, Malaysia, Belarus, China, Slovakia to obtain the Master's and doctoral degrees, each according to his/her qualification and specalization.

7 - Sending some of the teaching staff members who hold the academic title of ‘professor’ , ‘assistant professor ‘and ‘lecturer’ to enjoy an academic leave abroad.This has covered six of the teaching staff members to be sent to the United States, France ,New Zealand and the Sultanate of Oman.

8 – Publishing a detailed college prospectus which contains all the academic, technical, administrative information in Arabic and English.

9 - Opening an information system attached to the college.

10 - Organizing Summer Training courses for students who have ranked first to be sent to Egypt, Sultanate of Oman and Syria.

11 - Activating the agreements concluded between the University of Baghdad and other universities abroad .

12 - Activating the agreement concluded between the University of Baghdad, and the Economic and Social Commission for Western Asia (ESCWA).

13 - Participation of the college teaching staff members through presenting their scientific research papers in conferences as well as publishing them in scientific journals in universities abroad, such as the United States of America , the United Kingdom, France, India, Jordan and other universities.

14 - Participation of the teaching staff members of the college in conducting research papers which serve the university and the society through signing an agreement between the teaching staff of the College and the Ministry of Higher Education and Scientific Research / Department of Research and Development.

15 - Acquainting the teaching staff members with the modern books, periodicals and online website through the Virtual Library Program.

16 – Participation in artistic activities and sports organized by the university.

17 - The Engineering Consultation Office at the college has a number of activities such as the conclusion of a number of contracts since its establishmentThese contracts have in turn contributed greatly to providing engineering advice and consultation at all levels and in all engineering specalizations.The said office has performed the following:

A – a contract with the Engineering Consultation office / Engineering College / Baghdad University to design a site on the Internet.

B - a contract with the Technical College / University of Baghdad and the

College of Engineering / Al-Mustansiriya University for the design and manufacture of a digital strain meter.

C – a contract with the College of Engineering / University of Kufa to design and manufacture ten Logic trainers.

D –a rehabilitation contract the Directorate General for Power Transmission Projects / Ministry of Electricity.under the specification of Total Quality Management ((IS0: 9001:2000) for

E - a contract for the design and manufacture of a device (Interface) with the collaboration of postgraduate students for the purpose of data storage, and display (strain meter) and another contract for the design and manufacture of a Digital Strain meter.

F –the design and manufacture of a Logic Trainer for AL-Ma'moon University College.

G- a contract with Nomaiors Group to provide an integrated study for the establishment of Asphalt and Block factories.

H - a contract with the Engineering Consultation Office of the College of Engineering / University of Baghdad, for updating theInternet site.

I - another contract for conducting tests on a piece of metal with the same party.

J - a contract with the College of Engineering / Al-Anbar University for the design and manufacture of a Digital strain meter.

K - a contract with the Silver Satellites Company for General Contracting for testing five plastic tubes .

L - a contract with the State Company for Vegetable Oil Industry for checking welding wires ,.There are also a number of works under study that will greatly contribute to serving the society.

M – a contract with the State Company for Automobil Industry / Alexandria for the analysis of the stresses and drawings of the structure of the bus plant manufactured by the said company.

N - a contract with Saher Gulf Company for Constructions Co., Ltd. to conduct soil investigations for the purpose of establishing a police station at AL-Khether District in the province of Babylon.

O- Other activities

18 -In April 2009 the First Students' Scientific Conference was held under the slogan of ' the Pioneering Role of Young Researchers in the Building and Construction of Iraq" with the participation of many Iraqi universities.

19 - participation in the Sovereignty Festival held by the Ministry of Youth at the College of Physical Education at the presence of His Excellency the Prime Minister.It is to be noted that the projects of college students won the first rank in various axes.

20 – One of the projects of the final stage students won the first rank of the 'Promising' Projects for 2009 of the distinguished students' projects.

21 - Participation in the Twelfth Students' Creative Forum of the Arab Council for Training Students of Arab Universities which was held in the Arab Republic of Egypt / Assiut University for the period from 27/9/2009 to 1/10/2009.

22 - Holding a scientific symposium in collaboration with the Ministry of Environment / Department of Radiation Protection, under the title of (Depleted Uranium - Effects and Treatments).

23 - Holding a specialized symbosium by the Department of Information and Communication in collaboration with the World Organization (IEEE) to introduce the said organization to the auidence and to study the mechanisms of cooperation with it in order to furnish engineers and

researchers with the latest scientific publications in the field of modern engineering specalizations.

24 – Holding a symposium by the Biomedical Engineering Department in collaboration with the Ministry of Health on "Artificial Organs".

25 –Holding an illuminating symposium under the title of ' Epidemic Influenza Disease'.

26 – The Biomedical Engineering Department held an illuminating symposium on “the Early Detection of Breast Cancer”.

27 – The Organization of the Fifth Annual Art Exhibition under the title of ' Art Output and its Impacts on Engineering Visions'.

28 – Participation in the Third Environmental Conference for Iraqi university students, which was held at the University of Sulaymaniyah.

29 – Participation in the Regional Conference of Engineering held by Al-Nahrain University.

30 - Participation in the Conference of the Ministry of Communications on “the Security of Computers and Information”.

31-College participation in Baghdad Forum for the Iraqi and World universities for the period from 19 to 20 January, 2009.

32 - Participation in the Ninth Conference of the deans of Engineering College in Arab universities, which was held at the University of Damascus for the period from 12 to 13 April, 2009.

33 – Preparing a study for the setting up an Internet network in the Ministry of Higher Education and Scientific Research.

34 - Opening new laboratories and developing the existing laboratories through supplying them with modern laboratory instruments.

35 – Developing the academic Curricula for all scientific departments in such a way that keeps pace with all the latest developments in the world curricula.

36 – Completing the distribution system of the undergraduates which aims at distributing students to the scientific departments according to the average mark obtained and lessons of preference.

37 – Preparing a prospectus for the new students which contains a profile of the college together with its scientific departments and the procedures that should be followed in the submission of documents and registration in the college.

38 - Sending some engineers and the teaching staff members of the college abroad, namely the United States of America, Germany, Malaysia, Belarus, China, Slovakia to obtain Master's and doctoral degrees, each according tohis/her qualifications.

39 – Sending six instructors in the College on sabbatical leave to the University of La Rochelle in France , Carolina University , the Polytechnic Institute in the United States of America ,University of Auckland in New Zealand , the University of Applied Sciences and the University **of Sohar** in the Sultanate of Oman.

40 – participation of one of the College instructors as a visiting professor to the University of Harvard (MIT) in the United States of America.

41 - Updating the College website on the international information network www.kecbu.net,www.kecbu.uobaghdad.edu.iq.

42 - Developing the college library and supplying it with the recent specialized scientific books.

43 – Involving instructors in academic activities such as familiarizing them with the recent periodicals and electronic books through the Virtual Library Program.

44 – Granting the Bachelor's degree to graduates of five scientific advanced engineering specializations.

45 - Granting a Master's degree in the field of Mechatronics Engineering and Manufacturing Operations Engineering.

46 - Increasing the number of accepted students of secondary school graduates /Science Branch in the scientific departments of the college where graduate students of secondary schools and holders of equalized certificates and distinguished ones were admitted.

47 - Opening postgraduate Studies in the Department of Manufacturing Operations Engineering in the field of advanced manufacturing systems for the academic year 2009-2010.

48 – The College has obtained the Armor of Arts from the Presidency of the University of Baghdad for excellence in artistic activities.

49 - Participation in several sports Championships in various games.

50 – The College has obtained the Armor of the College of Engineering / University of Assiut / Arab Republic of Egypt.

51 – The college has obtained the Armor of Assiut University / Arab Republic of Egypt.

52 - The college has obtained the Medal of the Arab Council for Training Students of Arab Universities.

53 - The Continuing Education Unit of Al-Khwarizmi College of Engineering has organized a number of courses ,the aim of which is to render services to the society and to maintain the continuation of communication between the engineers in the field work and to know all about the latest scientific developments and innovations.

54 - Participaton in authoring three textbooks in collaboration with the Ministry of Education in computer science for the Primary, Intermediate and Secondary schools.

55 –Establishing the Department of Mechatronics in Vocational Education / Ministry of Education and starting work to design a curriculum through the committees formed of Vocational Education and our college.

56 - Hosting the Ministerial Examinations for Secondary school students.

57 - Participation in the preparation of curricula for the schools of gifted students and the identification of the gifted students in the Ministry of Education.

58 - Establishing the Department of Information and Communication in Vocational Education / Ministry of Education and starting work to design a curriculum through the committees formed of Vocational Education and our college.

59 –The Department of Manufacturing Operations Engineering held a scientific symposium in collaboration with the Ministry of Science and Technology under the title of (Modern Manufacturing Technology).

60 - The Department of Mechatronics Engineering held a scientific symposium on (Mechatronics Engineering Role in the Detection of Explosives).

61 – The Department of Chemical Engineering held a scientific symposium under the title of ' Biochemical Engineering Industries'.

62- The Department of Information and Communication Engineering held a scientific symposium on (Information and Communication Engineering in the sectors of the state).

63- Al-Khwarizmi College of Engineering, in collaboration with the Department of Quality and Reliability at Baghdad University held a symposuim at the Presidency of the University under the title of (Programming Accrediation in the colleges of Engineering and Technology).

64 – Some university instructors have obtained an appreciatory certificates from the Ministry of Higher Education and Scientific Research for their distinguished participations in the conferences and symposiums run by the Ministry.

65 – The college obtained a distinct evaluation among the colleges of the university.

66-Other activities.

8.Future Plan:

- Establishment of an independent building for the College in accordance with the investment plan for the Engineering Affairs Division / Presidency of the University of Baghdad.
- Development of the teaching staff members through their academic contributions and academic promotions.
- The opening of postgraduate studies / Masters'degree in other scientific engineering departments.
- Sending engineers and instructors abroad to complete their postgraduate studies: Master's and Doctoral degrees at scientifically solid universities.
- Development of the performance of administrators and technicians through involving them in courses, each according to his/her specialities.
- Development of other modern scientific engineering departments.
- Providing the services of the Consultation Office in the sphere of modern engineering specalizations inside and outside Iraq and opening channels with universities and institutions of other countries.
- Intermingling college work with state companies and benefiting mutually in the sphere of scientific engineering specalizations in the college within the frame of 'the university at the service of the society'.
- Introducting an Electronic Administration System to maintain contact among College employees.

- Development of a scientific research mechanism in the scientific engineering departments of the College.

-Establishment of central laboratories including modern equipment which serve all scientific engineering departments of the College, researchers and students of other peer colleges.

- Continuing development of the curricula and the development of modern techniques in the mode the curriculum is displayed.

-Holding the Third Scientific Conference of Al-Khwarizmi College of Engineering on 20 to 21 April 2011 under the slogan of (Scientific Research in Modern Engineering Specalizations is a Promising Path for Building and Development).

The Deans Who have Held the Deanery of the College

No.	Name	Dates
1	Dr. Souad Naji Abdul Majeed	01.09.2002 to 09.04.2003
2	Prof. Dr. Nabeel Kadhim Abid Al-Sahib	24.05.2003 up to now

Members of the College Board

Name	Position	Dates
Prof. Dr. Nabeel Kadhim Abid Al-Sahib	Dean	24/05/2003
Asst. Prof. Dr.Osamah Fadhil Abdulateef	Assistant Dean for Administrative and Financial Affairs	04/09/2006
Asst. Prof. Dr. Ahmed Zidan Mohamed	Assistant Dean for Academic and Student Affairs	08/01/2007
Asst. Prof. Dr. Suha Mohammed Hadi	Head of Information and Communication Engineering Department	01/10/2009
Dr. Ali Hussein Kadhim	Head of manufacturing Operations Engineering Department	01/10/2009
Dr. Wael Abdel Rashid	Head of Mechatronics Engineering Department	05/09/2010
Dr. Muhanned Kazim Sabir	Head of Biomedical Engineering Department	26/09/2010
Dr. Safa Rashid Yassin	Head of of Biochemical Engineering Department	11/01/2010
Dr. Shatha Abdul Latif Kazim	Representative of the Teaching Staff	01/12/2007
Asst. Lecturer Haidar Rahim Zughayyar	Secretary of the College Board	29/05/2007

Number of the Teaching staff and their Academic Titles in the College

Scientific Dept.	Teaching Staff at the College				
	Prof.	Asst. Prof.	Lecturer	Asst. Lecturer	Total
Biomedical	-	1	4	20	25
Mechatronics	2	2	6	15	25
Information and	-	2	6	15	23

communication					
Operations Manufacturing	**1**	**2**	**6**	**17**	**26**
Biochemical	**-**	**2**	**6**	**14**	**22**
Total	**3**	**9**	**28**	**81**	**121**

Number of Temporary and Permanent Staff of the College in 2011

Scientific Dept.	Instructors	Engineers and technicians		College administr-ative staff		contracts
Mechatronics	**25**	**9**	**19**	**46**	**2**	**1**
Biomedical	**25**	**9**				
Information and communication	**23**	**9**				
Biochemical	**22**	**13**				
Manufacturing operations	**26**	**12**				
Total	**121**	**52**	**19**	**46**	**2**	**1**
Total permanent staff	**238**					

9.Admission Controls of Students to the Scientific Departments, Starting from the Academic Year 2007-2008

AL-Khawarizmi College of Engineering - Baghdad University, located in Al- Jadiriyah Complex received graduates of secondary schools / Science Branch as of the academic year 2007-2008. This was done according to the Central Admission Controls of the Ministry of Higher Education and Scientific Research in Iraq under the Ministerial Order number: (b T / 470) dated 20 / 7 / 2007.

Required Documents

1. Six personal photos .
2. Student's registration form.
3. Student's original document for Secondary school endorsed by the Ministry of Education.
4. Two photocopies of the Nationality Certificate .
5. Two. Photocopies of the ID card .
6. One photocopy of the Residence Card .
7. One photocopy of the Food Basket Card.
8. Legal issues and commitments.

10.Board Secretariat Unit

The unit is responsible for organizing and archieving meetings of the College Board and following up the implementation of the decisions approved by the College Board and the Presidency of the University.

11.Dean's Office and the Confidential Letters Unit

The Dean's Office undertakes public correspondence affairs of ingoing and outgoing mail, coordination and following up the implementation of the

decisions and orders issued by the office in addition to scheduling appointments for interviews and meetings.

12.Scientific Affairs Unit

This Unit undertakes supervision of the scientific research plan for the college and preparation of the scientific structure which includes the most important scientific acomplishments such as scientific research papers, seminars, scientific conferences and scientific symposiums. The most important acomplishments of the Scientific Affairs Unit are:

- Scientific research financial allocations / completion of research papers conducted by researchers from our college on a contractual basis with the Ministry of Higher Education and Scientific Research / Department of Research and Development.
- Preparation of a scientific study on the process of modernization and development in the world.
- preparation of a scientific plan at the beginning of a new academic year.
- Preparation of a study under the title of “The Ministry's Activities” which includes the most important published research papers, scientific publications, seminars and discussion panels.
-Preparation of a scientific structure which includes fellowships, scholarships, private study, the gifted students and innovators.

13.Legal Affairs Unit

This unit undertakes the supervision of all work and legal issues. It also provides legal consultation and pleadings in lawsuits and participates in committees that require the presence of legal opinion. The aim behind its establishment is to ensure the application of law to all matters and legal facts that take place during the academic and administrative process.

14.Control and Audit Division

The work of this Division includes the following activities: -

- Auditing all dealings before and after paying .
- Examining the accounting records, salaries and store.
- Auditing cash vouchers, documents of registration and store inputs-outputs
- Auditing salaries and allowances.
- Auditing wages of lectures for undergraduate and postgraduate studies.

15.Higher Education Fund Division

This Division enjoys a moral status and administrative and financial independence. It has a separate unit of accounting and a special accounting in one of the government banks. It also follows a unified accounting system. These accounts are subject to monitoring and auditing by the Financial Inspection Office. The necessary decisions for spending from the Fund shall be made by the Fund Administration Board based in the Ministry of Higher Education and Scientific Research in accordance with the provisions of laws and decisions which become final after the Minister's approval.

16.Studies, Planning and Follow-up Division

This Division is responsible for the preparation of statistics for the College. These statistics contribute to providing the College and the University of Baghdad with the data regarding the number of college employees and the number of students admitted to and graduated from Al-Khwarizmi College of Engineering. These statistics have to be done on a detailed basis. This can be set down in the university's annual statistics and the annual report submitted by the said Division in coordination with the Assistant Dean for Administrative Affairs and the Assistant Dean for Scientific Affairs at the College.

This Division is also responsible for building a database for Al-Khwarizmi College of Engineering which includes all the details and information about the college employees .This can be done in the Database Unit which is attached to the Studies, Planning and Follow-up Division. This Division also supports the other units of the college through joint work as per statistical data.

17.Accounting Division

This Division is responsible for preparing budgets for the disbursement of financial resources to the college, follow-up and documentation of financial and accounting constraints for receipts and expenditures.

18.Human Resources Management Division

This division is responsible for taking the necessary necessary for appointment applications, re-appointment , service transfer, pensioning off, study leave with or without pay, granting of annual increments, salary increases, all matters relating to human resources and receipt and delivery

of incoming and outgoing mail for all the College Divisions. The structure of the Division is organized as follows:

- Outgoing and incoming mail Unit.
- Files Unit.
- Photocopying and Printing Unit.
- Retirement Unit.

19.Maintenance and Services Division

This Division is responsible for the maintenance of buildings, squares and all civil, mechanical and electrical works. It is also responsible for the maintenance of electronic devices and the following-up of maintenance and service operations performed by companies when contracting with this Division.

20.Registration Division

This Division takes up the responsibility of organizing and archiving records and files of students' information who are still following up their course of study and who are college graduates, such as applications and admission information submitted by students or information about their academic record, including results and grades and the granting of documents and confirmations required for recruitment or study purposes.

21.Information Unit

The media has a great role in shedding light on the academic and extra-curricular activities, documenting information, publishing in international and local newspapersin addition to shedding light on other activities through satellite channels.

22. Postgraduate Studies Division

This Division is responsible for the preparation of a plan for the admission of postgraduate students in coordination with the departments, the preparation of a competitive test, the issuance of an administrative admission order , issuance of an administrative graduation order , and issuance of documents and certification after student's graduation, preparation of a discussion committee and the supply of a scientific and linguistic reviewer. It also allows postgraduate students to extent their period of study according to their academic needs.

23.College Library

The library of Al-khwarizmi College of Engineering comprises the recent engineering and technical publications , inlcuding books, periodicals and pamphlets which provide both undergraduate and postgraduate students with abundant information of various kinds of engineering specalizations. The library in collaboration with some national and international institution is supplied with new books, journals and other references.

24.Computer and Internet Unit

This Unit was established in our college at the end of the academic year 2002-2003. Work has been done to complete the requirements of the operation of the unit and connection. It started running at the beginning of the academic year 2003-2004, in which the unit was equipped with a network to ensure the operation of modern computers and the system of advanced wireless communications quickly and efficiently when being used.

In mid-2004 the unit was opened with new suit of computers and a new system of communication via satellite of twenty-one computers.

The unit provides services in the field of browsing, chatting, e-mail and other services for students and researchers, inside and outside the college,.The unit is run by qualified engineers in the field of telecommunications and information and it is in progress throughout the year

25.Continuing Education Unit

This unit was established in Al- Khwarizmi College of Engineering in the academic year 2003- 2004 to undertake organizing continuing education courses at the college. Such courses aim at developing and updating information for engineers and non-engineering disciplines in the field of work. The unit has organized a great number of courses at the college for universities, other state institutions and for the private sector as shown below:

Specialized Courses

1. Diagnosis and treatment of vibrations in machines.
2. Modern Welding Technology.
3. Occupational safety and environmental protection.
4. Industrial hazardous wastes and their treatments.
5. Ways of setting the items and the expense of Molari focus of industrial forms.
6. Total Quality Management.
7. Steam boiler- types - working methods - Methods of testing.
8. Non-conventional Manufacturing operations .
9. Operations research and its engineering application.
10. Destructive testing of materials and welded devices.

11. Use of engineering accuracy performance in maintenance programming.
12. Applications of computer-aided quality control.
13. Plumbing operations and congelation castings.
14. Aluminum alloy welding.
15. Statistical methods of improving the quality of production.
16. Engineering test- its importance and methods of treatment.
17. Transfer of materials.
18. Study of the technical and economic feasibility of industrial projects.
19. Erosion and ways of protection.
20. Thermal treatments of steel.
21. Conveyor belts and methods of their maintenance.
22. Cathodic protection.
23. Computer use in quality control.
24. The critical path in the management of construction projects CPM)).
25. Designs of pure water networks .
26. ISO 14001 for environmental management.
27. Quantity Surveying for Construction Projects.
28. Purification plants and water treatment.
29. Solid wastes treatment.
30. Preparation of specifications for construction projects.
31. Designs of sewage systems.
32. Water pollution.
33. Design of processing units and sewage treatment plants.
34. Design of biological treatment units.

35. Earthworks machines, types and methods of calculating production.
36. Design of rainwater Networks .
37. Methods used for the programming of completion periods, resources and items of construction projects.
38. Pumping stations and their types.
39. Environment and industrial safety.
40. Radiation and risk prevention.
41. Sewage treatment plants.

Computer courses

1. Word.
2. Windows.
3. Excel.
4. Power Point.
5. Engineering drawing using Computer Auto CAD.
6. Mechanical Desk top.
7. Maintenance and assembling of computers.
8. The Internet (browsing + Email + chat).
9. System individuals Access (preliminary).
10. System individuals Access (Advanced).
11. Read the digital signal using the Mat lab.
12. Visual Basic (preliminary).
13. Visual Basic (Advanced).
14. Image processing using Mat lab.
15. PC Interface using Visual Basic.
16. 3D-MAX.

17. Computer Networks.
18. Numerical Analysis program Mat lab.
19. Design and Stress Analysis of Mechanical Parts Using ANSYS.
20. Qualifying Courses in the field of Computer for Postgraduate Students, which include (Word, Windows, Excel).

Administrative courses

1. Secretary and computer use in office work.
2. Administrative comunications and common linguistic errors.
3. Constructional contracts.
4. Development of maintenance management.
5. Methodology for the implementation of projects.
6. Privatization.
7. Materials management and control of **inventories**.
8. Administrative leaderships and profession practice .

26.Al-Khawarizmi College of Engineering Journal

Al-Khawarizmi College of Engineering Journal is a refereed scientific engineering journal. It accepts modern engineering research of all engineering specalizations, particularly in the field of Biomedical Engineering, Biochemical engineering, Mechatronics Engineering, Manufacturing Operations Engineering and Information and Communication Engineering. The journal is issued four times a year and is concerned with the publication of original scientific research papers and brief articles.

The Editorial Board and Advisory Board directly supervise the journal and maintain its solid scientific level. The Journal Editorial Board is composed of six members, including the Editor in Chief, Managing Editor and the other board members. The members of the Editorial Board are professors of high academic titles. The Advisory Board is composed of seven members who hold the academic titles of "Professor" and "Assistant Professor".

The recommendation for the adoption of research papers published in this Journal for academic promotions has been approved in accordance with the decisions taken at the session No.(16) held by the University Board on 22/5/2006 and endorsed by the Board Secretariat of the Ministry of Higher Education and Scientific Research in view of the university letter No. 12 s / 227 dated 09/08/2006.

The journal depends in its funding on self-financing and has a bank account at Al-Rafidain Bank of Iraq.It is an internationally accredited Journal and registered with the UNESCO under No. 1171-1818-ISSN.

The procedure of publishing papers in the journal is made through their submition to the Editorial Board of the Journal for consideration and the appointment of reviewers according to regular meetings. The published research papers are to be evaluated by three experts from the teaching staff members who hold advanced academic titles and who are well-qualified instructors in the universitiesofIraq.

The Editorial Board endeavors to create a website for the journal on the International Network of Information including the dissemenation of the contents and abstracts of research papers

published in the Journal. The said Board also aspires to develop a common cooperation mechanism with solid international journals for the purpose of exchanging scientific expertise in the field of research evaluation of research and publication.

27.Physical and Artistic activities Unit

The Physical Activities Unit aims at developing college students' physical fitness in addition to extracurricular activities.Such activities renew the psychological condition of the student and make him able to continue classroom activities. Following are some of the achievements and participations which were carried out by the College during the past two years:

1.Participation in the Badminton Championship and obtaining the second rank (singles and doubles) on 29/3/2009.

2.Participation in the University Football Championship on 08/03/2009.

3.participation in the Basketball Championship on 05/04/2009.

4.Participation in Handball Championship on 19/04/2009.

5.Participation in the Basketball Championship on 22/3/2010.

6.Participation in the Badminton Championship and obtaining the third rank on 29/3/2010.

7.Participation in the Chess Championship for students (both males and females) and obtaining the second rank by female students.

8.Participation in the Track and Field Championship and obtaining the second rank by female students and the fourth rank (400-meter) by male students on 03/02/2010.

9.Participation in the University Volleyball Championship and obtaining the second rank on 08/12/2010.

10.Participation in the University Football Championship and being elected for the semi-final stage on 06/04/2010.

28.Artistic Activities Unit

This unit was founded at the college at the end of the academic year 2002-2003, as one of the student's extra-curricular activities. The aim of this Unit is to teach students of the scientific departments Musical Arts and Plastic Arts, and encourage them to submit artistic works in an attempt to participate in art exhibitions which are held in the College or University. Below are some of the artistic activities accomplished at the College during the past two years:

1. Holding the Annual Exhibition at the college's library Hall, which coincided with the celebrations of International Women's Day on 08/03/2009.
2. Participation in the Arab Calligraphy Exhibition that was held on 11/11/2009.
3. Participation in the Joint Plastic Arts Exhibition held at the Hall of the Presidency of Baghdad University on 04/01/2009.
4. Participation in the Joint Ceramic Exhibition held at the Hall of the Presidency of Baghdad University on 4/3/2009.
5. Participation in the Poetry Session held at the Activities Hall run by the Presidency of Baghdad University on 15/05/2009.
6. Participation in the Fine Arts and Handicrafts Exhibition held on 17/11/2009.
7. Participation in the Calligraphy and Ornamentation Exhibition held at the Hall of the University Presidency on 15/12/2009.

8. Participation in Poetic Festival held at the Hall of the university Presidency on 31/12/2009.
9. Participation in the photos Fair held at the Hall of the University Presidency on 23/.2/.2009.
10. Holding the Annual Exhibition at the College's Library Hall on 6/4/2010 and hosting students and instructors of the College of Dentistry, which concided with the University Celebration Day.
11. Participation in the competition of Film Documentaries held at the Hall of the University Presidency on 20.4.2010.

29.Quality Assurance and Academic Performance Unit

This unit was established in the academic year 2008-2009 to ensure the quality of education in the college through its commitment to worldwide and internationally agreed standards.Our college currently adheres to the American Standards of (ABET) Foundation which specializes in the field of ensuring the quality of education in the engineering and scientific Colleges.

30.Engineering Consultation Office

The Engineering Consultation Office was formed in Al-Khawarizmi College of Engineering in accordance with the University order No. 1 a / 615, dated 04.03.2004 which includes the approval of the Ministry of Higher Education and Scientific Research of the minutes of the eleventh session of the University Board held on 26/1/2004.

This Office consists of the following names:

Prof. Dr. Nabil Kadhim Abdel-Saheb / Dean (Chairman of the Advisory Board.)

Lect. Dr. Winner Fawzi Mustafa (Director of the Consultation Office).

Asst.Prof.. Dr. Abdul Salam Abdul-Abbas Mansour, (Member).

Asst. Prof.. Dr. Osama Fadhel Abdul Latif, (Member).

Lect. Dr. Hossam Abd al-Kazim, (Member).

Lect. Dr. Emile Mohammed Rahman, (Member).

Lect. Dr. Khalifa Salim Abboud (Member)..

The said Office aims at offering engineering consultancies and scientific and academic expertise to the public and private sectors which contribute to raising the standard of profession practice, increasing the expertise of the teaching staff members, technicians and exchanging expertise with the counterpart offices and the parties concerned. To cope with the reality of the specializations of the College departments, the Engineering Consultation Office is capable of performing the following tasks:

First: Engineering test, which aims at providing services and issuing test certificates by experts and examiners who are entitled to do the following:

Conducting different engineering tests through the stages of manufacturing, installing and operating each of the following: steam boilers (gas pipelines, water pipes), boilers, oil, pressure vessels, tanks, lifts, cranes fixed, mobile cranes, elevators, rotating equipment, piping, welding, protection cathode, and destructive and non-destructive tests.

Second: Maintenance and repairs, which undertakes the following:

Repair and rehabilitation of high pressure engines of all kinds and their pressure low engines, planning for maintenance, mechanical maintenance, electrical maintenance, construction and maintenance workshops, plumbing and handling thermal and surface and securing the necessary equipment, manufacturing and maintenance of all the control boards, setting up and running all types of machinery production and manufacturing lines.

Third: **"**Designs", which is responsible for providing the following services:

- Providing services and engineering consultancies, maintenance and rehabilitation of the following laboratories and factories:

(Refineries, oil and gas, cement, iron and steel, water treatment and sewage plants, electricity and electrical maintenance).

- Design and implementation of the software databases and scientific and engineering programs.

- Design, installation and operation of chemical processing plants and water purification plants.

- Design and construction of systems of automation and robotics.

- Operation and maintenance of medical equipment.

- Design and implementation of automated and normal production routes.

- Design of industrial units for biological processes, bio-reactors, filters, sterilization of all kinds.

- Monitoring and control of all water projects (CCTV systems, systems design and implementation of SCADA, systems design and implementation of the control wheel distance).

- Design of various productive templates and stress analysis for all types of structures and machinery.

Fourth: "Project Management", which aims at providing the following services:

Engineering consultancies, site surveys, the study of technical and economic feasibility of projects, site management, providing engineering studies and consultancies relating to environmental pollution, rehabilitation of offices and companies with total quality management system.

Fifth; "communications", which aims at providing the following services:

Radio networks, base stations, Internet services via satellite, wireless, networking communications, computers, design and create sites in the information network (The Internet).

Sixth: "Training", which is concerned with the training of the personnel in the following areas for the purpose of increasing their experience and the advancement of their technical, professional and administrative competence:

- Courses in Civil, Environmental, and Sanitary Engineering.

- Courses in Mechanical and Chemical Engineering.

- Courses in Electrical and Electronic Engineering.

-Courses in Administrative, Financial and Legal Affairs.

- Courses in the ISO and Quality Management.

- Courses in Industrial Safety.

- Courses in Communications.

-Courses in Computers and Software.

- Courses in Networks and the Internet.

-Specialized courses on-demand.

31.Academic Promotion Committee

This Committee was formed in Al-Khawarizmi College of Engineering in accordance with the approval of the Presidency of Baghdad University in its letter No. 40 / Q / 85, dated 12/01/2004 of the minutes of the seventh session of the College Board was which held on 30/12/2003.Accordingly, the Academic Promotion Committee consists of the following names:

1. Asst. Prof. Dr. Abdul Salam Mansour (Chairman).
2. Asst. Prof. Dr. Suha Mohammad Hadi (Member).
3. Asst. Prof. Dr. Wadood Taher Hassan (Member).
4. Asst. Prof. Nuha Abdul-Sahib Hassan (Member).

The said committee is responsible for conducting academic promotions for the teaching staff members. These were previously accomplished by the Academic Promotion Committee attached to the College of Engineering / Baghdad University

Department of Biomedical Engineering

Department of Biomedical Engineering

1- Introduction:

The Department of Biomedical Engineering was established in 1997and in 2002 it was attached to Al-Khwarizmi College of Engineering .

The department represents a true foundation of biology, medicine and engineering. The Biomedical engineers who possess a wide range of capabilities may be called upon to design instruments, devices and software. This may help in bringing knowlege together from many technical sources to develop new procedures of study, or to conduct research papers needed for solving clinical problems.

The department admits students who have successfully completed their second year at an accredited engineering college in one of the following fields of specialization: Electrical, Computer science, Control, Electronics and Mechanical Engineering.

At the session held in the academic year 2007- 2008 and on the recommendation of the College Consultancy Board and University Board and approval of the Ministry of Higher Education and Scientific Research in Iraq, it was decided, following the Ministrial Central Scheme, to admit students who are graduates of secondary schools of Iraq to the first stade . The period of study is five years ,then graduate students are awarded the Bachelor's degree in engineering science from the Departmentof Biomedical Engineering.

2- Objectives :

1. Preparing well- qualified graduates in scientific and applied medical sciences.They may be called upon to design, develop,maintain and operate modern medical instruments and conduct research papers needed for solving clinical problems.
2. Preparing graduates ,who are capable of applying engineering concepts and technologies , in the medical field.
3. Fulfilling the needs of the Ministry of Health by preparing well - trained biomedical engineers who posses good medical background.
4. Introducing this modern field of specialization in many Arab countries.
5. Encouraging the use of computers in various medical applications that are important for doctors in order to facilitate diagnosis and treatment of diseases.

3- Academic Staff :

Names	Academic Title	Degree / Country	General Specialization	Minor Specialization	ition
Dr.Hussam Kadhom Al-adhli	Lecturer	Ph.D/ Iraq	Mechanical Engineering Department	Applied mechanics	Head Of Department
Dr.Elham Zeki Said	Asst. Prof.	Ph.D./England	Chemical Science	Petrochemicals	instructor
Dr.Shatha Kathem Abdullatif	Lecturer	PhD./Iraq	Chemical Engineering	Alloys	Lecturer
Dr. Mohannad Kadhim Sabir	Lecturer	Ph.D./Iraq	Electrical Engineering	Computer & control	Lecturer
Ayden Kamil Muhammed	Asst. Lecturer	M.Sc./ Iraq	Biology	Zology	Academic administrator department
Taha Yassin Khalaf	Asst. Lecturer	M.Sc./Iraq	Chemical Engineering	Water Treatment	Lecturer

Names	Academic Title	Degree / Country	General Specialization	Specialization	Position
Mayassa Hatem Aswad	Assistant Lecturer	M.Sc./Iraq	Chemical Engineering	Catalyst	Lecturer
Nebras Hussain	Assistant Lecturer	M.Sc./Iraq	Mechanical Engineering	Power	Lecturer
Mayada Monther Majeed	Assistant Lecturer	M.Sc./Iraq	Physical science	Electronic Optics	Lecturer
Muntaha Razzak Ibraheem	Assistant Lecturer	M.Sc./ Iraq	Biotechnology/ science	Microscopic biology	Lecturer
Ibraheem Amer Ibraheem	Assistant Lecturer	M.Sc./Iraq	Electrical engineering	Electron and communications	Lecturer
Waleed Jasim Mehemeed	Assistant Lecturer	M.Sc./ Iraq	Mecahnical engineering	Design	Lecturer
Ali Hussein Ali	Assistant Lecturer	M.Sc./ Iraq	Medical engineering	Medical engineering	Lecturer
Mahmood Ibraheem Ali	Assistant Lecturer	M.Sc./ Iraq	Electronics and communications department	communications	Lecturer
Ali Hussein Hawy	Assistant Lecturer	M.Sc./ Slovakia	Mechanical engineering department	forces	Lecturer
Reem Jalal Channo	Assistant Lecturer	M.Sc./ Iraq	Environment eng.	Drinking water consumbtion	Lecturer
Ahmed Ali Mohammedd	Assistant Lecturer	M.Sc./ Iraq	Medical engineering	Medical engineering	Lecturer
Saif Daood Salman	Assistant Lecturer	M.Sc./ Iraq	Medical engineering	Medical engineering	Lecturer
Mustaffa M.B. Abdul Ridha	Assistant Lecturer	M.Sc./ Iraq	Control and system eng.	Control engineering	Lecturer
Noor Kamal Muhsin	Assistant Lecturer	M.Sc./ Iraq	Medical engineering	Signal processing	Lecturer
Ali Jasim Hammood	Assistant Lecturer	M.Sc./ Iraq	Computer Engineering	Micro Processing	Lecturer
Hassen Alaa Hameed	Assistant Lecturer	M.Sc./ China	Medicine	Oncology	Lecturer

4- External Lecturers:

Names	Subject	Workplace
Dr. Ibtessam Thabet Auda	Arabic	Baghdad University /College Education for Women
Hula Abdul Rida Idan	English	Baghdad University /The Center for International Studies
Shaimaa Abed Al-Kareem	Freedom and Democracy	Baghdad University / Law Affairs
Dr. Amaar Jassem Mohammed	Biochemical Lab.	Biochemical Engineering dept./ Al-Khawarizmi College of Engineering

5- Engineers :

Names	Occupation	Degree
Fadya Nuri Hamadi	Chief Engineering	B.Sc./ Electronic Eng.
Rabab Alaa Hameed	Engineer	B.Sc./control and systems
Zahraa Abdulrahman	Engineer	B.Sc./Biomedical Eng.
Niaam Khalid Hammeed	Engineer	B.Sc./Biomedical Eng.
Isra'a Fa'aik Abdul-Azez	Engineer	B.Sc./Biomedical Eng.
Farah Mohammed Ridha	Engineer	B.Sc./Biomedical Eng.
Sadeem Nabeel Saleem	Engineer	B.Sc./Biomedical Eng.
Yasir Salam Abdualkafoor	Engineer	B.Sc./Biomedical Eng.
Ali Kamel Bunea	Engineer	B.Sc./Biomedical Eng.
Osama Iyad Kadhem	Engineer	B.Sc./Biomedical Eng.
Alaa' Abed-Al Munim	Engineer	B.Sc./Medical Instrument

6- Administration:

Names	Occupation	Workplace
Zainab Hussain Ali	Assisnt Superintendent	Secretary
Meelad Asaad Jassemm	Chief Superintendent	Secretary

7- Laboratories:

1- Engineering Laboratories:

- Microprocessor Lab./ Al-Khwarizmi College of Engineering – Baghdad University
- Computers Lab. / Al-Khwarizmi College of Engineering – Baghdad University
- Electronic Lab./Engineering College I – Baghdad University
- Electrical Circuit Lab./Engineering College I – Baghdad University
- Medical Instrumentation Lab./ Al-Khwarizmi College of Engineering - Baghdad University
- Medical Measurements Lab./ Al-Khwarizmi College of Engineering - Baghdad University
- Engineering Drawing Lab./ Al-Khwarizmi College of Engineering - Baghdad University
- Digital Logic and Network Lab./ Al-Khwarizmi College of Engineering - Baghdad University.
- Microproccesser and Microcontroolar Lab./Engineering College I – Baghdad University

8. Medical Laboratories:

- Anatomy Lab./ Al-Khwarizmi College of Engineering -Baghdad University.
- Neurology Lab./ Al-Khwarizmi College of Engineering - Baghdad University.
- Biochemistry Lab./ Al-Khwarizmi College of Engineering -Baghdad University.

Biomedical Instruments Lab.

Centrifuge
Medical Device.

Sonar - Medical Device

Electrical Circuits Lab. (Scilloscope، Function Generator)

(ECG) - Medical Device

Anatomy Lab.

Auto CAD Lab.

Computers Lab.

9. The Curricula for undergraduate students:

First Stage:

Code	Subject	Hours \ week						Units
		First term			Second term			
		theory	App.	Tutor. Or lab.	theory	App.	Tutor. Or lab.	
BME 121	Mathematics I	3	1	-	3	1	-	6
BME 131	Introduction to Biomedical Engineering	3	-	-	3	-	-	6
BME 132	Electronic Physics	2	1	-	2	1	-	4
BME 133	Engineering Mechanics	2	2	1	2	2	1	6
BME 122	Electrical Circuits	2	-	2	2	-	2	6
BME 123	Computer Science	2	2	-	2	2	-	4
BME 111	English	1	1	-	1	1	-	2
BME 112	Human Rights	1	1	-	1	1	-	2
BME 124	Engineering Drawing	1	-	2	1	-	2	4
Total		17	8	5	17	8	5	38

Weekly Hours

First term	Second term
30	30

Syllabi:

Mathematics I:

Inequalities:-(absolute value, greatest integer, signum function).Functions:-(domain & range, operations on algebraic function).Limits:-(definitions & its theorems).Derivative (Definition, rules of differentiation, chain rule, implicit differentiation, high order derivatives, applications, tangent line & normal line, approximate value of function, maximum & minimum problems, concavity, graphs of function).Integration:-(indefinite integral, application of indefinite integral, definite integral, area under the carve, fundamental theorem of integral calculus, trapezoidal rule for approximating an integral).Application of the Definite Integral:-(area between curves, volume of Revolution, length of the curve, surface area of revolution).Transcendental Functions:-(Inverse trigonometric, natural logarithmic, exponential & power) Definitions Properties Graphs iv) Derivatives & Integrals. Method of Integration:-(basic formulas, power of trigonometric functions, integration by partial fractions, integration by part, integration of rational functions of sin x & cos x, further substitutions, improper integrals). Vector Algebra:-(representation of vectors in space (i, j, k) unit vectors, Scalar product, Vector product).Complex Numbers:-Invented number system, The Argand diagram, Addition, Subtraction, product Quotient, Power & Roots. Demoiver s theorem, Polar Coordinates: -The polar coordinate system. Graphs of polar equations. Plane area in polar coordinates.Matrices & Determinations: Definition. Properties, Inverse of a matrix.

Introduction to Biomedicine:

Forces on & in the body. Physics of the skeleton. Heat & Cold in medicine. Energy, Work, & Power of the body. Pressure (in human body).Physics of the Breathing (Lungs).Physics of cardiovascular system. Electricity within the human body Cardiovascular instrumentation. Application of electricity & magnetism in medicine. Sound in medicine. Physics of the Ear & Hearing. Physics of Diagnostic X-rays. Physics of Nuclear medicine. Radiation protection in medicine.

Electronics Physics:

Semiconductors:

Semiconductor types Diffusion ,Graded Semiconductors The pn Junction Diode :The Open-Circuited and Biased PN Junction , The V-I characteristics and its Temperature Dependence, Elementary Diode Applications , Small and Large-Signal Diode Models , Junction Diode Switching Times , Zener Diodes ,Schottky Barrier Diodes, The Step-Graded Junction Diode. Bipolar Junction Transistors :The Ideal Current-Controlled Source ,The Junction Transistor ,The Common-Base (CB) Characteristics ,The Common-Emitter (CE) Configuration , Cutoff and Saturation Modes ,DC Models, The BJT as a Switch , Amplifier , and diode ,The BJT Small-Signal Model ,The Emitter-Coupled Pair ,Transistor RatingsField-Effect Transistors : The Ideal Voltage-Controlled Current Source ,The Junction Field-Effect Transistor ,The JFET Volt-Ampere Characteristics ,The MESFET ,The Enhancement MOSFET Volt-Ampere Characteristics ,The DC Analysis of FETs ,The MOSFET as a Resistance , Switch , and Amplifier ,Small-Signal FET Models , CMOS Devices,Basic Logic (Digital) Circuits :The Binary System, Boolean Algebra ,The

Exclusive-OR. nand. and nor Gates ,The NMOS Inverter and The CMOS Inverter ,Propagation Delay of an NMOS Inverter , NMOS and CMOS Logic Gates ,The TTL nand Gate ,TTL Logic Families ,Emitter-Coupled Logic (ECL) Circuits , Comparison of Logic Families.

Engineering Mechanics:

Vector&Matrices,Force Systems; Two-dimensional Force system,moment, couple, Resultants. Three dimensional force system, Moment, Couple, equilibrium, construction a free body diagrams. Equilibrium conditions; Two dimensions Structures plane trusses, space trusses, Frames. Distributed forces, centre of mass, Friction, Application of friction, Wedges, Journal bearing, belts ,Virtual work, Potential energy and stability ,Area moment of inertia introduction to dynamics, Kinematics of particles; Rectilinear motion, plane curvelinearmotion,normal and tangential coordinates, polar coordinates, relative motion,Kinetics of particles; Newton's second law, Rectilinear motion,curvelinear motion work and kinetic eneryy,potential eneryy, Impulse and momentum, Impact .

Electrical Circuits:

Basic concept: Units and notation.Current, voltage and resistance.

Ohms law.Series resistive circuits parallel resistive circuits and series-parallel circuits ,Network analysis techniques: -Voltage sources and current sources. Kirchhoff s laws. Mesh and Nodel analysis. Della-Star transformation. ,Network theorems:- Superposition theorem. Thevenin s

theorem. Norton s theorem. Millman s theorem. Maximum power transfer theorem.D-C transient circuits: R-C circuits. R-L circuits. A-C circuits Sinusoidal voltages and currents. Phase relations. Average value and effective value. Single phase A.C circuits. Pharos diagram and the j notation. Power& power factor., Network theorems applied to A.C circuits. Resonance: - Series resonance. Parallel resonce..

Computer Science:

Introduction. MS-DOS operating system. Windows operating system. (Introduction to desktop, using the mouse, my computer, closing-max-min and Open window, creating new folder, selecting folders, finding folders or files, copying and moving files and folders. How to start any program, shut down, formatting floppy disk, scandisk, arranging icon, run, help, etc). Win Word.(Description of the Opening Screen components. Title bar, menu bar, toolbars. Creating a new File, opening an existing file, the use of close, save, save as, page setup, print preview, print, Edit undo, typing, repeat typing, cut, copy paste, clear, select all, find replace, goto, etc. VIEW (Tool bars, header and footer, zoom). INSERT (page numbers, symbol, footnote, picture, textbox, object). FORMAT (Font, paragraph, bullets and numbering, borders and shading, columns). TOOLS (Spelling and grammar, language). TABLE (Insert table, insert rows, delete cells, split cells, select row, select column, Table auto format, sort, formula)).

Excel. (How to start Excel program, Menu bar, tool bar, formula bar, worksheet, cell, creating new workbooks, open existing workbooks. Clearing cell, saving your work, closing workbook, zoom, and drop, insert cells, delete cell, find, replace, auto sum. Enter a formulamanually, formatting work sheet, auto format, print,& print preview. Drawing charts).

Power Point.(Description of its featuresand use, the functions of toolbars and menu items (File, Edit, View, Format, Tools, Slid Show)).Auto CAD. (Description of the facilities provided by Auto CAD, Drawing various geometrical patterns.

English :

Revision of grammatical structures with emphasis on technical usage, argumentation of technical vocabulary, dictionaries. Precise writing, descriptive and reflective paragraphs writing, Practice in presentation of passage original idea in a summary form, writing original compositions on themes connected with passages. Technical writing, clear and accurate writing on themes of common and technical English , theme discussion, beginning of essay, theme development, logical and effective conclusion, professional letter writing, note taking, special English for electrical and mechanical engineering, reading and listening comprehension.

Human Rights :

- The historical fundamental roots of human rights and its development in our nation
- Human rights in the Ancient
- Human rights: Definitions and Limits.
- General view of freedom
- Historical development of freedom
- Designation of freedom
- Classification of freedom

Engineering Drawing:

Drawing standard ,Types of lines ,use of drawing instruments geometical,costruction.,projection,dimensioning,isometric,drawing,sectiona l views, assembly drawing introduction to Auto cad puckages, preparing to draw with Auto CAD , layout and signing to drawing sheat, drawing lines,arcs, projecticn, sectional views.

Second Stage:

Code	Subject	Hours \ week						Units.
		First term			Second term			
		theory	App.	Tutor. Or lab	theory	App.	Tutor. Or lab.	
BME 221	Mathematics. II	3	1	-	3	1	-	6
BME 222	Anatomy I	2	1	2	2	1	2	6
BME 231	Biomaterial Science	2	1	-	2	1	-	4
BME 232	Mechanics of Materials & Vibration	2	2	1	2	2	1	6
BME 233	Digital Techniques.	2	1	-	2	1	-	4
BME 234	Network and Digital Lab.	-	-	3	-	-	3	2
BME 223	Biochemistry	2	1	2	2	1	2	6
BME 211	Arabic	1	1	-	1	1	-	2
BME 212	Freedom & Democracy.	1	1	-	1	1	-	2
Total		15	9	8	15	9	8	38

Weekly Hours

First term	Second term
32	32

Syllabi:

Mathematics II:

Polar Coordinate:- (equivalent points & equivalent equation, plotting curves, certain standard curve, the angle between tangent to curve & the radius vector, arc length, area of a plane region ,asymptotes ,domic section)..Vectors:-(operations on vectors in space, linear dependece,the scalar & vector product, the triple product, lines & planes in spaces, vector-valued functions of single variable, limit & continuity,derivative,the unit vector Ur & Uo velocity & acceleration, the unit vector T,N,B in coordinates,integation of a vector-valued function).

Partial Derivatives:- (functions of two or more independent variables, limit & continuity, partial derivatives, differentiable functions, total differential, chain rule ,Jacobian ,normal lines &tangent planes to surfaces, the gradient of a function, divergence & curl of a vector-valued, exact differential ,max & min with constraints).Multiple Integrals:- (the double integral as a limit of sum, the integral in polar coordinate, area of a plane region, general curve-linear coordinates, triple integral in Cartesian & cylindrical, polar & spherical systems, line & surface integrals, theorems).Sequences & Infinite Series:-(convergence of a sequence, bounded & monotonic sequence,

subsequences, power series, Taylor theorem).Ordinary Differential Equation:-(the order, degree, special & general solution).

Anatomy I:

Introduction. Upper Limb, Breast. Pectoral Region.Brachial Plexus and its clinical applications.Scapular Region. Axilla and Brachium. Joints. Shoulder Joint(Sternoclavicular joint and acromioclavicular joint). Cubital fossa. ,Fore arm. Hand. Bones of the lower limb.

General blood supply. Anterior aspect of the thigh. Adductor canal and femoral hernia. ,Gluteal Region. ,Hip joint,Politeal fossa and knee joint. Leg , anterior. , lateral and posterior compartments . Foot and ankle joint.Thorax ,Introduction. , skeleton and respiration . Anterior thoracic wall (lungs and respiration) . Mediastinum and Heart..Lymphatic drainage. Review . Posterior mediastinum .

Biomaterial Science:

Definitions.Types of Bonding.Crystal lattice Calculations (BCC, FCC, HCP).Mechanical properties of Metal.Polymers and plastics Materials.Bio materials properties. Alloys.Corrosion of Metals and prevention.Types of corrosion.Bio-corrosions of Implants.

Mechanics of material. Simple stress, Analysis of internal force, simple steess, sheaing stress, bearing stress, thin walled cylinder .

Simple strain :- stress-strain diagram, Hooke`s law; axial deformation Poisson`s ratio, statically indeterminate members thermal stresses.

Torsion: Derivation of torsion formulas, flonged bolt couplings, torsional thin walled lube, helical springs.

Shear and moment in beams:Shear and moment, relation between load, shear,and moment,moving loads.Stress in beams:

Derivation of flexure formula.

Beam deflections: Double integration method deflection of contilever beams, deflection in simply supported beam, midspan deflections

Mechanics of Materials & Vibration :

Oscillatory motion: introduction, harmonic motion, timefunction, random time function

Free vibration: force summation method, the energy method,effective mass, damped free vibration, logarithmic decrement, coulomb damping Stiffness and flexibility .

Harmonically Excited Motion :

Intoduction ,forced harmonic Vibration, Rotating unbalalance, whiling of rotating shafts, support motton, vibration measuring instruments, Vibration Isclation Daniping

Two degrees of Freedom system .

Introduction, Normal mode Vibration, coordinate Ccupling .

Digital Techniques:

Integrated-Circuit Fabrication Monolithic Integrated-Circuit (Microelectronic) Technology ,The Planar Processes and CMOS Technology,Bipolar and FETs Transistor Fabrication , Monolithic

Diodes, The Metal-Semiconductor Contact,Integrated-Circuit Resistors and capacitors ,Integrated-Circuit Packaging and Characteristics of Integrated-Circuit Components

Combinatorial Digital Circuits : Standard Gate Assemblies ,Binary Adders,ArithmeticFunctions,Digital Comparator ,Parity Checker-Generator,Decoder-Demultiplexer,Data Selector-Multiplexer Encoder, Read-Only Memory (ROM) and its Applications , Programmable ROMs (PROMs) , Erasable PROMs , Programmable Logic Arrays .

Sequential Circuits and Systems: The Circuit Properties of a Bistable Latch The Clocked SR flip-flop , J-K-,T-, and D-Type flip-flops , Shift Registers , Ripple (Asynchronous) and Synchronous Counters , Applications of Counters .

Very Large Scale Integrated Systems :Dynamic MOS Shift Registers , Ratio less Shift-Register Stages , CMOS Domino Logic , Random-Access Memory (RAM) , Read-Write Memory Cells and Bipolar RAM Cells , Charge-Coupled Device (CCD) , Integrated-Injection Logic (PL) .

Introduction to matlab neural network.

Biochemistry:

Introduction,Carbohydrates,Lipids ,Proteins.Nucleic acids. nzymes, Cell walls and Membranes ,.Vitamins, Digestion and absorption of major food nutrients. Carbohydrate metabolism, Fat metabolism. Amino acid metabolism Lipid metabolism. Protein metabolism.

Arabic :

Technical Arabic language, the engineering Arabic word, the English word and its Arabic origin, vocabulary, grammar, types of sentences, scientific writing,

Freedom & Democracy :

- Public freedom (general view)
- General theory of public freedom
- Democracy concept
- Definition of democracy and its limitation
- The federalism concept
- The democracy and federalism relationship
- Classifications

Third Stage:

Code	Subject	Hours \ week						Units.
		First term			Second term			
		theory	App.	Tutor. Or lab	theory	App.	Tutor. or lab.	
BME 321	Anatomy II	2	1	2	2	1	2	6
BME 322	Engineering & Numerical Analysis	2	1	-	2	1	-	4
BME 331	Microelectronics	2	1	-	2	1	-	4
BME 323	Computer Aided Design	2	-	1	2	-	1	4
BME 332	Bioelectromagnatics	2	1	-	2	1	-	4
BME 333	Biofluid & Thermodynamics	2	1	-	2	1	-	4
BME 324	Neourobiology & Biology	2	-	2	2	-	2	6
BME 341	Microwave , X- Rays & Gamma –Rays	2	1	-	2	1	-	4
BME 334	Electronic Circuit Lab	-	-	3	-	-	3	2
Total		16	6	8	16	6	8	38

Weekly Hours

First term	Second term
30	30

Syllabi:

AnatomyII :

Introduction to head & neck & neuroanatomy .Skull ,Scalp, ranium.Venous sinuses ..Cervical vertebrae & joints of the neck Fascia of the Neck & posterior triangle of the neck Temporal & infratemporal fossae parotid gland.Anterior triangle & deep dissection of the neck .Lymphatic drainage ,outh cavity . Pharynx & larynx Vagus.Gloss pharyngeal & accessory nerves,rbit & nose . Ear ,Submandibular Region.Introduction to Neuroanatomy. Spinal cord ,ain & temperature pathways. Propioception & tectile pathways. Cerebral cortex .Abdominal wall Peritoneum .Liver, Stomach, Pancreas. Intestine . .Blood supply and nerves.Bony Pelvis . Vessels and nerves .Perineum.

Engineering and Numerical Analysis:

Introduction & Classification of differential equations.

Lap lace transforms,atrices..Functions of complex variables.

Z-Transform. Fourier transforms. Partial differential equations.

Numerical Analysis.

Microelectronics:

Basic amplifier stages at low frequencies . waveforms for a sinusoidal input , the operating point of a BJT , BJT biasing for integrated circuits , the widlar current source , three –transistor current sources , discrete – component BJT biasing –analysis , discrete – component biasing –design , FET biasing , linear analysis of transis tor circuits , the common – emitter amplifier , the emitter follower , the common –base amplifier , comparison

of BJT amplifier configurations , the common –emitter amplifier with an amitter resistance , FET amplifier stages , cascaded BJT amplifiers , compound (composite) transistor stages , the differential amplifier analysis of differential amplifiers , FET differential amplifiers , the operational amplifier , elementary op –amp applications .

Frequency response of amplilfiers , frequency – response characteristics, step response of an amplifier , the common – emitter short- circuit current gain , the generalized gain function , the high-frequency response of acommon – emitter stage , the gain – bandwidth product , the common – source stage at high frequency , the time –constant method of obtaining the response , the frequency response of cascaded stages , the cascade (CE-CB)amplifier ,the operationl amplifier at high frequencies ,the effect of couplingand bypass capacitors.

Feedlback amplifiers , classification and representation of amplifiers,the feedback concept, the ideal feedback amplifier, properties of negative-feedback amplifiers,impedance in feedback amplifiers, properties of feedback amplifier topologies,approximate analysis of a feedback amplifier, general analysis of feedback amplifiers, impedance in feedback amplifiers revisited, the shunt- feedback triple, the shunt-series pair, the series – shunt pair , the series triple, general analysis of multistage feedback amplifiers, mulitloop feedback amplifiers .

Stability and response of feedback amplifiers , effect of feedback on bandwidth , stability , tests for stability , compensation, frequency response of feedback amplifiers – the double-pole transfer function , phase margin of the two- pole feedback amplifier, three – pole feedback amplifier response, approximate anlysis of a multipole feedback amplifier, approximate determination of the open –loop poles, compensation revisited.

Operational-amplifier characteristics, operational amplifier architectures, the gain stage with active load, the differential stage , DClevel shifting , output stages, offset voltages and current, measurement of operational-amplifier parameters, frequency response and compensation, slew rate, B1FET B1MOS circuits , three-stage operational amplifiers, other types of operational amplifiers, MOS operational amplifiers.

Computer Aided Design:

Introduction to Mat lab & Simulink.,introduction to neural network.

Bioeelectromagnetics :

Coulombs law and electric field intensity .Electric flux density –gauss's law. Energy and potential ,Conductors . Anatomical and physiological basis of bioelectromagnatism. Bioelectric sources and conductors and their modeling . Theoretical method in bioelectromagnatism . Electric and magnetic measurement of the electric activity of neural tissue . Electric and magnetic measurement of the electric activity of heart . Electric and magnetic stimulation of neural tissue Electric and magnetic stimulation of the heart ,Measurement of the intrinsic electric properties of biological tissues, Electric signals originating in the eye .

BioFluid & Thermodynamics:

Fluid properties and Definitions, Fluid static's. pressure at point,busic equation to fluid static's, fluid flow; concepts and basic equation, Fluid flow.

Flow entrance, Viscous effects-Fluid resistance, fluid measurement, pressure measurement, velocity measurement fovea measurement , Blood

flow in the heart, arteries, veins, and microcirculation,Air flow in the lungs and air ways.

Introduction, work ,first law of thermodynamics, second law of thermodynamics, entropy, enthalpy, applications of thermodynamics , introduction to heat transfer, heat conduction, heat convection , radiation.

Neurobiology & Biology:

Introduction , the cell and its comports, utilization and control of cellular metabolism , grades of organization , tissue , organs and systems , Introduction to embryology , principles of inheritance . molecular requirements of life .

Introduction , Microscopy , Neurons , Neural organization and function , Neuronal signals & receptors . General principles of signaling , synapses , Neurome dilators . Reflex arc . spinal cord . Spinal nerves. Embryonic development of the nervous system . cerebrum and memory. Hypothalamus , Biological clock .

Microwaves ,X-rays & Gamma – Rays:

X-ray, Properties of x- rays , production of x-ray beams in an x-ray tube , x-ray spectrum (characteristics x-ray ,and bremsstrahlung radiation), x-rays interaction with matter (photoelectric effect, Compton effect , and pair production) , attenuation of x-ray , high- tension generator , transformers, block diagram and operation of x-ray unit, control system of x-ray equipment , digital x-ray unit.

Nuclear medicine, nature and type of nuclear radiation , scintillation detectors , gamma –camera , positron imaging .

Microwaves . introduction, transmission lines , microwave devices, resonant cavities, Doppler effect , microwave semiconductor devices , microwave polarization , TRS and frequency changing.

Electronic Circuit Lab

At this lab, students learn how to desgin and implement electronic cuircuits,used in the design of medical instruments and equipment pertaining to surgery and other medical domains.

Fourth Stage:

Code	Subject	Hours \ week						Units.
		First term			Second term			
		theory	App.	Tutor. Or lab.	theory	App.	Tutor. Or lab.	
BME 431	Artificial Limbs & Biotribology	2	1	-	2	1	-	4
BME 441	Machine Design	2	2	1	2	2	1	6
BME 442	Control System Design	2	1	2	2	1	2	6
BME 443	Integrated Optics & Laser	2	1	-	2	1	-	4
BME 432	Microprocessors & Microcomputers	2	1	-	2	1	-	4
BME 444	Signals Processing	2	1	2	2	1	2	6
BME 445	Medical Instrumentation & System I	2	1	-	2	1	-	4
BME 446	Medical Measurements	-	-	3	-	-	3	2
Total		14	8	8	14	8	8	36

Weekly Hours

First term	Second term
30	30

Syllabi:

Artificial Limbs & Biotribology:

Friction, types of friction, law of static and dynamic friction, friction in journal bearing , friction measurements. Hydrodynamic lubrication, squeeze film, boundary lubrication,Elasto hydrodynamic lubrication, Theory and typer of wear. Wearmeasurments Tribology in human body, lubrication of human joints, wear in human joints.

Machine Design :

Mechanism :- Introduction to the study of mechanism constrained motion, Velocity and accelercotion diagram , forces acting in mechanism.

Hooke`Joints (Univesal Joints)

Gyroscopic couple, Governors, Balancing to rotating masses Fatigue, Greep , Ductile material , brittle material, Detachable fastenings , (scrs, keys, knuckie joints, cotter joints, pins, snap) , Power screw, belt and chain cluches and brakes , gears, bearings.

Control System Design:

Linear control system . Introduction :- Open-loop system .Closed-loop system .Mathematical Background :- Laplace transform .Matreces .

Transfer Function of system :-Electrical system .Mechanical system . Electro-Mechanical System . Chemical Process modeling .Bio-Medical Examples .Block diagram Reduction Rules .signal flow graph and Masons rule . Time responses analysis of control system . .Routh stability criteration. .

Root locas Techniques . Frequency response analysis of control system, Bode plot techniques . Nyquist stability ceritrion .Non-Linear control system (describing function Approach).

Integrated Optics & Laser:

Properties of light. Lenses & prisms. Medical applications of light. Electronic Image. Eye &Vision. Visual acuity. Defective vision. Physiology of the eye. .Optical Instruments.

Laser:- a.physicsof laser. Characteristic of laser. Device & Types of laser in Medicine. Laser interaction with Biological Tissue. laser safety.

Microprocessors & Microcomputer:

Microcomputer system Microprocessor :-Microprocessor registers, arithmetic logic unit, control unit, address, data, control buses, memory, input\output devices and interfaces, The microprocessor :microprocessor internal organization(programming models), segmented memory, machine language,

Instruction set.Data transfer instructions,Arithmetic instructions.

Logic instructions. ,String manipulation instructions.

Control transer instructions. Interrupt instructions.

Miscellaneous instructions.

Memory. Memory fundamentals,Basic element of the memory.

Reading from\Writing into memory,RAM, ROM.

Internal architecture of memory.

The microprocessor operations and system organization:

8088 microprocessor minimum mode.

,External signals:address\data bus, memory, I\O control signals, interrupt interface signals, DMA interface signals, system timing.

Main memory system design:

Microprocessor read\write timing).

Memory interfacing to the microprocessor. Address decoding & The memory map.

Basic input\output.Input\output instructions,Basic port design.

Input\output timing diagrams. ,Operation.

Peripheral-mapped I\O. ivv)Memory -mapped I\O.

Input/output Techniques:-

Programmed I/O (interfacing keyboard).

Interrupt-Driven I/O:-(Maskable interrupts, Non-maskable interrupts,multiple interrupts & priorities,interfacing keyboard).

DMA (Direct Memory Access) I/O :-

Signals Processing

Types of signals ;according to mathematical view point ,according to signal continuity ,according to Signal certainty , according to signal values and according to signal periodicity .

Important continuous / discrete signals (examples) . Examples of typical biomedical signals . Representation of continuous / discrete time signals . Continuous / discrete time systems . Signal processing from implementation view point . Basic operations applied to continuous / discred time signals . Processing types of continuous / discrete tim signals

block diagnams . Continuous / discrete time system . Linearty and time invariance . Response of LTI systems . Bibo stabitiy and causality . Active , passive and lossless systems . Structures for realizing LII systemws . Signals / systems time domain analysis .Convolution techniques. Correlation techniques auto – correlation and cross – correlation . Sampling and sampling theorem . practical aspects of sampling and reconstraction . furrier analysis . the z – transform and its application to discrete time system analysic . Discrete time fourier trans form (DFT)
Calculation of spectra using the DFT .

Medical Instrumentation and System . I:

Cardiovascular measurements.Blood flow measurements,
Plethysmography, Catheterization laboratories.
Cardiac stimulation and life support equipment.Defibrillators
Pacemakers,Heart-lung machines.
Respiratory instrumentation.spiro meters,Pulmonary measurement systems and instruments,Artificial mechanical ventilation.
Electroencephalography (EEG).EEG-electrodes,EEG-amplitude and frequency bands,Multi-channel EEG recording systems and typical external controls,Pre-amplifiers and EEG-system,
EEG-artifacts.
Intensive care unit.ICU- equipment,Cardio tachometers,Alarms
Lead fault indicator, Remote oscilloscopes, Memory system.
Electro surgery generators. electro surgery machines, Electro-surgery circuits, Electro surgery safety.

Medical Measurments،

Introductions to measurments.resistive, capacitive, inductive, LVDT, piezoelectric transducers. forward and inverse problem.

ENG, EMG, ECG.chest leads. Evoked potential.Biopotential electrodes, Cardiac pacemaker. Cardiac defibrillator. Other Medical Measurement system.

Fifth Stage:

Code	Subject	Hours \ week						Units
		First term			Second term			
		theory	App.	Tutor. Or lab	theory	App.	Tutor. Or lab.	
BME 541	Physiological Control & System	3	1	-	3	1	-	6
BME 542	Clinical Engineering	2	1	-	2	1	-	4
BME 543	Biodigital Signal Processing	1	-	2	1	-	2	4
BME 544	Medical Imaging	3	1	-	3	1	-	6
BME 545	Biomedical Sensor .	2	-	2	2	-	2	6
BME 546	Medical Instrumentation & System. II	3	-	-	3	-	-	6
BME 547	Medical Engineering Lab.	-	-	4	-	-	4	2
BME 548	Engineering Project	1	-	3	1	-	3	4
Total		15	3	11	15	3	11	38

Weekly Hours

First term	Second term
29	29

Syllabi:

Physiological Control and System:

Cell Physiology,Muscle and Nerve,Neuromuscular , Auto.N.System,Circulation,Respiration,Renal,Blood,CNS (Central Nervos System),Endocrine, Special Senses.

Clinical Engineering:

ENG(Electro-Neurograph),EMG(Electro-Musculograph).EEG (Electroencephalograph),Vitalograph.Spirometer,PeakFlow Metry, ECG(Electrocardiograph)Gram poly graph, Excercise Physiology.

Biodigital Signal Processing:

General biomedical signal acquisition systems (study and design): analogue acquisition and digital acquisition. One dimensional signal processing: Time domain processing; Linear/circular convolution techniques: direct, table-look up, polynomial and graphical. Linear / circular correlation techniques: Direct, table look up, polynomial, and graphical. Frequency domain processing: The discrete Fourier transform (DFT), the fast Fourier

transform (FFT); decimation in time FFT and decimation in frequency FFT.

A review to Z- transform. Analogue filter design: Butterworth approximation and Chybechev approximation. Design of infinite impulse response digital filters. Design of finite impulse response digital filters. Two dimensional processing: time domain processing: convolution and correlation. Frequency domain processing: DFT and FFT .wavelet transform. Introduction to the computer aided design, physiological system study using computer aided design, software implementation of DSP algorithms.

Medical Imaging:

Radiographic film,Film construction,Latent image,Types of film processing,Processing chemistry, Automatic processing methods, Alternative processing methods. intensifying screens,Screen construction, Screen characteristics Screen-film combination.

The Grid.Characteristics of grid construction,Measuring grid performance,Types of grids,Grid selection. Radiographic quality. Film factors, Geometric factors, Subject factors improved radiographic quality, Radiographic exposure, KVP, MAS, Exposure time, Distance. Radiographic technique. Patient factors, Image quality factors ,Automatic exposure techniques, Special X-ray imaging, Select plane-film procedure, Tomography, Magnification radiography, Mammography, Introduction, X- ray apparatus, Image = receptors. Fluoroscopy. Image intensifying tube, Block diagram and operation of a fluoroscopic machine.

Biomedical Sensor :

Fourier component of periodic waveforms,Effect of system response on periodic signal,Thermal characteristics of metals,thermistors,and thermocouplese,Properties of strain gage materials.Example of strain gages.

Example of force transducer.

Strain gage manual,project lab handout,Straingth-duration curves for ultra-sonic power,Capacitive and inductive displacement seneors,Hall effect sensors,Electromagnatic flowmeter,Absorbance spectrum of hemoglobin and basic design of opticaloximeters,Phenol red and pH measurments,Some optical components and their spectral characteristics,Fluorescent O2 and pH indicators,Optical system design,Fiber optic O2 and pH sensors,Ray diagrams of optical fibers,Important blood gases and other analyes,Electrochemical sensors, pH, PCO2 and PO2 electrodes,Oxyhemoglobin dissociation curve,

Electrode handout-electrical characteristics of metal/electrode interface,

Polarizable and nonpolarizable electrodes,Glass microelectrodes.

Medical Instrumentation and Systems. I I:

Ultrasound,scanners,Introduction,A-scan,B-scan,M-scan,Realtime scanners, Doppler methods for flow measurements, US contrast media and harmonic imaging.

Magnetic resonance imaging.introduction,T1-recovery and T2-decay,Contrast of MRI,Magnetic field gradients, Slice selection

Frequency enconding,MRI-pulse sequences, Resolution and field of view, Instrumentation for MRI (MR-spectrometer, radiofrequency coils, magnets ,shims coils and gradient coils)

Computed tomography (CT-scanners).CT-technology, Scanning gantry-ray tubes and detectors, Data handling systems.

Hem dialysis machines. Hem dialysis machine, Electrical safety precautions, Typical faults, troubleshooting and maintenance.

Medical Engineering Lab.

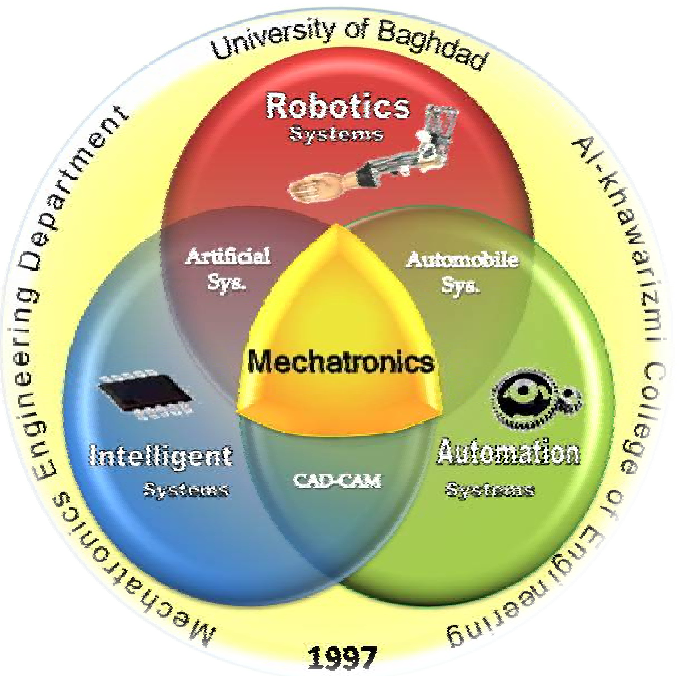
Engineering human recovery, biomechanics low termianl artificial legs, concept, design , CAD for Biomechanics

Introduction . biomechanics , CAD . mathematical modeling . description of geometry , description of problem , finite element analysis (FEA) , general view , description of geometry , description of problem . introduction to software . ansys pamily , problem procedure , applications , bone , joint , biofluid , solution of problem . problem procedmer , static analysis , dynamic analysis , multimaterial . applications , bones , joints , biofluid .

Engineering Project

An application represents the student's knowledge of engineering sciences field in their specialties where this project is one of the graduation requirements.

Department of Mechatronics Engineering



Department of Mechatronics Engineering

1- Introdution:

In order to keep pace with the rapid progress and development the world has been witnessing in the field of informatics ,communications revolution , Electronics Engineering , Computer Engineering , and Mechanical Engineering , the Department of Mechatronics Engineering was established to represent an integration between these disciplines. This was achieved by carrying out a number of engineering operations, including the design and manufacture of smart products and systems that contain mechanical devices, electrical and electronic circuits such as robotics, and automatic machinery which are controlled by computers and products based on the microprocessors.

The Department of Mechatronics Engineering was established in the academic year 1997-1998 as part of the College of Engineering / University of Baghdad, and was attached to Al-Khawarizmi College of Engineering when the said college was established in the academic year 2002- 2003.

The department admits students who have passed their second academic year of study in the engineering departments, namely Mechanical, Electronic, Electrical, Computer Science, Control Systems and Nuclear engineering of all engineering colleges in Iraq after passing an entrance test. The period of the study in the department is three years after the second college stage. The study at the College begins at the third stage and lasts for three years after which graduates are awarded the BSc. degree in Mechatronics engineering.

In pursuance of the recommendation of the Board of Al- Khwarizmi College of Engineering , the Board of the University of Baghdad and the Sectoral Committee for Engineering specializations, the Ministry of Higher Education and Scientific Research and under the Central Admissions Plan has approved the admission of students to the first stage as of the academic year 2007-2008. The period of the study has become four years leading to the BSc. Degree in Mechatronics Engineering.

2- Mission :

-Upgrading the present status of the society and contributing to the building up of the country through the teaching staff members, engineers and scientific research papers. This can be accomplished by:

1. Graduating engineers who are able to achieve innovations and creativity and find solutions for the industrial problems the society is suffering from.

2. Preparation of research papers that would contribute to solving the society problems.

3. Setting mechanisms of cooperation between the department and other ministries in an attempt to find solutions for the problems encountered by those ministries.

4.Providing engineering consultancies to the various state sectors .

3 – Vision:

-Upgrading the local and regional level of the department.This can be done through the development of curricula that provide students with the necessary participations in the different spheres through education and applicable research:

1. Development of the teaching staff members of the Department by sending them to other universities to visit academic departments and research centers pretaining to their specalizations in an attempt to transfer such expertise to the department.

2. Investment of human resources available to the Department and diagnosing of the gifted students to support the process of development in the country.

3. Development of scientific research resources, techniques and employment of the products to serve the state institutions and the private sector

4. Acquainting students, educational centers and govermental bodies with the latest educational programs of the department which rise to the standard of education quality accrediation within the departmentspecalizations.

5. Making different educational programs compatible with the requirements of technological development and the society needs.

6. Rehabilitation of graduates who are ccapable of innovations and take decision-making.

7. Sending instructors abroad in study courses and research fellowships.

8. Trying to achieve integration between the departments and other fields of specilization within the College through promotion of research in the fields of Informatics and Biomedical Engineering.

4 – Objectives:

In view of the urgent need of the country for engineers in the highly specalized areas in the field of engineering sciences, the department aims at:

1- Preparation of qualified well-versed engineers,who are able to support and serve the society through furnishing various ministries and local market with qualified cadres.

2-Contribution to solid and modern engineering research in order to enhance scientific progress in the field of Mechatronics Engineering.

3. Contribution to the creation of this rare and modern specalization in the modern Arab world.

4. Developing skills of teaching staff members.

5. Creating an environment suitable for education that requires the involvement of students and stimulating their research capabilities.

6. Expansion of applied education and scientific training.

7. Providing assistance to the academic bodies in the planning of education engineering programs.

5 - Values :

The department believes int the following values:

1. Responsibility and accountability.
2. Academic excellence.
3. Complementarity between various sciences.
4. Modernizing and strengthening of human and material capabilities.
5. TQM

6- Lecturers :

Names	Academic Title	Degree / Country	General Specialization	Minor Specalization	Position
Dr. Nabeel Kadhim Abid-AL-Sahib	Prof.	Ph.D./ Russia	Mechanics	Manufacturing	Dean of college
Dr. Wael Rasheed Abd Al-Majeed	lecturer	PhD/ Iraq	Mechanics	Applied Mechanics	Head of department
Dr.Abdul Salam A. Al-Ammri	Prof.	Ph.D/ Iraq	Mechanics	Applied Mechanics	Lecturer
Dr. Bahaa Ibraheem Kadum	Asst. Prof.	PhD/ Iraq	Mechanics	Applied Mechanics	Lecturer
Dr.Ali Ibrahim Mahdi	Asst. Prof.	Ph.D/ United Kingdam	Electronics	Electronics&	Lecturer
Dr . Laith Jamil Bunni	lecturer	PhD/ Iraq	Electrical Eng	Machine	Lecturer
Dr.Laith Abed Sabri	lecturer	phD/ Iraq	Mechanics	Applied Mechanics	Lecturer
Dr. Laith Owda Kadum	lecturer	phD/ Iraq	Electronics & communications	Electronics & communications	Lecturer
Yarub Omer Naji AL-Azzawi	lecturer	M.Sc/ Iraq	Mechatronics Eng.	Mechatronics	Lecturer
Ali Hussain	lecturer	M.Sc/ Iraq	Electrical Eng.	Control and Comp.	Lecturer
Hisham H. Jasim	Asst. lecturer	M.Sc/ Iraq	Mechanics	Power	Lecturer
Ra'ad Kadhim Mohammad	Asst. lecturer	M.Sc/ Iraq	Mechanics	Power	Lecturer
Malik M. Ali abdalhadi	Asst. lecturer	M.Sc/ Iraq	Mechanics	Applied Mechanics	Lecturer

Names	Academic Title	Degree / Country	General Specialization	Specialization	Position
Ahmed Mahrous Ragib	Asst. lecturer	M.Sc/ Iraq	Electrical Eng.	Control and Comp.	Lecturer
Ayad Jassim Mohammed	Asst. lecturer	M.Sc/ Iraq	Mechatronics Eng.	Mechatronics	Lecturer
Dena S.Munim	Asst. lecturer	M.Sc/ Iraq	Mechanics	Power	Lecturer
Ahmed rahman	Asst. lecturer	M.Sc/ Iraq	Mechatronics Eng.	Mechatronics	Lecturer
Wissam Saadi Khedair	Asst. lecturer	M.Sc/ Iraq	Mechanics	Power	Lecturer
Ala'a Abdul Ameer Hassan	Asst. lecturer	M.Sc/ Iraq	Electrical Eng.	Electronic	Lecturer
Ali Hussain	Asst. lecturer	M.Sc/ Iraq	ElectricalEng.	Control and Comp.	Lecturer
Eman Ahmed Zayer	Asst. lecturer	M.Sc/ Iraq	Mechatronics Eng.	Mechatronics	Lecturer
Aslann Jalal Abdi	Asst. lecturer	M.Sc/ Iraq	Electrical Eng	Machines	Lecturer
Maher Yahya Saloom	Asst. lecturer	M.Sc/ Iraq	Mechanics	Applied Mechanics	Lecturer
Furat Ibrahim hussein	Asst. lecturer	M.Sc/ Iraq	Mechanics	Laser	Lecturer
Saif Ghazi	Asst. lecturer	M.Sc/ Iraq	Mechatronics Eng.	Mechatronics	Lecturer

7- Engineers:

Names	Occupation	Degree

Isra'a Rafie Shareef	**Assistant Engineer**	B.Sc../Mechatronics Eng.
Adnan jebar Atia	**Assistant Engineer**	M.Sc../Mechatronics Eng
Amina Abdul- Hadi	**Assistant Engineer**	B.Sc../Mechatronics Eng.
Hussin Naiem	**Assistant Engineer**	B.Sc../Mechatronics Eng.
Yassar Nori	**Assistant Engineer**	B.Sc./ Electrical Eng.
Mohameed Yahia	**Assistant Engineer**	B.Sc../Mechatronics Eng.

8- Technicians:

Names	Occupation	Bachelor Degree
Suhad Ibraheem Mohammad	Chief of. Researchers	Bsc mathematics
Ahmed Zaid Abed-Alla	Asst.Physcist	Bsc physics
Rasha Majeed Yaseen	Asst.Technician	Bsc mathematics

9- Administrative Staff:

Names	Working Degree	Position
Shaymaa Mahdi Hasson	Superintendent	Secretary
Heyam Kadum Naeem	Physcist	Secretary
Hamida Atia Abod	Chief. Technician Observer	Secretary

10- Laboratories:

	**Computer simulation labs** **Control lab** **Image processing lab** **Software design lab** **CAD lab** **Programming lab** **Eng.& numerical analysis lab** **Machine Theory lab** **Simulation of mechatronics systems lab**
	**Microprocessor Labs** **Microprocessor lab** lab **Power electronics** **Logic lab**
	**Sensors & Instruments Labs:** **Sensors lab** **Electrical circuits lab** **Electronics lab**
	**Projects Labs** **Undergraduate project lab** **Higher studies lab**

11- The Curricula for undergraduate students :

First Stage:

Code	Subject	Hours \ week						Units
		First term			Second term			
		theory	App.	Tutor. Or lab	Theory	App.	Tutor. Or lab.	
MTE121	**Mathematics1**	**3**	**-**	**1**	**3**	**-**	**1**	**6**
MTE134	**Engineering Mechanics (Static & Dynamic)**	**2**	**-**	**2**	**2**	**-**	**2**	**4**
MTE133	**Engineering Drawing and Descriptive Geometry**	**1**	**3**	**-**	**1**	**3**	**-**	**5**
MTE131	**Fundamentals of Electrical Eng.**	**2**	**2**	**1**	**2**	**2**	**1**	**6**
MTE132	**Electronics1**	**2**	**1**	**1**	**2**	**1**	**1**	**5**
MTE132	**Workshop & Industrial Safety**	**1**	**1**	**-**	**1**	**1**	**-**	**3**
MTE122	**Computer Programming 1**	**2**	**1**	**-**	**2**	**1**	**-**	**5**
MTE111	**Technical English**	**1**	**-**	**1**	**1**	**-**	**1**	**2**
MTE112	**Human Rights and General Freedoms**	**1**	**-**	**1**	**1**	**-**	**1**	**2**
	Total	**15**	**8**	**7**	**15**	**8**	**7**	**38**

Weekly Hours

First term	Second term
30	30

Syllabi :

Mathematics 1 :

Vectors , vector components , unit vector ,basic operations on the vectors , equation of line and plane .Limits , methods of calculating limits , continuity and discontinuity , the derivative and high order derivatives , functions , differentiation of functions , plot the function .The complex numbers , representation of number in the complex plane , complex number algebra ,the complex conjugate , absolute values , polar and exponential formats , Demover theorem , roots finding . Undefinite integral and the fundamental theorem in calculus , application of definite and undefinite integrals , methods of integrations. Multiple integration , linear integration , double and triple integral , surface integration .Hyperbolic functions .Finite and infinite sequences and series .Curves, circle and different sectors . Determines , characteristics and order of determine , calculation and multiplication of determine, Gramer's rule , solving of instantenous equations. Coordinate systems and transformation between them.

Differential equations, development and classification of equations, classification of equations solution, initial conditions, homogenous equations, Bernoly and Recatii equation, complete and un complete equation, solving of linear equation with constant parameters, solving of non homogenous equations, Caushi-Euler equation. Power series solutions of differential equations .

Engineering Mechanics :

Statics:- General principles of statics, force vectors, equilibrium, force system resultants, analysis of trusses, internal forces and moments, friction, centroids and moments of inertia, and virtual work .

Dynamics:- Kinematics of particles and rigid bodies. Kinetics of particles and rigid bodies .Newton's laws. Equations of motion . Work and Energy methods . Impulse and Momentum .Gyroscope . Introduction to Mechanical vibrations

Eng. Drawing and Descriptive Geometry :

Descriptive Geometry:- Projection type, represented of point, line, and plain, Scale and location problems, assistant projection, Intersection and planning of multi surface bodies, Revolutionary surfaces and planning and intersection.

Eng. Drawing : using and maintenance of drawing tool, scaling, fonts type, principal of division of drawing , writtening of characters and numbers, method of input distance, drawing of polygon, parallel lines, tangent and curve line, projection, theory of projection, projection type, kinds and method of solid drawing, copy of projection, copy of 3rd projection, Sections, full sectioning, half sectioning, application of electrical drawing.

Fundamentals of Electrical Engineering:

Concepts of electric charge and Coloumb's law ,Conductor and insulator ,electric field ,Gauss law and the potential, capacitors ,stored energy in the electric field, electric current density ,electromotive force, polarity of current and voltage , resistivity ,resistance ,Ohm's law, modeling of electric

sources, resistive circuits, Kershoff's laws, open and short circuits, resistances in series, resistances in parallel, star-delta and delta-star transformations, loop and mesh and mesh analysis, nodal analysis, networks theorems, electrical power and the theory of maximum power transfer.

Magnetic fundamentals, magnetic induction, magnetic field, flux density and magnetic potential, Ampere's law, magnetomotive force, Faraday's law, ferromagnetic materials, stored energy in magnetic field, self and mutual induction, analysis of magnetic circuit.

Waveform, average and effective values , form factor, sinusoidal waveform ,frequency and period, phasor representation, complex impedance, analysis of alternating current circuits using the previous methods and theorems , resonance circuits , maximum power transfer , circuit topology . Three phase systems . Analysis of electric circuits using PSPICE and MULTISIM programs .

Electronics1:

Physics of semiconductors , PN junction ,characteristics and modeling of different types of diodes ,analysis and applications of diodes .Photo diode ,photo cell ,light emitting diode. Characteristics and modeling of bipolar transistor , biasing and analysis of bipolar transistor , field effect transistor characteristics , modeling and analysis of FET transistor, small signal model of transistor, amplifiers, small signal amplifier, input and output impedance, multistages .

Engineering Workshops &Industrial Safety :

Engineering workshops, industrial safety, different manufacturing processes, casting, operation and metal cutting, milling, lathing, installation of parts and metals, welding, installation and manufacture of integrated electronic circuits, control and automation of production processes and manufacturing, and cutting tools used in operations Automation and control.

Computer System and Programming 1:

Computer system, software and hardware, relationship between software and hardware, programming type, IDES, System work(Dos and Windows), program language, machine language, assemble language and high level language, C++, data structure, solving Eng. problems by used C++.

Technical English Language:

Revision of grammatical structures with emphasis on technical usage, augmentation of technical vocabulary, dictionaries. Precise writing, descriptive and reflective paragraphs writing, Practice in presentation of passage original idea in a summary form, writing original compositions on themes connected with passages. Technical writing, clear and accurate writing on themes of common and technical English , theme discussion, beginning of essay, theme development, logical and effective conclusion, professional letter writing, note taking, special English for electrical and mechanical engineering, reading and listening comprehension.

Human Rights and General Freedom:

The historical fundamental roots of human rights and their development in our nation ,human rights in old age, human rights : definition and limits,general view of freedom ,historical development of freedom, Designation of freedom, classification of freedom

Second Stage :

Code	Subject	Hours \ week						Unit
		First term			Second term			
		Theory	App..	Tutor. Or lab.	Theory	App..	Tutor. Or lab	
MTE 220	**Mathematics 2**	**2**	**-**	**2**	**2**	**-**	**2**	**4**
MTE 221	**Strength of Materials and machines theory**	**2**	**-**	**1**	**2**	**-**	**1**	**4**
MTE 222	**Engineering Materials and Manufacturing Processes**	**2**	**1**	**1**	**2**	**1**	**1**	**5**
MTE 223	**Electronics 2**	**2**	**1**	**-**	**2**	**1**	**-**	**5**
MTE 224	**Microprocessor and Microcontroller**	**2**	**2**	**-**	**2**	**2**	**-**	**6**
MTE 225	**Power Mechanics (Thermodynamics & Heat Transfer)**	**2**	**-**	**2**	**2**	**-**	**2**	**4**
MTE 226	**Electric Circuits**	**2**	**-**	**1**	**2**	**-**	**1**	**4**
MTE 227	**Digital Logic Design**	**2**	**1**	**-**	**2**	**1**	**-**	**5**
MTE 229	**Computer Programming 2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**
MTE 228	**Freedom and Democracy**	**1**	**-**	**1**	**1**	**-**	**1**	**2**
	Total	**18**	**6**	**9**	**18**	**6**	**9**	**42**

Weekly Hours

First term	Second term
33	33

Syllabi :

Mathematics 2:

Laplace transform, characteristics of Laplace transform and its application in solving of differential equation .Multivariable functions, partial differential , series rule and its applications, directional functions, directional derivatives. Matrices, matrices algebra , types of matrices, matrix transport and inverse , eigen values and vectors Complex functions. Partial differential equation , development of partial differential equations, wave and heat equation, transmission line equation, Laplace equation in different coordinates, solving of partial differential equations. Special functions, gama , beta and Bessel functions and their applications, solving of Bessel equation, Lagender equations and polynomials , orothogonal equations. Modern algebra, sets, relations, groups, fields , vector space.

Probability and Statistics: Probability distributions, types and characteristics. Probability theory. Estimation and order statistics. Linear and multiple linear regressions. Time series analysis and analysis of variance. Design of experiments. Application of statistical methods in quality control.

Materials Strength and Theory of Machines:

Materials Strength :-Axial stresses and strain, stress-strain curve, Modulus of Elasticity, Hooks law, Modulus of rigidity, Bending stresses, Elongation , Thermal stresses and strains, Undeterminate static of stresses, Stresses of centrefiugal forces. Stiffness coefficient ,twist and shear, stresses of twist and shear, Undeterminate static of shear stresses, springs, Shear stresses and torque for beams, Combined stresses, Mohr circle, critical load for columns, Euler law, Deflection, Strain energy in tension and compression, the theorem of Castiliano, Failure theory.Theory of Machines:-Acceleration and speed analysis in leves, power analysis, CAM mechanical, Gear mechanical, stability, gyroscope, control tools, flywheel, friction(clutches), governors, universal joint

Engineering Materials and Manufacturing Processes:

Engineering Materials:- Atomic and molar constructions of metals, point , line, and surface defects, hardening processes . Mechanical , electrical, thermal and optical properties, fracture mechanics , corrosion and oxidation , composite materials, test of metals, properties of magnetic and organism material, plastic construction and properties of plastic, polymers construction and properties of plastic polymers, ceramic properties of ceramic glasses composite material, powder metallurgy.

Manufacturing Processes:- Cutting and design process, design of machine cutting, accurate measurement, forming operation, shear cutting, hot forming, cold forming, plastics forming, casting techniques, molds, blast furnace, welding techniques.

Electronics2:

MOS transistor, MOS transistor as a switch with resistive load, characteristics of MOS transistor, current drain. Power semiconductors, thyristor, triac, diac. Operational amplifier circuits, active filters, power supplies, oscillators, non sinusoidal oscillators and timing circuits, voltage to frequency and frequency to voltage converters. Memory, classification of memory, memory hardware, common emitter, transistor-transistor logic, ADC and DAC circuits. Sample and hold circuits. Design and analysis of electronic circuits using MULTISIM program.

Microprocessor and Microcontroller

Introduction to microcomputers, types of microprocessors, x86 microprocessors series. 8086 microprocessor, internal architecture of the 8086 , machine and assembly languages, addressing modes in the 8086, instruction set of the 8086, data movement instructions, arithmetical and logical instructions, branching instructions, subroutines instructions, stack instructions, other instructions. Instruction coding. Methods of input and output data. Interrupt method, timing diagram of the interrupt bus cycle. Interface of memory, timming diagram of read and write bus cycles. Direct memory access DMA, timing diagram of a DMA bus cycle. Serial and parallel ports. Interface of ADC and DAC to the microprocessor.

Thermodynamic and Heat Transfer:

Basic concepts of thermodynamic systems, properties of pure material, first and second law of thermodynamic, entropy, cycle energy and cooling, mixture of ideal gases, reactive mixture, chemical and phase equilibrium

law of heat transfer, Conduction for steady state one and multi dimension, numerical analysis, use of chart , radiation, properties of radiation, heat transfer by convection, free and force heat transfer, thermal exchanger, application for industrial and mechatronics system.

Electric Circuits:

Electric signals , periodic signals , Fourier series, using Fourier series in circuits analysis . Non periodic signals , unit step function , impulse function , ramp function , parabola function , shift in time , transient circuits, application of Laplace transform in analysis transient circuits, zero-input response, zero-state response, characteristics polynomial and the modes, transfer function, poles and zeros, plotting poles and zeros in the s-plane, convolution in time and s domains , correlation in time and s domains , systems types , linear time invariant systems , using MATLAB program in systems simulation and analysis . State space representation , solution of state equation . Fourier transform, application of Fourier transform in the analysis of electric circuits . Network functions, frequency response, plotting the frequency using Bode's method, resonance, passive and active filters . Two port networks , two port parameters. Using PSPICE and MULTISIM programs to analysis electric networks.

Digital Logic Design:

Number systems , conversion between number systems. Bolean algebra . Logic gates . Combinational and sequential circuits . Multiplexers and demultiplexers , coders and decoders, flip flops, registers , counters , adders, comparators, memories .Analysis and design of combination and

sequential synchronous and asynchronous circuits. Programmable logic arrays and programmable logic devices , PLC circuits.

Programming 2:

Introduction to MATLAB, create one dimensional variables, writing the mathematical formula, the execution priority, the hyperbolic & trigonometric functions & the inverse of such function, the instructions (clc, for…end, clear, whos, if…end, if…else), vectors, matrices, numerical functions, data plots, saving & loading data to files and from files

Freedom & Democracy

public freedom (general view) ,general theory of public freedom,democracy concept ,definition of democracy and its limitation ,the federalism concept ,the democracy and federalism relationship &classifications

Third Stage:

Code	Subject	Hours \ week						Units
		First term			Second term			
		Theory	App.	Tutor. Or lab.	Theory	App.	Tutor. Or lab.	
MTE346	Vibrations and Machines Design	3	-	1	3	-	1	6
MTE347	Digital Signal Processing	2	-	-	2	-	-	4
MTE331	Thermodynamics and Heat Transfer	2	-	1	2	-	1	4
MTE341	Measurements and Sensors	2	1	1	2	1	1	5
MTE243	Hydraulic and Pneumatic Systems	1	-	1	1	-	1	2

MTE342	PC- Interface and Data Acquisition	1	2	-	1	2	-	4
MTE343	Automatic Control Engineering	3	1	1	3	1	1	7
MTE344	Power Electronics and Drives	2	1	1	2	1	1	5
MTE321	Autocad Programming	-	3	-	-	3	-	3
	Total	16	8	6	16	8	6	40

Weekly Hours

First term	Second term
30	30

Syllabi:

Vibrations and Machines Design :

Vibrations :-Oscillation motion , force and free vibration, damped and undamped, separation of vibration, measurement and vibration devices, transient vibration, 2-degree of freedom, absorb the vibration, multi-degree of freedom, introduction to random vibration.

Machines Design:-Introduction of materials resistance, dynamic strain and shock strain, strain center, rotational shift, clutch, gears, levers, motion translation by broad leather strap ,springs, levers and hubs coupling.

Digital Signal Processing:

Analogue signals and systems, analogue filters design. Representation of discrete signals and systems, sampling and quantization, time sequence, Z-transform of discrete signals. Discrete time Fourier series and Fourier transform, discrete Fourier transform, fast Fourier transform, other transforms. Difference equations and the transfer function of discrete time system, zeros and poles , stability, frequency response. Solving of difference equations using different methods. Design of digital filters, FIR and IIR filters. DSP microprocessors. Multidimensional digital signal processing , multidimensional transforms. Adaptive systems. Using MATLAB in study and analysis of discrete time signals and systems.

Thermodynamic and heat transfer:

Basic concepts of therodynamic systems, properties of pure material, first and second law of thermodynamic, entropy, cycle energy and cooling, mixture of ideal gases, reactive mixture, chemical and phase equilibrium law of heat transfer, Conduction for steady state one and multi dimension, numerical analysis, use of chart , radiation, properties of radiation, heat transfer by convection, free and force heat transfer, thermal exchanger, application for industrial and mechatronics system.

Measurements and Sensors:

Description of measurement devices, dynamic and static characteristics, measurement of motion, force, torque, power, pressure, sound, flow, heat

and temperature, amplifiers, analogue and digital electrical measuring devices, oscilloscope. Sensors and transducers, tension sensors, flow sensors, pressure sensors, temperature sensors, proximity sensors, optical sensors, speed sensors, ultrasonic sensors, robotic sensors.

Hydraulic and Pneumatic Systems:

Hydraulic : weight , pressure ,force , hydrostatics , hydrodynamics , basis of a hydraulic system .Examples and applications from various fields . Hydraulic pumps and motors , hydraulic cylinders .Actuators.Check valves , flow control valves , proportional valves , servo valves . Hydraulic accumulators .Accessories (filters,pressure switches,gauge, isolator valve , pressure control unit , heat exchanger , heaters thermostats , thermometers , float switches).Connection methods . Hydraulic components in various industries .Circuits.

Pneumatics :-Introduction ,development of compressed air engineering ,volume changes as function of temperature, equation of state for gases. Distribution of compressed air . Preparation of compressed air.

Pneumatic working elements. Valves . Proximity sensing devices. Pneumatic-electric signal conversion. Symbols used in pneumatics. Basic circuits. Practical examples.

PC- Interface and Data Acquisition:

Interfacing of electro-mechanical systems to microcomputers for data acquisition, data analysis and digital control. Using of PC ports and Internet for data acquisition and control purposes. PC architecture. Serial port,

parallel port, USB. Programming techniques for serial and parallel communication. ISA and PCI bus specifications. ISA bus interfacing and programming. Simple ISA card design for data acquisition

Automatic Control Systems:

Control concepts. Modeling of physical processes and systems, transfer function and block diagram. Open and closed loop systems and comparison between them. Signal flow diagram. Transient and steady state error analysis. Routh-Herutiz criteria. The root locus. Bode diagram. Nyquist criteria and its inverse. Methods of designing controllers. Using of MATLAB program in study and analysis of classical control systems. Development of state equations of a control system. Solving of state space equations. State transition matrix, its properties and the metods of evaluating it. Time response and stability analysis. Lyapenove direct method. Sensitivity, controllability and observability. Pole placements by state and output feedback. Compensation of state space control system. Using MATLAB program in the study and analysis of state space systems .

Power Electronics and Drives:

Electrical Drives: D.C drives. Review of three phase systems, three phase induction motors. Synchronous motors and generators . Single phase induction motors. Stepper motors. Linear motors .Electrical transformers.

Power electronics: Power semiconductor devices. Uncontrolled rectifiers . Controlled rectifiers . Natural and forced commutation in the thyristor . D.C to A.C inverters , A.C to D.C converters. Speed control of a d.c and a.c drives. Application of the microprocessor and DSP in power electronics.

AutoCAD Programming:

Introduction to drawing using computer AutoCAD, free drawing, installation, units, ends, case, points(input points, disk, point shape, network), line, ray, straight, lines type of font ,re-drag, eraser, redrawing, reproduce, circles, arc, elliptical shape, solid, hollow disk, view(zoom in, zoom out, aerial view) questions, area, snap, distance, insert, edit, move, copy, mirror, rotation, dimension, break, stairs, trim, hatching, layer, text , dimensions.

Introduction to planning chart system(EXCEL) with applications.

Introduction to mechanical drawing program Mechanical desktop, drawing axis, drawing projection, cut, intersection command, browsing, holes, arranging, introduction on information networks with applications.

Fourth Stage :

Code	Subject	Hours \ week						Units.
		First term			Second term			
		Theory	App..	Tutor. Or lab.	Theory	App..	Tutor. Or lab.	
MTE445	Computer Aided Design and Manufacturing CAD/ CAM	2	1	1	2	1	1	5
MTE448	Microeletromechanical Systems	2	-	-	2	-	-	4
MTE446	Fuzzy Logic and Neural Networks	2	1	1	2	1	1	5
MTE442	Robotic	2	1	1	2	1	1	5
MTE441	Mechatronics Systems Design and Modeling	2	1	1	2	1	1	5

MTE443	Digital Control	2	1	1	2	1	1	5
MTE444	Image Processing and Machine Vision	2	1	1	2	1	1	5
MTE447	Eng. Project	1	3	-	1	3	-	5
	Total	15	9	6	15	9	6	39

Weekly Hours

First term	Second term
30	30

Syllabi:

Computer Aided Design and Manufacturing CAD/ CAM :

Computer Aided Design (CAD):- Representation of two and three dimension matrices, projection algorithm, curves design, surface design, rotational surfaces design.

Analysis, application with ansys package, bar, beam, plain stress and strain , truss, thermal stress.

Computer Aided Manufacturing(CAM):- The role of computer in manufacturing, automated programming, digital controlled equipment, programmed manufacturing equipment, Programming (CNC) machines

with (G-Codes), APT system, robot control system in manufacturing processes, save and recovery systems of material.

Microeletromechanical Systems (MEMS) :

Historical Backgraound , silicon pressure sensor technology , micromachining , microelectromechanical systems . Microfibrication and micromachining , integrated circuit processes , bulk micromachining , bonding , high-aspect-ratio processes . Physical microsensors , classification of physical sensors , integrated , intelligent or smart sensors , sensor principles and examples . Chemical and biomedical sensors , electrochemical sensors , semiconductive gas-sensing microsensors , calorimetric microsensors , chemical and biosensor packaging . Microactuators , mechanical design of microactuators , electromagnetic and thermal microactuating , comparison of actuation methods , microactuator examples .

Fuzzy Logic and Neural Networks:

Comparison of conventional and fuzzy logic . Fuzzy set theory ; fuzzy logic and approximate reasoning; fuzzy logic control system. Artificial neural networks Feedforward network and supervised learning, single-layer feedback networks, unsupervised learning network. Applications of neural networks in control systems, sensor processing and communications Fuzzy neural integrated systems.

Robotics:

Introduction to robotic system, static & dynamic analysis for manipulator movement & control manipulators, sensors & detectors, actuators, robotic programming, path programming, orbit programming, main design and testing of robot and application.

Mechatronics Systems Design and Modeling:

Introduction to modeling and simulation, dynamic systems, construction of system model, transformation laws and system characteristics, reduction of modeling equations, input of practical and experimental signals, similarity between systems. Design of mechatronic systems . Sensors and actuators .Hardware components of mechatronic systems . Controller design . Real-time control system implementation using dSPACE and MATLAB.

Digital Control :

Signal processing and transform .Discrete time control systems. Analysis of discrete time state space control systems. Stability analysis of digital control systems Root locus of digital control systems. Nyquist and Bode diagrams. Study of digital control systems using MATLAB program. Design and compensation of digital control systems Design of control by computer systems. Different algorithms for compensation of control systems.

Image Processing and Machine Vision :

Introduction . Machine vision concepts. Image acquisition . Digital representation of image .Lighting . Image formation . Cameras. Vision sensors. Image processing and analysis , image transforms, application of Fourier transforms to the images, other transforms for image separation, image analysis , image enhancement, image restoration, , image segmentation, edge detection. Three-dimensional machine vision techniques. Image interpretation .Applications of image processing .Using of MATLAB program in image processing study and analysis .

Engineering Project:

A design project to integrate students knowledge in previous studies . Emphasis is placed on creativity, analytical thinking, teamwork, and ability to produce a useful product. Regular consultation with supervisor and periodic seminar are conducted throughout the semesters . Students are required to submit a formal report and present their work in a seminar at the end of the year

12. The curricula for the preparatory year(MSc.) :

First Semester

Subjects	Units	Hours
Advanced Manufacturing Process	2	2
Industrial Automation & Robotic Tech.	2	2
Advanced Control System	2	2
Technical English Language 1	2	2
Advanced Eng. Vibration	2	2
Advanced Eng. Mathematics	2	2
Advanced digital signal processing & applications	2	2
Total	14	14

Second Semester

Subjects	Units	Hours
Advanced Structural Dynamics	2	2
Microcontrollers &Interfacing	2	2
Digital Control System Design	2	2
Technical English Language 2	2	2
Mechatronics systems	2	2
Applied Numerical Analysis	2	2
Intelligent System &Applied Intelligence	2	2
Total	14	14

Department of Information & Communication Engineering

Department of Information & Communiction Engineering

1- Introduction:

The Department of Information & Communication Engineering was established in the academic year 1997- 1998, and was incorporated into Al-Khwarizmi College of Engineering at the beginning of the academic year 2002-2003.

During four years of study , students are taught various subjects related to Information Engineering and Communication . Upon graduation, they are awarded B.Sc. degree in Information and Communcation engineering.

This department is concerned with the infra structure of Information Technology, that is, computer hardware and software, computer networks and various communication systems connected with them (e.g. Internet).In addition to, Design and Analysis various Information Systems which use such infrastructure as: E-Commerce, E-learning, E-government …etc.

2- Objectives :

The Department aims to prepare qualified engineers that specialize in different subjects such as:

The hardware and software of computer networks and the internet.

Various communication systems, including satellite communication systems.

Software design of various systems, including database of information systems.

3-Academic Staff:-

Names	Academic Title	Degree / Country	General Specialization	Specialization	Position
Dr.Suha Mohammed Hadi	Asst. Prof.	PhD/Poland	Information Technology	System Analysis & Design	Head of Dept.
Azzam Ahmed Marouf	Asst. Prof.	M.Sc/England	Electrical Engineering	Control Systems	Lecturer
Omar ali Athab	Lecturer	PhD/ Iraq	Electronics Engineering	Satellite Engineering	Lecturer
D.khalifa abood Salim	Lecturer	PhD/ Iraq	Electrical Engineering	communica-tion	Lecturer
Dr.Omar Yousif Shaban	Lecturer	PhD/ Iraq	Electronics communication	Fibe Optic Communicati on	Lecturer
Dr. Ameer Husaeen	Lecturer	PhD/ Chaina	Electrical Engineering	Signall Processing	Lecturer
Ali mohamed Noori	Lecturer	Msc /Iraq	Electrical Engineering	Electronics	Lecturer
Ahmed Sattar Hadi	Lecturer	M.Sc/Iraq	Electronics Engineering	Control& computers	Lecturer
Ali Hussein Hammed	Asst. Lecturer	M.Sc/Iraq	Control and computers	Mechatronic	Assistant Lecturer
Fatima Behjet Ibrahim	Asst. Lecturer	M.Sc/Iraq	Computer Science	Image processing	Assistant Lecturer
Zaid Ali Salman	Asst. Lecturer	M.Sc/Iraq	Electronics communication	Computer networks	Assistant Lecturer
Haider fakher radi	Asst. Lecturer	Msc /Iraq	Electronics communication	CAD	Assistant Lecturer
Ali Haider mahdi	Asst. Lecturer	M.Sc/Iraq	Information Engineering	computers	Assistant Lecturer
Luaa faisal Abd alamer	Asst. Lecturer	M.Sc/Iraq	Electronics communication	Communicati on	Assistant Lecturer
Muna mustfa hummadi	Asst. Lecturer	M.Sc/Iraq	Computer Engineering	computers	Assistant Lecturer
Zeina abbas abd	Asst. Lecturer	M.Sc/Iraq	Information& communication	Laser engineering	Assistant Lecturer
Saleem mula mohammed	Asst. Lecturer	M.Sc/Iraq	Electrical Engineering	Electronics	Assistant Lecturer
Shaker ali jaber	Asst. Lecturer	M.Sc/Cheek	Electrical Engineering	Electronics	Assistant Lecturer
Atheer Dhia Khalaf	Asst. Lecturer	M.Sc/Iraq	Electronics communication	Computer networks	Assistant Lecturer
Saja Majeed Mohammed	Asst. Lecturer	M.Sc/Iraq	Computer Science	Computer Science	Assistant Lecturer
Harith Tahir	Asst. Lecturer	M.Sc/Iraq	Computer Eng.	Computer Eng.	Assistant Lecturer

Yasir Ahmed	Asst. Lecturer	M.Sc/Iraq	Information Eng.	Information Eng.	Assistant Lecturer

4- Engineers:

Names	Occupation	Degree
Ahmed Ameer	Engineer	B.Sc/ Electrical Eng.
Adel Fadhl	Engineer	B.Sc/ Electronic Eng.
Ahmed kahdim	Senior Engineer	B.Sc./ Information Eng.
Ahmed Mohammed Saheb	Engineer	B.Sc./ Information Eng.
Zeina osaama dawod	Assistant Engineer	B.Sc./ Electronics Eng.
Heba Mohammed fadhil	Assistant Engineer	B.Sc./ Computer Eng.
Ahmed Emad	Assistant Engineer	B.Sc./ Computer Eng.
Beydaa Mohammed Mchjil	Assistant Engineer	B.Sc./ Computer Eng
Ali Salah Mahdi	Assistant Engineer	B.Sc./ Information Eng

5- Administrative Staff:

Names	Occupation	Position
Abeer Zuheir Ali	Superintendent	Secretary

6- Laboratories:

1.Programming & Networks Laboratory

Experiments are carried out in the following fields:

1. Computer networks
2. Programming in different languages
3. Data Base Design
4. Computer-Aided Design
5. Object Oriented Programming
6. Information systems analysis and design
7. Data structure

2. Electronics and Communication Laboratory

Experiments are carried out in the following fields:

1. Electronics
2. Communication
3. Computer interface
4. Electrical.

Programming and network lab.

7- The Curricula for Undergraduate study:

First Stage:

Code	Subjects	Hours / week						Units
		First term			Second term			
		Theory.	APP.	Tutor. Or lab	Theory.	APP.	Tutor. Or lab.	
ICE121	Mathematics	**3**	**2**	**-**	**3**	**2**	**-**	**6**
ICE131	Electronics	2	1	-	2	1	-	4
ICE 132	Digital techniques	2	1	-	2	1	-	4
ICE 122	Electrical engineering fundamentals	3	-	3	3	-	3	8
ICE 133	Programming with C	2	1	2	2	1	2	6
ICE 141	Introduction to information technology	2	1	-	2	1	-	4
ICE 123	Computer aided drawing	1	-	2	1	-	2	4
ICE 111	Technical English language	1	0	-	1	0	-	2
ICE 112	Human rights & general freedom	1	0	-	1	0	-	2
Total		17	6	7	17	6	7	40

Weekly Hours

First term	Second term
34	34

Syllabi:

Mathematics:

Functions, Application of definite integrals (area between curves, volumes, … etc), Hyperbolic function, methods of integration, vector algebra, approximations integrals, Partial differentiation, Polar coordinates, Taylor series, ordinary differential equations, partial differential equations, multiple integrals.

Electronics:

Introduction, energy levels, atomic structure, semiconductors, Si, Ge, and compound semiconductors, diode circuit application, Zener and photodiode LED, bipolar transistor circuit application, field effect transistor (FET).

Digital techniques:

Codes, number, code conversion, mathematical operation, logic gates, simplification circuits, multiplexer, demultiplexer, synchronous sequential logic circuit.

Electrical engineering fundamentals:

Basic concept and units, analysis of DC circuit, alternating quantities, analysis of single phase AC resonant circuits, magnetic circuits, transient state in RLC circuits, three phase system, two port networks.

Programming Using C Language

Part I: Introduction to computers, definition and classification of computers, functional units (input, output, CPU, and memory), computer organization, and introduction to computer software concepts, computer programming languages (levels, Types…), system, programming, and processing types.

Part II: Programming fundamentals, declaration (data types), assignment Statements, expression, input / output statements, iteration statements, user defined data type, subprograms, pointers, files.

Introduction to Information Technology:

Discovering information technology, definition, the difference between data and information, the internet and IT, Software, the intellectual interface, the difference between application and system software, characteristics of operating system, Input and output devices, the physical interface, converting hardware and software, the CPU & internal memory, the processing engine, CPU, internal memory storage devices and data bases, organizing your word, storage devices, data administration.

Computer Aided Drawing:

Introduction, computer & engineering drawing, 2D drawing-Basic elements (line, arc, …etc), viewing & editing drawing, setting element properties (color, line, type, layer, ...etc), enhancing engineering drawing (text, and dimensions), use advanced drawing technology in engineering design (poly lines and blocks) in engineering design, engineering drawing technology

(paper space and plotting), 3D drawing, write frame, surfaces model, and solid model, editing 3D drawing, programming with drawing (introduction to VBA).

Technical English language:

Revision of grammatical structures with emphasis on technical usage, arugmentation of technical vocabulary, dictionaries. Precise writing, descriptive and reflective paragraphs writing, Practice in the presentation of passage original idea in a summary form, writing original compositions on themes connected with passages. Technical writing, clear and accurate writing on themes of common and technical English , theme discussion, beginning of essay, theme development, logical and effective conclusion, professional letter writing, note taking, special English for electrical and mechanical engineering, reading and listening comprehension.

Human Rights and General Freedom:

- The historical fundamental roots of human rights and their development in our nation
- Human rights in old age
- Human rights links: definition and limits
- General view of freedom
- Historical development of freedom
- Designation of freedom
- Classification of freedom

Second Stage:

First term	Second term
30	30

Syllabi:

Analogue & Digital Electronic Circuits:

Difference Amplifier, Operational Amplifiers application linear and non linear, Active Filters (LP, HP, BP, and BS), Timing Circuits, VCO, Logic Circuit Families, Memories, Analogue to Digital and Digital to Analogue Converters.

Communication Systems:

Introduction (Elements of Communication System), Electrical Filters, Transmission Lines, Signal Analysis, Amplitude Modulation AM, Angle Modulation, Random Signal Theory, Noise in Analog Communication Systems.

Fields, Antenna & Propagation:

Fundamentals of Electromagnetic Analysis, Electrostatics, The Steady Magnetic Field, Maxwell's Equations, Electromagnetic Waves, Pointing

Vector and The Flow of Power, Guided Waves, Wave Guides, Fundamentals of Antennas and Antenna

Parameters, Basic Antenna Types, Radiation and Radar Equation, Troposphere Propagation.

OOP and GUI:

C-language Review, Function Overloading, Default value function parameters. Classes, Member function, member variables, Access specifies, This operator, References, Constructor & Destructor, Operators overloading. Conversion form built-in data types to classes and vice versa, Pointer member variable, Friend function & classes, Static Members, Inheritance Polymorphism &function over riding, Templates, name Spaces, Error Handling.

Computer Aided Drafting and Design (CAD&D):

Introduction, Graphical Techniques, Geometry of Curves, Integrating Databases and Data Transfer, Introduction to Mat lab, Applications Using Mat lab, Representing objects.

Engineering & Numerical Analysis:

Fourier series, Fourier Transform, Lap lace Transforms, Z-Transform, Matrices, and Numerical Methods.

Microprocessor & Microcomputer:

Introduction to Microprocessors and Microcomputers, The 8086 Microprocessor, The SDK-86 Microcomputer, Memory Interface of The

8086 MP, Input/Output Interface of the 8086 Microprocessor, Interrupt Interface of the 8086 MP, Introduction to 32 & 64 bit microprocessor.

Freedom &Democracy

- Public freedom (general view)
- General theory of public freedom
- The concept of democracy.
- Definition of democracy and its limitation
- The concept of federalism
- Democracy and federalism relationship
- Classifications

Technical Arabic Language:

The technition Arabic language, the engineering Arabic word, the English word and its Arabic origin, the vocabulary, the grammar, types of sentences, scientific writing,

Third Stage:

Code	Subjects	Hours / week						Units
		First term			Second term			
		Theory	APP.	Tutor. Or lab.	Theory.	APP.	Tutor. Or lab	
ICE 331	Digital system Design	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 341	Digital Communications	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 332	SDigital Signal& Image Processing	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 342	Information & Coding Theory	**3**	**-**	**-**	**3**	**-**	**-**	**6**

ICE 343	Data base design	**2**	**-**	**2**	**2**	**-**	**2**	**6**
ICE 333	Data structures & Algorithms	**2**	**-**	**3**	**2**	**-**	**3**	**6**
ICE 334	Computer Architecture	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 321	Control Systems &PC interfacing	**2**	**1**	-	**2**	**1**	-	**4**
ICE 322	Control & interfacing lab	**-**	**-**	**3**	**-**	**-**	**3**	**2**
Total		17	5	8	17	5	8	40

Weekly Hours

First term	Second term
30	30

Syllabi:

Digital System Design:

Combinational logic cct. With MSI & LSI and Function Implementation, PLA, PAL, ROM,… Synchronous Sequential logic cct., Asynchronous Sequential logic cct., Algorithmic state machines (ASM).

Digital Communications:

Signal Analysis and Representation Classification of signals and systems, Fourier series and F-T, Parse Val's power theorem, Raleigh's energy theorem. Convolution theorem: (time convolution theorem, frequency convolution theorem, prepares of convolution, graphical interpretation), response of linear system, Sampling Theorem, Pulse Modulation, PAM, PDM, PCM, DPCM, ADPCM DM, ADM. Matched Filter. Digital modulation system: ASK, FSK, PSK, DPSK, demodulation, carrier recovery, M-ray PSK modulation, & M-ary FSK modulation, Traffic Theory. Spread Spectrum System.

Digital Signal & Image Processing:

Signals & Linear Systems: Basic Concepts, Discrete Linear Systems (Sequence Manipulation, Solution of a Linear Constant Coefficients Difference Equation), The Z-Transform, Solution of Linear Constant Coefficient Difference Equations Using z-Transform, Response of Linear Discrete Systems, Linear and Circular or Cyclic Convolution Methods, Fourier and Fast Fourier Transform, Digital Filters, Introduction to Computer Vision and Image Processing, Image Analysis.

Information & Coding theory:

Communication Systems & Information Theory, A Measure of Information, Communication Channels & Capacity, Source Coding, Error Control Coding.

Database Design:

Introduction to DB Processing – DB Development (DB, DBMS, Creating the DB) – The Entity Relation Model (DB elements, Network, Hierarchical, Relational models) – DB design (Relational Model DB, Normalization) – DB design using ERD (Relational Algebra, SQL) – db Application using Internet Technology (Network environment, 3 Tier Architecture, DB Web Server).

Data Structures & Algorithms:

Definition: Data Structures and Algorithms, Data Types and Abstract Data Types (ADT)(with C++ for Lab), Fundamentals of Data Structure (Static Structure, Dynamic Structure, Searching and Storing Algorithms, Files and Data Base).

Computer Architecture:

Review of Digital Circuits, Register transfer and Micro- Operation, Basic Computer Origination and Deign, Programming the Basic computer, Micro programmed control, The Central Processing unit.

Control Systems and PC Interfacing:

Introduction, Mathematical Models, Transient Response Analysis, Root Locus Method of Analysis and Design, Frequency Response Methods, State Space Method of Analysis and Design, Isntroduction to PC interface, Parallel port, Serial port, PC Buses, ISA Bus digital
drivers, Display, Digital remote control.

Control &Interfacing lab:

Doing related experimental tests

Fourth Stage:

Code	Subjects	Hours / week						Units
		First term			Second term			
		Theory.	APP.	Tutor. Or lab	Theory.	APP.	Tutor. Or lab	
ICE 441	Information system analysis & design	**2**	**-**	**2**	**2**	**-**	**2**	**6**
ICE 442	Satellite Communications	**2**	**1**	**-**	**2**	**1**	-	**4**
ICE 443	Computer Networks	**2**	**-**	**2**	**2**	**-**	**2**	**6**
ICE 431	Operating systems	**2**	**-**	**3**	**2**	**-**	**3**	**6**
ICE 448	Internet Architecture	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 444	Cryptography & Data security	**2**	**1**	**-**	**2**	**1**	**-**	**4**
ICE 445	Optical communications	**2**	**-**	**-**	**2**	**-**	**-**	**4**
ICE 446	Engineering Project	**1**	**-**	**3**	**1**	**-**	**3**	**4**
ICE 447	Communications Lab	**-**	**-**	**3**	**-**	**-**	**3**	**2**
Total		15	2	13	15	2	13	40

Weekly Hours

First term	Second term
31	31

Syllabi:

Information System Analysis and Design:

Information system analysis and design concept (SAD, IT, Information system building blocks) system development life cycle phases (Planning, Analysis, Design, Implementation), system development methodology (what is methodologies, Structured design development, rapid application development, selecting the appropriate methodology), tools support system development (CASE tools, Microsoft project management), modeling system requirement, (data flow diagram, process flow diagram), system design strategies (elements, selecting strategies), system design tasks (DB design, user interface design, network design).

Satellite communications:

History of the satellite, applications of the satellite, types of satellite, orbit equation, block diagram satellite, and Sub satellite, received signal: calculate the power transmitted from the earth station to satellite, effective of rain, snow, ice, atmosphere, ionosphere, temperature, and the noise on the power signal, noise temp, noise figure, and system noise temperature, modulation, and multiplexing: FDM, TDM, CDM, Multi channel per carrier for analogue and digital transmission, Multiple accesses techniques, FDMA, TDMA, and CDMA. Digital Communication Process via Satellite: Types of coding, Decoding, and Calculate the code gain.

Computer Network:

Introduction and basic concepts, the OSI model, signals encoding, transmission of digital data and interfaces, transmission media, error detection and correction, data link layer controls and protocols, local area networks, data switching and routing, internetworking devices, transport layer and upper OSI layers, network performance , standard protocols and services.

Operating Systems:

Computer system overview, operating system overview, definition, processes management, CPU scheduling, process synchronization, memory management, file management, and network operating system.

Internet Architecture:

Networks essentials, internet services, IP addresses and sub netting, Ethernet frame format, IP header format, TCP & UDP header format, SLIP, PPP, ARP, DNS, bridges, routers and routing protocols, HTTP protocol, FTP protocol, DHCP, internet security, introduction to Web pages development.

Cryptography and Data Security:

Introduction, classical cipher systems, stream ciphers, block cipher, public key cryptography, practical security, introduction to computer viruses,

information security and safeguarding, information hiding (watermarking, steganography).

Optical Communications:

Optical background, optical fiber communication system, optical fibers, optical sources, optical detectors, overall system, application, and case study.

Engineering Project

Application as a part of graduation requirements

Communications lab

Doing experimental tests

Department of

Manufacturing Operations Engineering

Department of Manufacturing Operations Engineering

1- Introduction :

In order to cope with the rapid contemporary scientific developments and to achieve advanced quality in higher education, engineering education has recently been extended to include many specific and modern specalizations , the most important of which is the opening of the Department of Manufacturing Operations Engineering (M.O.E).

The Department of (M.O.E) was established in the academic year 2002-2003 to be one of the departments of Al-Khwarizmi College of Engineering - University of Baghdad. It admits students who have passed the second college stage in the following engineering Departments :Mechanical, Machines and Equipment Production and Metallurgy and Material. The department of Manufacturing Operations Engineering admits students from different universities all over the country after passing an admission test in engineering science .

The period of study in the department was five- years. The department is run by the teaching staff members who possess wide experience in various engineering and scientific fields.

In view of the recommendation made by the Board of Al_Khwarizmi College of Engineering Baghdad,University Board and Sectoral Committee for Engineering specalizations and approval of the Ministry of Higher Education and Scientific Research, it was decided , following the Central Admission Plan, to admit students who have graduated from secondary schools in Iraq to the first stage as of the academic year 2007/2008 . Hence,the period of study in the department became four years leading graduates to the B.Sc. degree in Manufactureing Operations Engineering.

2-Mission:

The mission of the department is to offer engineering education in the field of manufacturing operations and to acquaint students with the latest developments of technology in orderto reach advanced levels in innovations and competitions with others.

3-Vision:

The vision of the department is to play a significant role in building up Iraq through its best performance that satisfies the criteria of the building operations.

4- Objectives:

The objectives of the department are as follows:

1- Developing the teaching staff members , their instruction and research abilities.
2- Praparing graduates for the best job opportinities in the different industrial and global institutions.

5-Academic staff:

Names	Academic Title	Degree / Country	General Specializatio	Minor Specialization	Position
Dr. Ali Hussen Kadhym	Lecturer	Ph.D./ Russia	Mech. Eng.	Cutting tools and Die Design	Head of Department
Dr. Somer Matti Dawood	Prof.	Ph.D. / Iraq	Mech. Eng	Design	Lecturer

Dr. Osama Fadhil	Asst. Prof.	Ph.D./ Iraq	Mech. Eng.	Design	Assistant Dean for adminstrative affairs
Dr. Ahmed Zaydan	Asst. Prof.	Ph.D./Russia	Mech. Eng.	CAD/CAM	Assistant Dean for scientific affairs
Dr. Faiz Fawzi	Lecturer	Ph.D./ Iraq	Mech. Eng.	Design	Lecturer
Dr. Amer abdul moonam	Lecturer	Ph.D./ Iraq	Mech. Eng.	Industrial Eng.	Lecturer
Dr.Kareem na'ama slome	Lecturer	Ph.D./ Iraq	Mech. Eng.	Applied Mechanics	Lecturer
Dr. Enas Abd Al Kareem	Lecturer	Ph.D./ Iraq	Laser Eng.	Laser	Lecturer
Dr.Hamed Mahde Saleh	Lecturer	Ph.D./ Hungaria	Mech. Eng.	Material	Lecturer
Ahmad Majeed	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Manufacturing	Lecturer
Yahya M. Hamad	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Design	Lecturer
Huda Hatem Dalaf	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Die design	Lecturer
Nazar Kais	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Design	Lecturer
Salah Salman	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Manufacturing	Lecturer
Sana Noman	Asst. Lecturer	M.Sc /Iraq	Laser. Eng.	Laser	Lecturer
Muhammed Nafaa	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Design	Lecturer
Wael Hekmat	Asst. Lecturer	M.Sc /Iraq	Production and Metals Eng.	Production	Lecturer
Haidir Rheem	Asst. Lecturer	M.Sc /Iraq	Production and Metals Eng.	Production	Lecturer
Kamal Aati	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Applied Mechanics	Lecturer
Zaid Rasem Muhammed	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Applied Mechanics	Lecturer
Ali Hader Hashen	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Power	Lecturer
Thamer Hareth Ali	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Power	Lecturer
Ahmed Foa'ad Mahde	Asst. Lecturer	M.Sc /Iraq	Mech. Eng.	Power	Lecturer
Emad Hader	Asst. Lecturer	M.Sc /Iraq	law	Law	Lecturer
Ragad Ahmed Abd-Alrazak	Asst. Lecturer	M.Sc /Iraq	Manufacturing operation Eng.	Laser	Lecturer
Izzat Abdul Razak	Asst. Lecturer	M.Sc /Germany	Mechatronic Eng.	Electron	Lecturer

6- Engineers:

Names	Occupation	Degree
Luma Lamie Ali	Asst. Engineer	B.Sc./ Production & Metals Eng.
Hebba Khalid Hussain	Asst. Engineer	B.Sc./ Production & Metals Eng.
Ziad Tarik	Engineer	B.Sc./ Mechanical Eng.
Osama Fakhri	Engineer	B.Sc./ Mechanical Eng.
Sana Shakir	Asst. Engineer	B.Sc./ Elictical Eng.
Marwan Ali	Engineer	B.Sc./ Manufacturing Operations Eng.
Saadoon Radi	Engineer	B.Sc./ Manufacturing Operations Eng.
Wisam Thamir	Engineer	B.Sc./ Manufacturing Operations Eng.
Muhammed Abd-Al jabbar	Engineer	B.Sc./ Manufacturing Operations Eng.
Zahra'a Abd-Al jabbar	Engineer	B.Sc./ Manufacturing Operations Eng.

7- Technicians:

Names	**Occupation**	**Place of work**
Abd-Al Sattar Abd-Al Jabbar	Technician	Labrotory

8- Administrative Staff:

Names	Occupation	Place of work

Nerges Mohammed Abid Ali	Translator	Secretary
Wassan Kazaal	Asst.Physist	Secretary

9- Laboratories:

Artificial Intelligent Laboratory. **Computer Aided Design CAD** **Computer Aided Manufacturing CAM** **Numerical Analysis** **Programming** **Control** **Microprocessors Lab**	
Applied Mechanics Laboratory: **Vibration** **Theory of Machincs** **strength of materials** **Mechanics of materials**	
	
Material Inspection Lab. **Heat Treatment Furnaces.** **Hardness Test.** **Impact Test.**	

Engineering Work-shop. **Welding lab.** **Lathe Machine.** **CNC Cutting Machine.** **4-axis Unimat CNC- Set** **C.N.C. Gantry.** **C.N.C. Hot wire cutting** **Surface polishing Machine.** **Chemical Etching Lab.** **Surface roughness tester** **Magnetic abrasive polishing machine**	
Electronics Lab. **Ome's Low.** **Methods analysis of electrical circuit** **Application in AC circuit**	

10- The Curricula for undergraduate Students:

First Stage

Cod	Subjects	Hours \ week						Units
		First term			Second term			
		Theory	App.	Tutor. Or lab.	Theory	App.	Tutor. Or lab.	
134 MOE	Manufacturing processes (1)	2	2	1	2	2	1	6
135MOE	Engineering Materials (1)	2	2	-	2	2	-	6
132MOE	Engineering Mechanics	2	-	1	2	-	1	4
121MOE	Mathematics(1)	2	-	1	2	-	1	4
133MOE	Electrical Technology	1	2	1	1	2	1	4
122MOE	Computer Software (1)	1	2	1	1	2	1	4

131MOE	**Eng. drawing &descriptive Geometry**	**1**	**3**	**-**	**1**	**3**	**-**	**4**
111MOE	**Human Rights& general freedom**	**1**	**-**	**1**	**1**	**-**	**1**	**2**
112MOE	**Technical English Language**	**1**	**-**	**1**	**1**	**-**	**1**	**2**
Total		**13**	**11**	**7**	**13**	**11**	**7**	**36**

Weekly Hours

First term	Second term
31	31

Syllabi:

Manufacturing Processes (1):

Introduction to manufacturing processes, mechanical properties of material, physical properties of material, criteria for material and processes selection. Casting processes, overview of casting technology, heating and purring , solidification and cooling, sand metal, other expendable mold casting processes, permanent metal casting processes, casting quality. Bulk deformation in metal working, rolling, forging, extrusion, wire bar drawing. Sheet metal working, cutting operation, bending operation, drawing, dies and processes for sheet metal processes. Material removal processes. theory of metal machining, cutting tool technology. machining operation and machine tools, non traditional machining and thermal cutting, Joining and assembly processes, fundamental of welding, welding

processes, arc welding , resistance welding, oxy-fuel gas welding, solid state welding, weld quality, weld ability, brazing, soldering, adhesive bonding, assembly methods based and interference fits.

Engineering Material (1):

The structure of metals, Crystallography of metals, Miller Inkes, Dislocations. Solid State and Solidification, Solutions, Diffusion. Mechanical Properties And metal Failure, Strength, Stiffness, Toughness, Ductility, Hardness. Failure by inelastic action at ordinary temperature, slip systems. Failure at elevated Temperature, creep, fatigue. Corrosion. Equilibrium Diagram. Hardening of Metal. Heat treatment of steel. Phase Changes in iron and steel.

Engineering Mechanics:

Static: Basic concepts, Resultant of force systems, Centro and centers of gravity, Equilibrium, Friction, Moments of Inertia and polar moment of Inertia.

Dynamic: Kinematics-absolute motion, Kinematics-relative motion, Kinetics-force mass and acceleration kinetics- work and energy.

Mathematics (1):

Functions, Limits, Differentiation and its applications, Integration and its applications, Methods of integration, Trigonometric functions, Logarithms, Conical sections, Matrices and determinants, Hyperbolic functions.

Electrical Technology:

Electric units, Power & Energy, Calculations of D.C. electric circuit, Delta-Star & Star-Delta transformation, Electromagnetism, Electrostatics, Capacitors, Alternating voltage & currents Electronic valve, Transistors, The electric energy system, Transportation & Distribution, Generalized theory of electric machines (motors, generators, transformers)

Computer software (1) :

Computers application, Flow charts, Basic language, Word program, Access program, Excel program, Power point program, Pascal programming loops, input /out put, Arrays, Pascal language.

Engineering Drawing & Description Engineering (I):

Engineering drawing: Engineering operations, Letters, Projections, Third view conclusion, Sections, Isometric drawing, Oblique drawing, Computer aided drawing, Description engineering: Theories of projection, (Point, Line and plane presentation), Real length of a line, Couples of lines, Auxiliary planes, (Perpendicularity, Parallelism and intersection), (Rotation of planes, surfaces and isometric bodies), Intersection of isometric bodies.

Technical English Language:

Revision of grammatical structures with emphasis on technical usage, arugmentation of technical vocabulary, dictionaries. Precise writing, descriptive and reflective paragraphs writing, Practice in presentation of

passage original idea in a summary form, writing original compositions on themes connected with passages. Technical writing, clear and accurate writing on themes of common and technical English , theme discussion, beginning of essay, theme development, logical and effective conclusion, professional letter writing, note taking, special English for electrical and mechanical engineering, reading and listening comprehension.

Human Rights and General Freedom:

- The historical fundamental root of human rights and its development in our nation
- Human rights in old ages
- Human rights; definition and limits,
- General view of freedom
- Historical development of freedom
- Designation of freedom
- Classification of freedom

Second Stage:

Cod	Subjects	Hours \ week						Units
		First term			Second term			
		Theory	App.	Tutor. Or lab.	Theory	App.	Tutor. Or lab.	
243MOE	Manufacturing Processes (2)	2	-	1	2	-	1	4
233MOE	Analogue & Digital Electronics	2	2	2	2	2	2	6
221MOE	Mathematics (2)	2	-	1	2	-	1	4
242MOE	Fundamentals of Industrial Engineering	2	-	1	2	-	1	4

234MOE	Thermal & fluid systems	2	-	1	2	-	1	4
232MOE	Mechanics of Materials	1	1	2	1	1	2	3
222MOE	Computer Software (2)	1	2	1	1	2	1	4
231MOE	Mechanical Drawing	-	3	-	-	3	-	2
211MOE	Freedom and democracy	1	-	1	1	-	1	2
212MOE	technical Arabic Language	1	-	1	1	-	1	2
Total		**14**	8	11	14	8	11	35

Weekly Hours

First term	Second term
33	33

Syllabi:

Manufacturing Processes (2) :

stress – strain diagram, plastic zone, yield theories , stress- strain relation in plastic zone, hot and cold working , upper and lower bound theories, slip line field theory , Visio-plasticity , application in the field of manufacturing including ; tube sinking, wire drawing, deep drawing, forging, extrusion, rolling.

Analogue and Digital Electronics:

Analogue Electronics:- Physics of semiconductors, PN junction, characteristics and modeling of different types of diodes, analysis and applications of diodes. Photo diode, photocell, light emitting diode. Characteristics and modeling of bipolar transistor, biasing and analysis of bipolar transistor, field effect transistor characteristics, modeling and analysis of FET transistor, small signal model of transistor, amplifiers, small signal amplifier, input and output impedance, multistage. Power semiconductors, thruster, Operational amplifier circuits, power supplies, Oscillators voltage to frequency and frequency to voltage converters .ADC and DAC circuits. Sample and hold circuits.

Digital Electronics:- Number systems, conversion between number systems. Boolean algebra. Logic gates. Combination and sequential circuits. Multiplexers and demultiplexers, coders and decoders, flip flops, registers, counters, adders, comparators, memories. Analysis and design of combination and sequential synchronous and asynchronous circuits. Programmable logic arrays and programmable logic devices, PLC circuits CMOS logic circuits, memory classification and circuits, common emitter logic, transistor-transistor logic.

Mathematics (II):

Polar coordinates, Vectors, Series, Partial differentiation, Multi integrals, Solution of linear differential equations, Special applications.

Fundamentals of Industrial Engineering :

Production cost control, Depreciation methods, Break-Even-Point analysis, Production forecasting techniques, plant location and layout, Materials handling, Flow systems, Work and time study, Production planning, Inventory control.

Fluids and Thermal Systems:

Introduction to fluid, Density, Viscosity, Surface tension, Compressible and non-compressible flow, Hydrostatic force on the surfaces, Pressure measurement, Fluid dynamics, Properties, Units, Gas law, First law of thermodynamic, Energy equation for non-flow system, Reversible thermodynamic processes, Energy equation for flow system, Second law of thermodynamics, Entropy, Steam and steam engine, Heat cycles, Introduction to heat transfer, Heat transfer by conduction through multi later wall, Heat transfer by conduction through cylinder, Convection heat transfer, Radiation heat transfer.

Mechanics of Materials:

Simple stress and strain, Torsion, Shearing force and bending moment diagrams, Stresses in beams, Slope and deflection of beams, Restrained beams, Continuous beams, Combined stresses, thin cylinders, Thick cylinders, Struts, introduction to fracture mechanics.

Computer Software (2) :

Visual basic (data and related with Access, array), C++ language (introduction, array, function & loop), Visual C++ language.

Mechanical Drawing :

Auxiliary planes, Screws, Nuts, Gears and other mechanical elements, Mechanical assembly, Keys and its applications in mechanical combination, Moulds and dies, Computer Aided drawing, Clearances and allowances.

Freedom &Democracy

- public freedom (general view) and general theory of public freedom
-the concept of democracy, definition of democracy and its limitation
- the federalism concept, the democracy and federalism relationship and classifications.

Technical Arabic Language:

The technician Arabic language, the engineering Arabic word, the English word and its Arabic origin, the vocabulary, grammar, types of sentences, vocational writing,.

Third Stage:

Cod	Subjects	Hours \ week						Units
		First term			Second term			
		Theory	App.	Tutor. Or lab.	Theory	App.	Tutor. Or lab.	
342MOE	Computer Aided Design	2	2	1	2	2	1	6

345MOE	Advanced Manufacturing Processes	2	1	1	2	1	1	5
343MOE	Microprocessor & Microcomputer	2	1	1	2	1	1	5
341MOE	Eng. Material (2)	2	-	-	2	-	-	4
347MOE	Design of Machine Elements	2	-	2	2	-	2	4
331MOE	Engineering & Numerical Analysis	2	-	1	2	-	1	4
346MOE	Theory of machine &vibration	1	1	2	1	1	2	3
348MOE	Manufacturing of Electronics Elements	1	-	1	1	-	1	2
344MOE	Quality Control	1	-	1	1	-	2	2
Total		**15**	5	10	15	5	11	35

Weekly Hours

First term	Second term
30	31

Syllabi:

Computer Aided Design (CAD) :

Introduction to computer aided design. General design theory and CAD system. Mathematical model, first degree spline, second degree spline, third degree spline, Her mite curves, Bezier curves. Geometric modeling. Critical analysis of geometric modeling. Optimization. Technical drawing with Auto-cad. Computer-aided design with visual basic. FEM package (ANSYS). FEM method, Animation of mechanisms.

Advanced Manufacturing Processes:

Introduction to precision machinery. Electro discharge machining. (EDM).electro discharge wire cutting (EDWC). Electro chemical machining (ECM). Comparison of ECM with other processes. Electro chemical grinding (ECG). Electro chemical discharge grinding (ECDG). Electro chemical honing (ECH). Laser. Water jet cutting. Plasma cutting.

Microprocessors and Microcomputers :

Introduction to microcomputer, Types of microprocessors, x86 microprocessors series. 8086 microprocessor, Internal architecture of the 8086, Machine and assembly languages, Addressing modes in the 8086, Instruction set of the 8086, Data movement instructions, Arithmetical and logical instructions, Branching instructions, Subroutines instructions, Stack instructions, Other instructions, Instruction coding, Methods of input-output data, Interrupt method, Timing diagram of the interrupt bus cycle, Interface of memory, Timing diagram of read and write bus cycles, Direct memory access DMA, Timing diagram of a DMA bus cycle, Serial and parallel ports, Interface of ADC and DAC to the microprocessor.

Engineering Materials (2) :

Ferrous metal and alloy, iron and its alloy, common ferrous alloys. Non ferrous metals and alloys, copper and zinc. Miscellaneous metal. Polymer, properties and structures, manufacturing processes and application. Composite materials and Ceramics materials, properties and structures, manufacturing processes and applications

Design of Machine Elements :

Introduction to stresses and strains, Dynamic stresses, Fatigue, Welded and riveted connections, Power screws, Shafts, Bearings, Springs, Key and key ways, Gears, Clutches, Belts and Chains.

Engineering & Numerical Analysis:

Engineering analysis: Special functions, Fourier series, Laplace transformation, Complex variable theory, Partial differential equations.

Numerical analysis: Numerical solution of simultaneous linear algebraic equations, finite difference methods & applications, Numerical solution of ordinary differential equations, Numerical integration, Numerical solution of partial differential equations, least square fitting, application with MATLAB software

Theory of Machines and Vibrations :

Theory of Machines: Velocity and acceleration diagrams, Cams, Flywheels, Governors, Clutches, Belts, gears, gyroscope.

Vibrations: Single degree of freedom vibration, Damping, Forced vibrations, two degrees of freedom vibration, Vibration modes and frequencies, Multi-degrees of freedom vibration, Vibrations of beams, and Introduction to random vibrations.

Manufacturing of Electronics Elements:

Solid state electronics materials. Semi conductor .circuit elements. Water fabrication. Oxidation. Lithography. Etching. Ion implantation. Water probe and sorting. Chip assembly, Chip test and burning. Integrating the fabrication steps. Electronics packaging. Software systems for IC manufacturing. The world wide IC markets.

Quality Control :

Introduction and Basic Definitions for quality control (Q.C), Responsibility for quality, Quality Assurance, Quality Control Evolution, Design and quality control, Materials selection, Statistical quality control, Tolerance and clearance in (Q.C), Applying specifications methods, Tolerance selection methods, Tolerance and fits, Reliability, Inspections and measurements for quality, Control charts, Application in Industry.

Fourth Stage:

Cod	Subjects	Hours \ week						Units
		First term			Second term			
		Theory	App.	Tutor. Or lab	Theory	App.	Tutor. Or lab.	
441MOE	Computer –aided manufacturing (CAM)	2	2	1	2	2	1	6
445MOE	Computer Integrated Manufacturing	2	2	1	2	2	1	6
447MOE	Modeling of Manufacturing processes	2	2	1	2	2	1	4
444MOE	Industrial Robot	2	1	1	2	1	1	4
446MOE	Die & Cutting tool design	2	-	2	2	-	2	4

443MOE	Quality Inspection and Metrology	2	1	1	2	1	1	4
442MOE	Control and Measurements	1	2	2	1	2	2	4
449MOE	Micro-Electro-Mechanical System	1	-	1	1	-	1	4
448MOE	Engineering project	1	3	-	1	3	-	4
Total		**13**	10	13	13	10	13	40

Weekly Hours

First term	Second term
36	36

Syllabi:

Computer Aided Manufacturing (CAM) :

Introduction to CAM. Programmable Automation, numerical control. Machining parameter. Flexible manufacturing system. Industrial robotics, Robot anatomy, control system and robot programming, application of industrial robot.

Computer Integrated Manufacturing. (CIM) :

General system theory for CIM, Delineation of key concepts to include system components, emergent properties, boundaries, hierarchy, negentropy and control. System methodologies, hand and soft systems, methodologies and their use in designing systems. CIM as a complex

information system, the application of system concepts to CIM to assist in its design and implementation. Designating and implementing CIM systems. Communication protocols, the need for communication protocols. Physical and data link communications.

Modeling of Manufacturing Processes :

Introduction to modeling. Modeling of mechanical systems, Analysis of mechanical systems, Classical solutions of D.E., Numerical solutions finite, Element method, Applications in manufacturing processes, Computer soft wares, Computer simulation.

Industrial Robot :

Robot classification. Robot specification. Direct kinematics. Inverse kinematics. Tool configuration. Robotic work cell. Workspace analysis and trajectory planning .differential motion and static. Manipulator dynamics. Robot control.

Die and Cutting tool Design :

Terms and definition. Cemented carbides and other hard material for tool material, cutting tool material. Turning tools. Forming tools. Milling cutters. Reamers. Twist drills. Core-drill and counterbor. Taps and threading dies. Broaches and broaching. Gear hobbling. Grinding tools.

Quality Inspection and Metrology :

Introduction. Allowances and tolerances for fit. Fits and tolerances. Measuring instruments. Inspection methods. Checking shaft conditions. Measuring surface variation. Surface texture. Precision gage blocks. Non Destructive Inspection, Magnetic inspection, dye penetrate, X-ray, ultra-sonic

Control and Measurements:

Introduction to automatic controls. Control component representation. Representation of control system. Steady-State operation. LAPLACE transforms. Transient response. The Root –locus method.

Measurements, Types of application of measurements instruments. monitoring processes, control of processes and operations, experimental engineering analysis, Generalized configurations and functional descriptions of measuring instruments, Generalized performance characteristics of instruments; statics characteristics , Dynamics characteristics.

Micro-electro-mechanical systems (MEMS) :

Historical background, silicon pressure sensor technology. Micro-Machining. Micro-electro-mechanical systems. Micro fabrication and micromachining. Integrated circuit processes . Bulk micromachining. Bonding. Physical micro sensors. Classification of physical sensors. Integrated, intelligent or smart sensors. Chemical and biomedical sensors. Electrochemical sensors. Micro actuators. Mechanical design of micro

actuators. Electromagnetic and thermal micro actuation. Comparison of actuation methods. Micro actuator example.

Engineering Project.

Application experimental project as a part of graduation requirements.

11- The Curricula for M.Sc.Courses

First Semester

Code	Subjects	Hours/week	Units
MOE621	Advanced Mathematics	2	2
MOB 641	Advanced Manufacturing Processes	2	2
MOE 642	Industrial Robotics and Automated Manufacturing	2	2
MOE 643	Advanced CAD/CAM	2	2
MOE 644	Computer Control Systems	2	2
MOE 645	Micro and Nano Systems Technology	2	2
Total		12	12

Syllabi:

MOE 621 Advanced Mathematics

Review of linear algebra, applications networks, structures and estimation.

Lagrange multiplier.

Laplace equation, boundary value problem.

Minimum principles and calculus of variations.

Fourier series, discrete Fourier transform, convolution.

Vector differential calculus.

Legendre polynomials.

Bessel equation and Bessel function.

Stochastic process, spectral analysis, Markov chains, central limit theorem.

Dynamical systems, linear and non-linear systems, phase space dynamics, fixed points, limit cycles and attractors.

MOE 641 Advanced Manufacturing Processes

Ultrasonic machining.

Abrasive flow machining.

Water jet cutting.

Electro-chemical machining.

Electrical discharge machining.

Plasma air machining.

Easer applications in manufacturing processes.

Rapid prototyping.

Surface properties of non-traditional processed materials.

MOE 642 Industrial Robotics and Automated Manufacturing

Introduction to industrial robots.

Building blocks of automation.

Electrical, pneumatic and hydraulic components.

Automated material handling systems.

Simulation of automated systems.

CNC machines.

Automated barcode systems.

Programming logic control (PLC).

Industrial applications of robots and mechanization of parts handling.

End of arm tooling.

Planning robot implementation.

Industrial logic control systems and logic diagramming.

Programming programmable controllers.

Work cell programming.

MOE 643 Advanced CAD/CAM

Introduction to CAD/CAM hardware and software.

Graphics and product definition and uses of CAD/CAM standards (1GES, STEP, DXF).

Aspects toward perfected CAD/CAM connectivity.

Feature-based and feature-recognition CAD/CAM.

Automated coding and classification.

Computer-aided process planning (CAPP).

Assembly and subassembly using CAD packages.

Productibility and manufacturability.

Mathematical bases of geometric modeling.

User interfaces of CAD/CAM systems.

CAD/CAM data exchange.

Knowledge based machining.

Use of CAM packages (Master CAM. Surf CAM).

MOE 644 Computer Control Systems

Computer numerical control and part programming.

Computer and CNC architecture.

Logics and programmable logic controllers.

Discrete control system design.

Command generation for motion control. Actuators (DC, AC and stepping motors).

Motion control systems.

MOE 645 Micro and Nano Systems Technology

Introduction to micromachining and MEMS.

MEMS fabrication.

Micro and Nano sciences.

Microscopic energy transport.

MEMS devices, physics and design.

Experimental mechanics of MEMS.

Sensors-actuators and signal processing.

Inter facial phenomena.

Micro/Nano fluids.

-Second Semester

Code	Subjects	Hours/week	Units
MOE 622	Numerical Modeling and Simulation	2	2
MOP: 646	Computer Integrated and Flexible Manufacturing Systems	2	2
MOE 647	Manufacturing Measurements and Intelligent Inspection Technology	2	2
MOE 648	Manufacturing Systems and Quality Management	2	2
MOE 649	Advanced Engineering Materials	2	2
MOE 6410	Manufacturing Information and Data Systems	2	2
	Total	12	12

Syllabi:

MOE 622 Numerical Modeling and Simulation

Influence of process variables on manufacturing.

Need of optimization-of process parameters.

Role of numerical modeling and simulation.

Fundamentals of finite element method.

Variational approach.

Weighted residue technique.

Material non linearity.

Applications of FEM.

Approach to modeling of manufacturing processes (Welding Casting. Forming, etc.).

Major causes of errors.

MOE 646 Computer Integrated and Flexible Manufacturing Systems

Product data exchange standards and virtual manufacturing.

Variable selection in regression analysis.

Criteria for regression models selection.

Cross-validation, hypothesis testing and prediction regression modeling.

Introduction to neural networks.

Neural network modeling.

Assembly line analysis.

Group technology.

Cellular and flexible manufacturing.

Modeling and simulation of FMS and QMS.

Just-in-time manufacturing, lean production/enterprise and agile manufacturing.

Synchronous manufacturing and the theory of constraints.

Information systems and e-manufacturing.

MOE 647 Manufacturing Measurements and Intelligent Inspection Technology

Introduction to intelligent inspection methods.

Computer vision and image processing.

Multiple line-scan camera web inspection systems.

High speed color grading, discoloration detection systems.

Multiple area-scan camera vision systems for non-contact gauging

Defect analysis arid identification.

Volume and surface area measurements.

Near-IR imaging.

Moisture measurements.

Texture and surface measurements.

Tracking using linear dynamic models.

Pattern recognition.

Design and built real-time high speed vision systems.

MOE 648 Manufacturing Systems and Quality Management

Production and operations management.

Productivity, competiveness and strategy.

Decision making.

Total quality management.

Product and service design

Reliability.

Process selection and capacity planning.

Linear programming.

Facilities layout.

Design of work systems.

Learning curves. Location planning.

Transportation model.

Project management.

MOE 649 Advanced Engineering Materials

Introduction to physical properties of materials.

Properties and structures of composite materials.

Ceramic materials.

Processing of ceramics, molding and chemical bonding.

Plastics, polymerization and bond strength.

Bonding position on near-polymerization mechanisms.

High temperature materials.

Advanced coatings.

Industrial applications of composites and ceramics.

Friction materials.

Microelectronics and MEMS materials.

Materials in energy systems.

MOE 6410 Manufacturing Information and Data Systems

Introduction to information technology.

Computer systems.

Database systems.

Product data systems.

Process and facilities planning systems.

Production planning systems.

Enterprise resource planning (ERP) systems.

Manufacturing execution systems (MES).

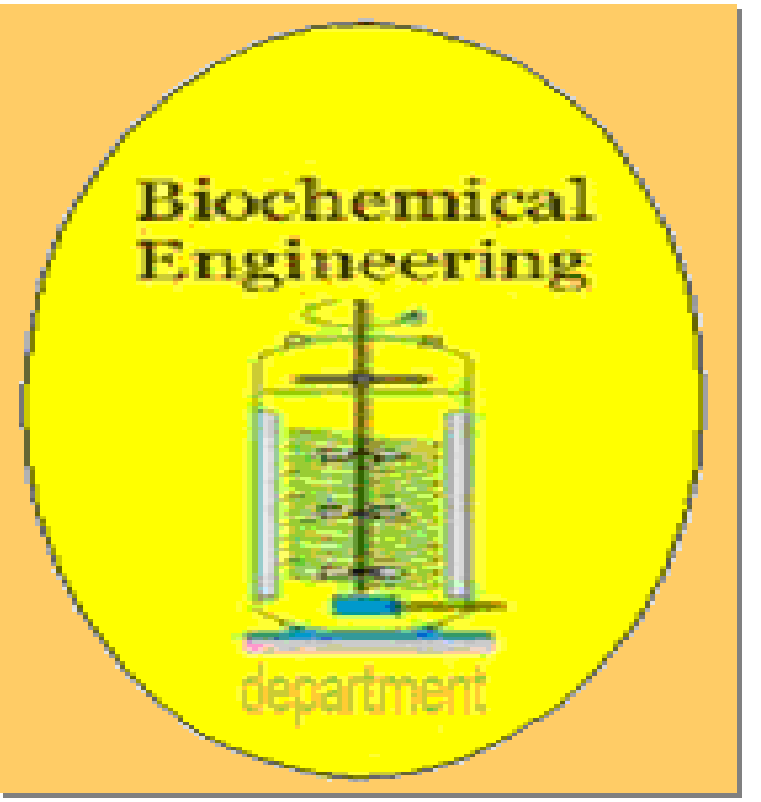
Warehouse management systems (WMS).

Supervisory control and data acquisition (SCADA) systems.

Automation systems.

Systems integration.

Department of Biochemical Engineering



Department of Biochemical Engineering

1.Introduction

Biochemical engineering is concerned with the study of chemical processes and biological processes in particular.
Biochemical engineering represents a mixture of scientific theories of biology, chemistry, and physics on one hand , and engineering applications together with their concepts and uses on the other hand. This can be done under the control of computers at possible high technicality.

The department of Biochemical Engineering is one of the most modern specializations in the country. It was established as part of Al-Khawarizmi College of Engineering, University of Baghdad in the academic year 2002-2003 due to its great significance in copying with the world industrial developments , taking into consideration that such a specialization is badly needed in Iraq.

2.Mission

- Provision of a proper academic environment through which the teaching staff members , technicians and administrators can offer their best services **for t**he teaching process, each according to his/her specialization. Through an environment like this , students are encouraged to exert their utmost efforts to cope with the latest development s in modern technology and to be able to solve the problems they might face on site

3.Vision

- preparing graduates who are armed with the necessary engineering expertise and skills through their acquaintance with a mixture of scientific specializations which will in turn contribute to industrial applications.

4. Objectives

1.Acquainting students with the basic scientific concepts of biochemical engineering and relating these concepts to other closely related sciences which would lead to the preparation of highly qualified engineers n the

field of biochemical engineering and would in turn fulfill the demands of the labor market in both the private and public sectors.

2.Paying attention to the scientific application of the curricula.

3.Development of knowledge and encouraging researchers to carry out research papers and development of students' innovations and creativity.

4.Continuing the development of the curricula to cope with the same scientific departments in other solid universities.

5.Holding conferences, symposiums and seminars.

6.Interacting with the private and public sectors and offering engineering consultations which may help in solving problems within this field of specialization.

7.Activating utilization of modern technology in such a way that would serve the development process in the country.

8.Preparation of qualified academics through a solid postgraduate studies program.

5.Academic Staff :

Names	Academic Title	Degree	General Specialization	Minor Specialization	Position
Malek Mostafa Mohammed	Assist. Prof	Ph.D.	Chem. Eng.	Transport Phenomena	Head of Dept
Ammar Jasim Mohammed	Assist. Prof	Ph.D.	Chemistry	Physical chemistry	Lecturer
Nada Mustafa Hady	Lecturer	M.Sc.	Chem. Eng.	Chemical Reactors	Lecturer
Khalid Waled Hamid	Lecturer	Ph.D.	Chem. Eng.	Electrochemical and Mass Transfer	Lecturer
Amil mohammed Rahman	Lecturer	Ph.D.	Chem. Eng.	Chemical Industry and Catalysts	Lecturer
Muhanad Hasseb Salman	Lecturer	Ph.D.	Chem. Eng.	Heat and Control	Lecturer
Safaa Rasheed Yasin	Lecturer	Ph.D	Chem. Eng.	Reactors and Separation materials	Lecturer
Ammar Waad Allah Ahmed	Assist. Lect.	M.Sc.	Chem. Eng.	Petrochemicals and Reactors	Academic Administrator
Aseel Abd-Aljabar Abd-Alrazak	Assist. Lect.	M.Sc.	Chem. Eng.	Fluid Flow	Lecturer
Zainab Ya'koob Ateya	Assist. Lect.	M.Sc.	Chem. Eng.	Corrosion	Lecturer
Samer Najah ALyas	Assist. Lect.	M.Sc.	Chem. Eng.	Biochemical Engineering	Lecturer
Rafid Abd-Alwaheed Abd-Alkareem	Assist. Lect.	M.Sc.	Biotechnology	Inheritance and Immunity	Lecture
Salwa Shamran Jassem	Assist. Lect.	M.Sc.	Chemistry	Analytical Chemistry	Lecturer
Sami Dawood Salman	Assist. Lect.	M.Sc.	Nuclear Eng.	Design and Modeling of Process and Equipments	Lecturer
Hassan Hadi Hasson	Assist. Lect.	M.Sc.	Chem. Eng.	Petrochemicals and Reactors	Lecturer
Ahmed Abd-Alazez Ibrahem	Assist. Lect.	M.Sc.	Chem. Eng.	Transport Phenomena	Lecturer
Ali Yassen Nasser	Assist. Lect.	M.Sc.	Chem. Eng.	Transport Phenomena	Lecturer
Mohammed Bassil Ali Ghalib	Assist. Lect.	M.Sc.	Chem. Eng.	Biochemical Engineering and Bioreactors	Lecturer
Isra' Abd-Al-Wahab Hamudy	Assist. Lect.	M.Sc.	Civil Eng.	Environmental	Lecturer
Zeyad Rafa'a Zair	Assist. Lect.	M.Sc.	Chem. Eng.	Industry and Units Operation	Lecturer
Ziad Tarak Ahmed	Assist. Lect.	M.Sc.	Chem. Eng.	Biochemical Engineering and Modeling	Lecturer
Najah Mahdi	Assist. Lect.	M.Sc.	Chem. Eng.	Materials Engineering	Lecturer

6.Engineers:

Names	Degree	Occupation	General Specialization
Bushra Abd-Al-Azez Fares	Engineer	**B.Sc. Eng.**	**Chemical Eng.**
Sanaa Noori Humady	Engineer	**B.Sc. Eng.**	**Chemical Eng.**
Mohammad Hasseb Ayoub	Engineer	**B.Sc. Eng.**	**Chemical Eng.**
Isra' Wajeh Ahmad	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Rawa Taha Abd-Al-Kareem	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Ramzi Ata' Abd-Al-Saheb	Engineer	**B.Sc. Eng.**	**Chemical Eng.**
Isra' Muzahem Rashed	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Muna Na'ma Gadeeb	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Dunia Abd-Al-Latef Saleh	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Usama Fawzee Saeed	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Noor Khasem Jabber	Engineer	**B.Sc. Eng.**	**Biochemical Eng.**
Hamssa Ahmed Abud	Biologist	**B.Sc. Sciences**	**Biology Sciences**

7.Administrative and Technical Staff:

Name	Occupation	Degree	Place of Work
Shayma Ahmed Kareem	**Superintendent**	**B.Sc. Education**	**Department Secretary**
Israa Khallel Abd-Al-Lateef	**Superintendent**	**B.Sc. Education for Woman**	**Department Secretary**
Sana' Hamid Saady	Technician	B.Sc. English Language	Technician in Department Laboratories

8.Laboratories:

1. Biochemical Engineering Lab.
2. Biochemical Industries Lab.
3. Biochemistry Lab.
4. Biology Lab.
5. Organic and Analytical Lab.
6. Physical Chemistry Lab.
7. Computer Application Lab.

Biochemictry Lab

Biology Lab

Compute Application Lab

9.The Curricula:

First Stage:

Code	Subjects	Hours/Week						Units
		1st semester			2nd Semester			
		Theo.	Prac.	Tuto.	Theo.	Prac.	Tuto.	
B.Ch.Eng.121	Mathematics 1	2	-	1	2	-	1	4
B.Ch.Eng.131	Organic and analytical chemistry	2	2	-	2	2	-	6
B.Ch.Eng.132	Physical chemistry	2	2	1	2	2	1	6
B.Ch.Eng.133	Cell Biology	2	2	1	2	2	1	6
B.Ch.Eng.111	Statistics and Resistance of Materials	2	-	1	2	-	1	4
B.Ch.Eng.134	Process Engineering Principles	2	-	1	2	-	1	4
B.Ch.Eng.122	Engineering Drawing	-	2	-	-	2	-	2
B.Ch.Eng.123	Introduction to Computer Applications		2	-		2	-	2
B.Ch.Eng.113	**Human Rights and General Freedom**	2	-	-	2	-	-	4
B.Ch.Eng.112	**English Language**	2	-	-	2	-	-	4
Total		16	10	5	16	10	5	42

Weekly Hours

1st semester	2nd semester
31	31

Mathematics 1 :

General revision. Equations formulation, complex numbers. Derivation of Algebraic equations, Triangular equations, integration, Application of integration. Logarithmic equations, Differential equations, Limits and Arrays.

Analytical and Organic chemistry:

Analytical methods , Types of solutions and their concentration , Volumetric analysis ,Titration,Titration Curves, Weight Analysis, Precipitated reactions, Oxidation-reduction reactions, Bonds and electronic orbital's for carbon, hydrocarbons, Thermal cracking , hydrogenation, halogenations , Oxidation , Sulphonation , Nitration , Substitution , Polymerization , Halides , Alcohols , and phenols , Ethers , Aldehydes , Ketones , Carboxylic acids ,Esters , Amides.

Experimental Part:

Reagents, calibration and neutralization titration, determination of equilibrium constant, determination of ionization constant, precipitation reactions, determination of solubility constant, Extraction , crystallization and recrystalization , Boiling point , Melting point , simple distillation , fractional distillation.

Physical Chemistry:

First , second and third law of thermodynamics , Gibbs free energy and equilibrium, thermodynamics of mixtures , chemical rate equation , theories of rate reaction ,complex reactions , surface chemistry , properties of solutions , electrochemistry.

Experimental Part:

Heat of equilibrium, heat of dissolution, first order reaction, second order reaction, adsorption on coal, surface tension reflection coefficient.

Cell Biology:

Classification and Characteristics of Living Cells, Biology, Cell Theory. Cell Contents, Cell –Cell Interactions, Cell Divisions, Genetic Engineering, Pollution, Biotechnology, An introduction to Biotechnology Resources of industrial biological microorganisms ,methods of separation, Nutrition and Ecological needs for Biological systems(carbon and nitrogen resources re sources, salts and vitamins, PH and temperature), development methods of industrial bio-micro-organisms.

Experimental Part:

Electron microscopy , distension of living organisms , division of animal cells , types of animal tissues , plant cell, division of plant cells , types of plant tissues , microorganisms , distinction of microorganisms (Bacteria , fungi , protozoa) .

Statistics and Resistance of Materials:

Principles of static's, resultant force systems, momentum and double momentum , equilibrium force systems , force systems in space , three dimensional force systems , resultant force systems in space, friction, structural analysis , pivot and centers , principles of resistance , simple stress , strain , Stress in cylinders , Simple tension , thermal stress, deformation, Equations of shear momentum, curves of shear momentum.

Process Engineering Principles:

Introduction to engineering calculations, units, chemical equation and calculations, limited and excess components in chemical reaction, conversion, yield, selective material balance, Al-jabraics techniques, material balance in steady state, recycle, purge stream, gases, streams, liquid and solid materials, Ideal gas, moisture and partial saturation, energy balances, heat content, calculation of heat content using heat capacity, humidity charts and its uses, first law of thermodynamics and total energy balance, unsteady state mass and energy balances, flow charts and process operation.

Engineering Drawing:

Introduction to drawing and its uses, graphic geometry, orthographic, dimensions, sectional view, piping system, assembly. This course will be studied using drawing boards and AutoCAD software.

Introduction to Computer Applications:

Introduction to computers, introduction to windows, Excel program. Microsoft Access program.

English Language

Human Rights and General freedom:

Roots of human rights and their development in human history , human rights in ancient and middle ages , human rights in modern history , human rights (identification , definition and guarantee) , the relationship between

human rights and general freedom , shapes and types of human rights and the relationship between them , guaranteeing respect and defence of human rights , general theory and general freedom , system law and general freedom , guarantees of general freedom , equality principles , distinction of general freedom , individual and principle freedom , personal freedom , work freedom , industrial and commercial freedom.

Second Stage:

Code	Subjects	Hours/Week						Units
		1st semester			2nd Semester			
		Theo.	Prac.	Tuto.	Theo.	Prac.	Tuto.	
B.Ch.Eng221	Mathematics 2	2	-	1	2	-	1	4
B.Ch.Eng231	Biochemistry	2	2	1	2	2	1	6
B.Ch.Eng232	Thermodynamics	2	-	1	2	-	1	4
B.Ch.Eng222	Fluid Flow	2	-	1	2	-	1	4
B.Ch.Eng223	Properties of Engineering Materials	2	-	-	2	-	-	4
B.Ch.Eng224	Engineering Statistics and economics	2	-	-	2	-	-	4
B.Ch.Eng225	Electrical technology	2	-	-	2	2	-	5
B.Ch.Eng226	Computer Applications using Visual basic	-	2	-	-	2	-	2
B.Ch.Eng241	Principles of Biochemical Engineering	2	-	1	2	-	1	4
B.Ch.Eng211	Technical Arabic Language	2	-		2	-		4
B.Ch.Eng212	Freedom and Democracy	2	-	-	2	-	-	4
Total		19	4	6	19	6	6	45

Weekly Hours

1st semester	2nd semester
29	31

Mathematics 2 :

Cuts , Polar coordinates , Hyperbolic functions , Vectors , Partial differential , Maximum and minimum , Double integration , series , differential equations.

Biochemistry:

Biochemistry, carbohydrates, lipids, amino acids and protiens,introduction to enzymes, enzyme assay, enzyme regulation, enzyme kinetics, immobilized enzymes, nucleic acids, vitamines, Absorption and assimilation, carbohydrates metabolisms, lipids metabolisms, protien metabolisms, introduction to hormones.

Experimental Part:

Carbohydrates detection , distinction between carbohydrates , carbohydrates reaction , lipids detection , distinction between lipids , lipids reaction , protien reaction , distinction between protiens , enzyme reaction .

Thermodynamics:

Basic concepts ,First law of thermodynamics for closed (constant mass) and open systems under both steady and unsteady fluid flow , enthalpy and internal energy functions , Reversibility , Heat capacity , PVT systems , Ideal gas behavior, Maxwell's equation , Throttling process , residual properties , Second law of thermodynamics , Heat engine and heat pumps , Carnot cycle , Ideal and non-ideal behavior of systems of variable composition , fugacity concept and calculations, chemical reaction, equilibrium, effect of temperature and pressure on the equilibrium constant

,calculation of equilibrium conversion for single and multi-reactions, Refrigeration, Liquefaction, Steam Power Plant, Thermodynamic Analysis of Process.

Fluid Flow :

Types of fluids, Friction in Pipes and channels, Shearing characteristics of a fluid, The drop in pressure for flow through a tube, Types of flow, Measurement of fluid flow, Pumping equipment for liquids, Power requirements for pumping through pipelines, Rheological Properties of Non-Newtonian biomaterials.

Properties of Engineering Materials :

Introduction to material engineering ,crystalline structure and crysal net for solids and crystal deformation, metallic materials , metal deformation , alloys of metals , steel and iron. , structure of polymers. deformation of polymers , ceramic materials , materials in hostile environments , corrosion reactions , control of corrosion , material selection in biochemical engineering processes , material of construction of fermenters.

Engineering Statistics and Economics :

Statistics : statistical operation with frequency distribution & curves, Measures of central tendency , standard deviation , probability ,statistical distribution . Sampling theory, statistical estimation theory , statistical Decision theory.

Electrical Technology :

Introduction to electrical circuits ,Ohms law and its application, Theories of electric circuits , methods of analysis of electric circuits , Delta to star and vice versa , Largest energy converted to load , AC circuit capacitors , Applications of AC circuits ,magnetic circuits and applications , transform measuring devices.

Experimental Part:

Ohms law , Kirchoffs law , Ameter , Internal resistanc.

Computer Applications Using Visual basic :

Introduction to visual basic , fundamentals of programming in visual basic, repetitions , arrays , procedures , graphical display of data , additional Objects. Use of visual basic in the design and execution of programs related to biochemical engineering.

Principles of Biochemical Engineering :

Cellular kinetics , batch growth kinetics, product formation kinetics, nutrient limitation, continuous culture , enzyme , enzyme kinetics, metabolic engineering , metabolic stoichiometry and energetic, simple ideal bioreactor design , batch vs. CSTR, Sterilization bioreactor for liquids & gases , down stream processing (filtration , centrifugation , membrane separation ,chromotographical separation , evaporation , crystallization , precipitation , drying & other downstream processes.

Technical Arabic Language

Freedom and Democracy

Third Stage:

Code	Subjects	Hours/Week						Units
		1st semester			2nd semester			
		Theo.	Prac.	Tut.	Theo.	Prac.	Tuto	
B.Ch.Eng 321	Engineering Analysis	2	-	1	2	-	1	4
B.Ch.Eng 331	**Heat Transfer**	2	-	1	2	-	1	4
B.Ch.Eng 332	**Mass Transfer**	3	-	1	3	-	1	6
B.Ch.Eng 341	Biotechnology	2	-	1	-	-	-	2
B.Ch.Eng 342	Biochemical Engineering Industries	2	3	1	2	3	1	6
B.Ch.Eng 343	**Food and Drug Processing**	2	-	1	2	-	1	4
B.Ch.Eng 344	**Environmental Pollution and Biochemical Treatments**	1	-	1	1	-	1	2
B.Ch.Eng 345	**Biocatalysts**	1	-	1	1	-	1	2
B.Ch.Eng 333	**Computer Applications using Matlab**	1	2	-	1	2	-	4
Total		16	5	8	14	5	7	34

Weekly Hours

1st semester	2nd semester
29	26

Engineering Analysis:

First degree differential equations : concepts & methods for solution , second degree differential equation : linear & non-linear , operator –

Method, Probinues method , tabulated functions) error , beta, & gamma) Function , Partial differential equations : concepts & solution methods, laplace transformation , mathematical simulation for steady & unsteady cases of engineering units applications , finite difference ; concepts & applications .

Heat Transfer:

Process heat transfer (conduction , convection , & radiation) thermal conductivity : concepts & calculation methods, insulations & thermal resistance , radial & Spherical systems, the optimum thickness of insulation , heat source systems ,

confection – conduction systems , fins , thermal contact resistance ,unsteady stets conduction, the jumped capacitance method, Heisler charts applications , multi – dimensional systems , principles of heat transfer by convection , convection boundary layers for laminar & turbulent fluid flow , Velocity boundary layer , thermal boundary Ayer, the heat & mass transfer analogy , empirical relations for forced convections heat transfer , fluid flow across mylinders , spheres, & tube bundles , heat exchangers, the effectiveness- nuts method , radiation.

Mass Transfer:

Diffusion, Mass transfer theories, Mass transfer coefficient, Absorption and absorption towers, Extraction, Distillation and Crystallization, Drying and Evaporation.

Bio- Technology:

Method for Monitoring and Control of Process variables, Measurement and Control of gas flow, Temperature measurements and control, Pressure measurements, PH measurements control, Levels measurements and control of dissolved oxygen levels other gasses, Determination of other materials in solution, Measurements of gasses in effluent gas stream, Measurements of viscosity, Measurements of turbidity, Power measurements, Methods for elimination of impurities in product, Process validation with regards to reproducibility, Product quality and safety, The main theme in quality control ob biopharmaceutical product manufacturing.

Biochemical Engineering Industries:

Introduction to chemical process engineering and biological microorganisms, brewing industry Production technology of : Alcohols , Aldehydes , Organic acids , Acetone , Carbohydrates , Starch , Amino acids , Single cell proteins , Antibiotics and Vitamins, Food and Medicine Industries.

Food and Drug Processing:

Cleaning and sorting, Extrusion, Homogenization (single and double stage), Refrigeration and freezing, Size reduction and enlargement, Frying, Packaging of foods and drugs , shelf life of foods and drugs.

Environmental Pollution and Biochemical Treatments:

Introduction to ecology and ecological pollution , water and solid pollution , biological treatment for water and liquid and solid waste , calculation of treatment units, Air pollution , Application of biotechnology in solving air pollution problem Radiation pollution ,clean rooms.

Biocatalysts:

The Enzyme Kinetics, enzyme Reactor with Simple Kinetics, Inhibition of enzyme reactors, Immobilized enzyme: Immobilization Techniques, effect of mass Transfer resistance biocatalytic reactors, selection & design. Industrial application of biocatalytic processes: Carbohydrates, Starch Conversion, Cellulose Conversation & Pharmaceutical Production, Chemical catalysis.

Computer Applications Using Matlab:

Matlab software, Control Flow (for, if-else-end, switch-case), Data Analysis, Polynomials, Curve Fittings and interpolations, Numerical Analysis (plotting, minimizing, integration, differentiation, differential equations), Two Dimensional Graphics, Three Dimensional Graphics, Cell Array and Structure. Application of Matlab to many biochemical engineering problems.

Fourth Stage:

Code	Subjects	Hours/Week						Units
		1st semester			2nd Semester			
		Theo.	Prac.	Tuto.	Theo.	Prac.	Tuto.	
B.Ch.Eng.421	Numerical methods & Optimization	2	-	1	2		1	4
B.Ch.Eng.441	Bioreactor Design	2	-	1	2	-	1	4
B.Ch.Eng.442	Biochemical Process Control	2	-	1	2	3	1	5
B.Ch.Eng.443	Computer Aided Design in Biochemical Processing	1	2	-	1	2	-	4
B.Ch.Eng.444	Biochemical Process Equipment Design	3	-	1	3	-	1	6
B.Ch.Eng.445	Unit Operation in Biochemical Processes	3	3	1	3	3	1	8
B.Ch.Eng.446	Biochemical Engineering Design Project	1	3	-	1	3	-	4
Total		14	8	5	14	11	5	35

Weekly Hours

1st semester	2nd semester
27	30

Numerical Methods & Optimization:

Types of errors , Calculation of roots , Solution of simultaneous equations , minimum and maximum calculations , elimination methods for constraint equations .Lagrange methods , Kuhn-Tucker method , golden section method , Fibonacci method , Fletcher method , Simplex method.

Bioreactor Design:

Kinetics Of cell Bioreactors, Ideal Cell Reactors (Mass Balances, Reactors For Biomass Growth, Reactors In Series, Recycle), Mixing & Aeration, Enzyme kinetics and reactor design, Immobilized kinetics and reactor design, Heat transfer in bioreactors, and Software applications for bioreactor design.

Biochemical Process Control:

Laplace transformation , Time Lag ,Response of first order systems (reacting and non-reacting) and signal transfer , control valve , Device , discrete , Integral and differential ,Zickler – Nickels method ,Rawth method , Bode and Nikost diagram , Equipments for measuring temperature pressure , concentration , Fluid flow and oxygen dissolved.

Experimental Part:

Dynamic responses, Calibration of pressure measurement equipment , Air control valve , Frequency responses analysis , Calibration of control equipment in their three phases , Acidity ,temperature and dissolved oxygen control.

Computer Aided Design in Biochemical Processing:

Review of available process design package for chemical and biochemical engineering, Chem. CAD Software as a selected software for process design includes Flow sheets (Process Flow Diagram (PFD), Piping

& Instrumentation Diagram (P& ID), Material & Energy Balances , Selected Equipment design for Fluid Flow, Mass and Heat Transfer and Plant Lay- out.

Biochemical Process Equipment Design:

Rule of thumb for bioprocess design, Heat Exchanger Design (Shell and Tube, Plate Heat exchanger), Column Design (Distillation Column, Absorption Column), Evaporator design (Single Effect Multi-effect , Dryer Design (Spray dryer, Drum Dryer, belt dryer).

Unit Operation in Biochemical Processing:

Sterilization, Homogenization, Grinding, Ultrasonication , Pressure cell ,ball mill , osmotic shock , heat shocking ,& others , Membrane Separation (Revere Osmosis, ultra filtration , Dialysis , Microfiltration & electodialysis). Chromatography & Fixed – bed Adsorption, Precipitation and Crystallization.

Experimental Part:

Cooling tower , tray dryer , spray dryer , filter press , filter drum , fluidization , packed bed , screen analysis , forced convection, heat exchanger , (liquid – liquid , liquid – gas) , sedimentation , distillation , flow rate equipment (venture , orifice , pitot tube , wear) , diffusivity measurement , extraction (liquid – liquid) , extraction (liquid – solid), absorption , evaporation.

Biochemical Engineering Design Project:

Best method of production, PFD (Process flow sheet), PID (Piping and instrumentation program), Mass and energy balances, Equipment design, cost estimation, plant layout**.**

Lecture Room

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