ABET

Self-Study Report

for the

Automotive Engineering

at

Mechanical Engineering Department

University of Technology

Baghdad, IRAQ

July 2018

CONFIDENTIAL

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Self-Study Report
Automotive Engineering

Bachelor of Science in Mechanical Engineering – Automotive Engineering

Mechanical Engineering Department
University of Technology
Baghdad, IRAQ

BACKGROUND INFORMATION

A. Contact Information

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Quality Assurance Committee Represntative of Automotive Engineering Program

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B. Program History

The Automotive Engineering is a branch in the Mechanical Engineering Department at the University of Technology – IRAQ, which enrolled its first class of students in 1960 and has continuously operated since that time. The branch first established as Automotive Department from the High Industrial Institute in 1967. Then, this institute had changed its name to Collage of Engineering Technology, which was belonging to University of Baghdad. Afterthat, the branch was a part of the Mechanical Engineering Department when University of Technology established in 1975.

This is the fourth ABET Self-Study Report of the Automotive Engineering Program. Automotive Engineering is a combination of mechanical, electrical and materials science. Engineers, in this field, can design new vehicles or look for ways to improve existing automotive engineering technology. Automotive engineers, graduated from this program, can design and test brake systems, engines, safety mechanisms, fuel technologies and transmissions. In this field, engineers use design software to devise new vehicle designs or systems. Some engineers also use grinders, machine tools and workshop presses to fabricate prototype parts for testing.

The program offers four years' degree as a minimum qualification. The degree awarded is Bachelor of Science in Mechanical Engineering – Automotive Engineering. The program covers the basic principles of automotive engineering industry along with modern vehicle design requirements in terms of safety, fuel economy and industrial manufacturing. The automotive engineering program is part of the ME curriculum, which, over the years continues to emphasize the Mechanical Engineering core topics of mechanical systems, design, thermal-fluid systems, materials, and manufacturing.

C. Options

The Automotive Engineering Program grants only one degree, the Bachelor of Science in Mechanical Engineering – Automotive Engineering.

D. Organizational Structure

The organizational chart, Figure 1.1, shows the administrative structure of the program. The program is one of five offered programs by the Mechanical Engineering Department. The Head of the Automotive Engineering Branch provides leadership and supervision to enhance the quality and reputation of the program offered by the branch. The Dean is the chief academic officer of the faculty, the Mechanical Engineering Department, which provides leadership and supervision of all consequential functions that affect the progress of the faculty and its programs.

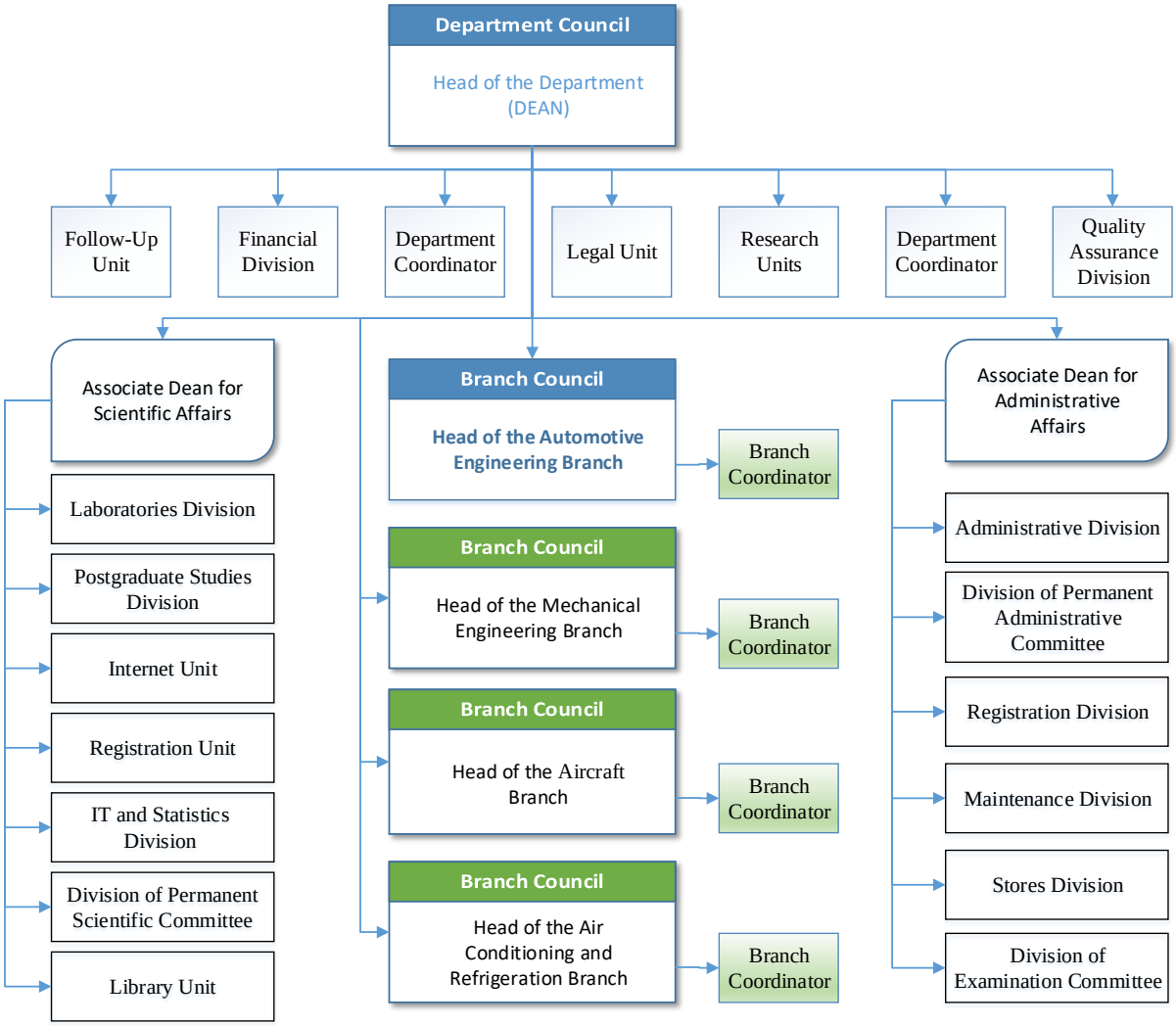


Figure 1.1: Mechanical Engineering Department General Organization

E. Program Delivery Modes

The Bachelor of Science in Mechanical Engineering – Automotive Engineering (BSME–AE) Program is delivered as a traditional lecture / laboratory, daytime program. Evening courses, have been offered in the past, then discontinued, and currently restarted again in academic year 2017-2018. There are no distance learning programs or off campus classrooms in the BSME – AE degree program.

F. Program Locations

The BSME – AE is located on the main campus of University of Technology in Sina'ah St., Baghdad, IRAQ.

G. Public Disclosure

Details about our Automotive Engineering program is provided online via the Mechanical Engineering Department – University of Technology website using the following URL:

Website: http://www.me.uotechnology.edu.iq/

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

The last general review of the Automotive Engineering Program took place in 2017. Since that time the ME Department try to diagnose any weakness or deficiencies that may exists in our educational programs to improve it or to overcome the difficulties. The following summarized some of the steps taken:

1. Attempt are now going on to improve our faculty knowledge about ABET standards and how our program to be accredited.
2. Evaluating our current educational system, which was based on yearly bases, and now our program depends on a courses based system, the academic year 2016-2017 witnessed the first application of the courses based learning since the establishment of our program. Therefore, we have now the first and second year classes in courses based system, classes for the third and fourth year still based on the yearly based educational system. Many meetings were held and a comprehensive change is now planned and completed. The final approval from the Deans Committee are now granted.
3. Student feedbacks are taken seriously, for this purpose we have been performed some surveys for both current students and alumni. We are now studying and analyzing these surveys in order to have some ideas about the future improvement concern student outcomes.
4. Another improvement in our academic program include:
    - Opening new lab: Electrical and Elctronics of Automotive LAB
    - Improving ME website
    - Including PBL learing in some courses subjects
    - Improving course syllabi in both courses based system and yearly based system

I. Joint Accreditation

Our BSME – AE Program does not have joint accreditation.

CRITERION 1. STUDENTS

A. Student Admissions

To be accepted for an undergraduate degree in Mechanical Engineering Department, applicants must hold the official Iraqi Secondary School Certificate, Ministry of Education, Appendix 1.1 represents the Admission Regulations of the Iraqi Ministry of Higher Education and Scientific Reseach. We have five disciplines in our Department, these are; Automotive Engineering, General Mechanical Engineering, Aircraft Engineering, Air Conditioning and Refrigeration Engineering, and Power Plants Engineering. After the freshman accepted at the Mechanical Engineering Department, a competition between the applicants has to be made for accepting them between the different disciplines, see Appendix 1.2 for more details about the Admission Regulations of our Mechanical Engineering Department. Table 1.1 shows the numbers and scores of the accepted students at the Mechanical Engineering (ME) Program for the six years ago. Table 1.2 shows the numbers of accepted and graduated students for Mechanical Engineering Department and the number of graduated student of the Automotive Engineering Program for the last six academic years.

Table 1.1: Numbers and scores of accepted students for Mechanical Engineering Department for the six years ago.

Academic Year	Acceptance Scores %		Number of New Students Enrolled	Number of Graduated Students
	MIN.	AVG.		
2017-2018	76.5	85.6	166	**76**
2016-2017	85.7	90.2	152	16
2015-2016	90.1	90.5	164	109
2014-2015	89.0	89.9	132	135
2013-2014	86.7	87.9	186	176
2012-2013	86.7	90.2	164	130

Table 1.2: Numbers of accepted and graduated students for ME Department and the number of graduated student of Automotive Engineering Program for the last six academic years.

Academic Year	No. of New ME Students Enrolled	No. of Graduated Students for ME Department	No. of Graduated Students for BSME – AE Program
2017-2018	166	**76**	**19**
2016-2017	151	101	**16**
2015-2016	164	109	**16**
2014-2015	132	135	**17**
2013-2014	186	176	**21**
2012-2013	164	130	**17**

B. Evaluating Student Performance

Evaluating student performance and progress is performed on a yearly basis after a student enters the program. Student rankings within the department usually performed by continuous evaluation to ensure that those students are meeting program objectives and making satisfactory progress toward the degree. To stay in the program; students must gain a grade of 50%; or higher, in each subject. Short exams are usually used for continuous evaluation, a mid-year exam is performed at the middle of the academic year, and a final exam is achieved at the end of the academic year. The academic year starts on September till the end of next

June. The student's subject for each year are recorded on a Master Grades Sheet, which kept, each year at the office of the Department's Registrar.

At the end of each year, the Examination Committee declares the students' grade reports. Any student determined to be out of minimum grade policy has to do a second attempt for each unachieved subject. If the student failed in the second attempt exam, he or she has to stay and redo the Program Year. Students who were not able to attend the relevant second attempt examination because of conditions beyond their control (e.g. due to security issues) are, sometimes, allowed to take a third attempt exam. If the student fails to get 50% final grade he/she will be considered FAILED.

Attending classes are compulsory, the obligation of the students related to attending the program lectures also being pursued through the Committee of Absences, see Appendix 1.3. The maximum allowable percentage of the absences is 10% of the total number of hours given during the year. Appendix 1.4 shows the method of evaluation and distribution of grades.

C. Transfer Students and Transfer Courses

Transfer student from one department to another in the same discipline. In case of a difference in some subjects matched for subject's analoging. Were for non analogues being clearing to see what subject the most similarity in the department or choose a subject with a similar curriculum, as well as taking into consideration equal to the units in order to graduate student an investigator full units.

Appendix 1.5 shows the method of distribution of students on the different disciplines in the Mechanical Engineering Program.

D. Advising and Career Guidance

While the instructors evaluate student performances in individual courses, academic advisors are in a position to monitor the overall progress of individual students. Each student admitted to the department is assigned an academic advisor. Each advisor has one class (about 25 students), advisors are selected from faculty teaching members.

The Mechanical Engineering Department has a Student Advising Committee in which a separate file is kept for each student (both on paper and electronically). These files are updated every year and an up-to-date follow-up form is distributed to the advisors each year, details of this committee is given in Appendix 1.6.

E. Work in Lieu of Courses

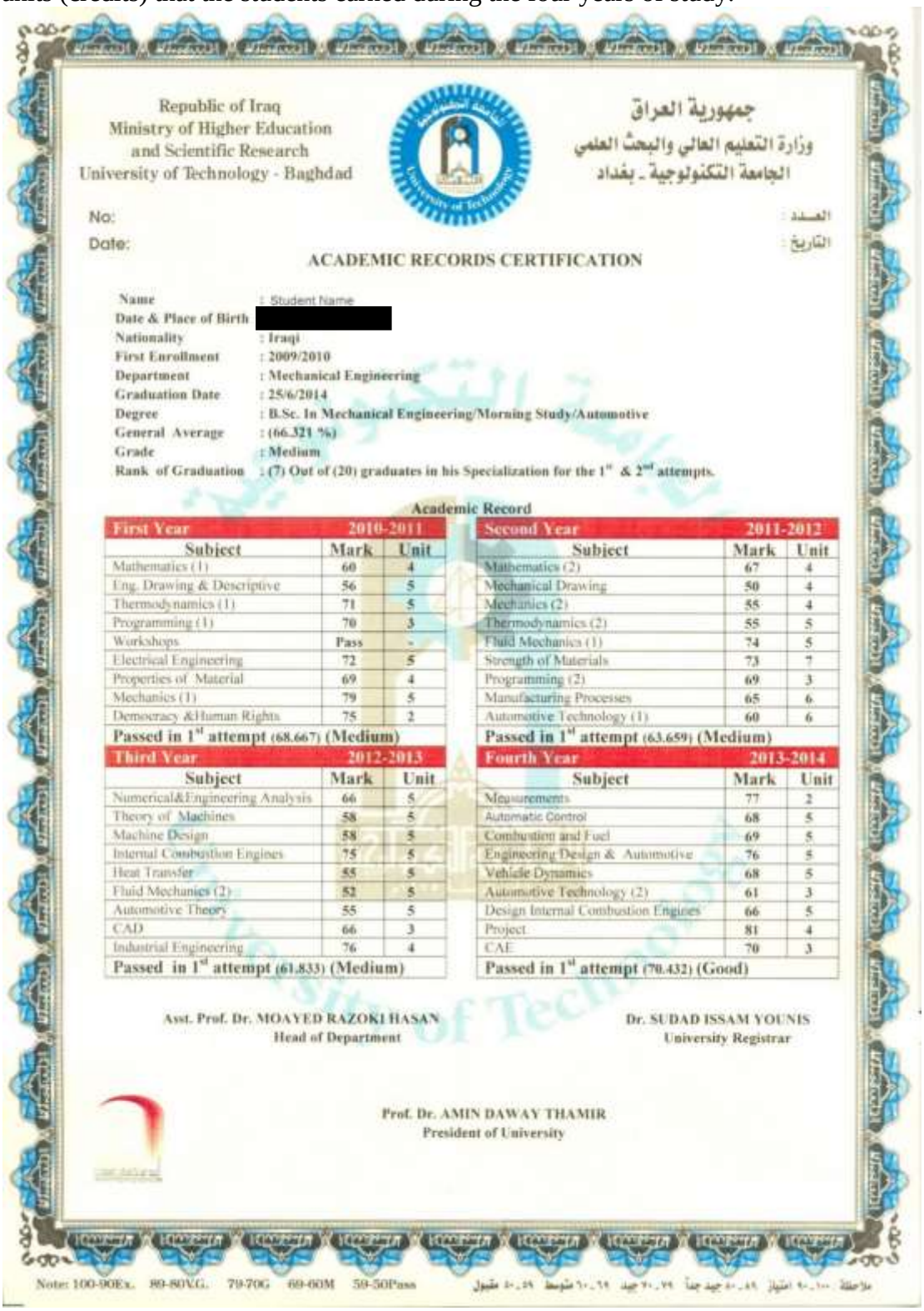
N/A

F. Graduation Requirements

Students of the Automotive Engineering Program will be awarded the BSME – AE after the successfully pass the four years of study. In the first year, the succeeded student will get 33 credits, and get 44, 37, and 40 after successfully passes the second, third, and the fourth year, respectively. The grades and credits are recorded, each year, via Master Grading Sheets which are kept at the Registrar's Office. When students have successfully earned a total of 154 credit hours, the student will be awarded the Bachelor of Science in Mechanical Engineering – Automotive Engineering (BSME–AE) degree.

G. Transcripts of Recent Graduates

After successfully completing the requirements of the BSME – AE degree, the program will provide to each student a transcript of records (see Figure 1.2), which details the marks and the units (credits) that the students earned during the four years of study.



Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Technology - Baghdad

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
الجامعة التكنولوجية - بغداد

No: العدد :
Date: التاريخ :

ACADEMIC RECORDS CERTIFICATION

Name : Student Name
Date & Place of Birth [redacted]
Nationality : Iraqi
First Enrollment : 2009/2010
Department : Mechanical Engineering
Graduation Date : 25/6/2014
Degree : B.Sc. In Mechanical Engineering/Morning Study/Automotive
General Average : (66.321 %)
Grade : Medium
Rank of Graduation : (7) Out of (20) graduates in his Specialization for the 1st & 2nd attempts.

Academic Record

First Year	2010-2011	
Subject	Mark	Unit
Mathematics (1)	60	4
Eng. Drawing & Descriptive	56	5
Thermodynamics (1)	71	5
Programming (1)	70	3
Workshops	Pass	-
Electrical Engineering	72	5
Properties of Material	69	4
Mechanics (1)	79	5
Democracy &Human Rights	75	2
Passed in 1st attempt (68.667) (Medium)		

Second Year	2011-2012	
Subject	Mark	Unit
Mathematics (2)	67	4
Mechanical Drawing	50	4
Mechanics (2)	55	4
Thermodynamics (2)	55	5
Fluid Mechanics (1)	74	5
Strength of Materials	73	7
Programming (2)	69	3
Manufacturing Processes	65	6
Automotive Technology (1)	60	6
Passed in 1st attempt (63.659) (Medium)		

Third Year	2012-2013	
Subject	Mark	Unit
Numerical&Engineering Analysis	66	5
Theory of Machines	58	5
Machine Design	58	5
Internal Combustion Engines	75	5
Heat Transfer	55	5
Fluid Mechanics (2)	52	5
Automotive Theory	55	5
CAD	66	3
Industrial Engineering	76	4
Passed in 1st attempt (61.833) (Medium)		

Fourth Year	2013-2014	
Subject	Mark	Unit
Measurements	77	2
Automatic Control	68	5
Combustion and Fuel	69	5
Engineering Design & Automotive	76	5
Vehicle Dynamics	68	5
Automotive Technology (2)	61	3
Design Internal Combustion Engines	66	5
Project	81	4
CAE	70	3
Passed in 1st attempt (70.432) (Good)		

Asst. Prof. Dr. MOAYED RAZOKI HASAN
Head of Department

Dr. SUDAD ISSAM YOUNIS
University Registrar

Prof. Dr. AMIN DAWAY THAMIR
President of University

Note: 100-90Ex. 89-80V.G. 79-70G 69-60M 59-50Pass

Figure 1.2: Sample of transcript of records for Automotive Engineering Program.

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

The mission of the Automotive Engineering Program is a continuation of the Mechanical Engineering Department and the University of Technology – IRAQ missions, which is devoted to the pursuit and application of knowledge for the engineering and technological development of our society and mankind through achievements in teaching, research and community service that are of highest international standards. Our missions are summarized as follows:

1. To educate individuals to become creative and productive engineers with a good knowledge and abilities to become leaders and pioneers in their field.
2. To graduate engineers that play a leadership role in the advancement of industry and society.

B. Program Educational Objectives (PEO)

The objectives of the Automotive Engineering Program are a continuation of our Mechanical Engineering Department the University of Technology in delivering its scientific message to the community. The department strategic objectives are represented by:

1. Successfully practice the mechanical engineering program specialized in Automotive Engineering discipline. To educate individuals to become creative and productive engineers that can contribute to society and the profession.
2. Engage in life-long learning to advance professionally through continuing education and training.
3. To graduate engineers that are having good knowledge to succeed in graduate studies in mechanical engineering or a related field if pursued.

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

The mission of Automotive Engineering (AE) Program focuses on the pursuit and application of knowledge, which can be achieved by individuals who can identify and solve engineering problems using a scientific approach with their sound engineering base, life-long learning habits, command of advanced technology, and research abilities, as stated in in the objective 1 and 2. Objective 3 is also consistent with the AE mission because a high standard of research can only be achieved by individuals who are sought in areas of new technology and/or product development, being innovative and entrepreneurial, as stated in Objective 2.
The mission of AE focuses on creative, inquisitive, and productive individuals who are leaders and pioneers in their field. Objective 1 is consistent with this mission through the statement being innovative and entrepreneurial individuals with leadership and pioneering abilities in professional areas. Moreover, research and development activities that will contribute to science and national technologies are possible through the achievement of Objectives 2 and 3.

D. Program Constituencies

The constituents of the ME program include the following groups: **Students**, **Faculty**, **Staff Members**, **Alumni**, **Employers**, and **Program Advisory Board**. The constituencies and their relationships to the program are described below:

Students: Students have a clear interest in having a broad knowledge of the program related principles, tools, and theories as this prepares them for related careers, and helps them secure jobs locally and abroad. The importance of student engagement is reiterated in student forums discussions, the course surveys and the alumni surveys.

Faculty: The faculty group consists of all full-time and part-time instructors in the ME program during this period of evaluation**.** Faculty members have an understanding of the ethical and social dimensions in the program; capable of life-long learning, and who can work in teams. Such traits would elevate the program status and improve its reputation locally, regionally, and internationally.

Staff members: Staff members consists of the personals provide administrative and technical support. Their tasks include overseeing the up keeping of department, academic, financial, and documents, arranging and sending calls on behalf of the chair for departmental meetings, data collection process for evaluation activities. They also maintain updated student records, personnel, alumni data, and work closely with the Registrar's office. Staff members, also, include laboratory technicians, IT unit personnel, and others.

Alumni: The alumni group consists of all past recipients of the BSME-AE degree from the ME program. Automotive Engineering try to find jobs for their alumni and help them advance their careers. Alumni frequently contact the faculty for recruitment purposes.

Employers: Employers or industry partners have indicated that they have a clear interest in having students prepared upon entering the workforce. Clearly, the technical and personal preparation of the students is instrumental. Employers are also surveyed to get their feedback and ideas on the state of our graduates and the relevancy of the program's outcomes and objectives.

Program Advisory Board: Our Advisory Board is central for the whole ME program and composed some graduates and industrial representatives, and recognized alumni members. The board is called Industrail Advisory Board, the board covered all disciplines in our ME programs, i.e. Automotive Engineering, Mechanical Engineering, Aircrafts Engineering, Airconditioning and Refrigeration Engineering, and Power Plants Engineering. This board consists of sixteen industry leaders from various sectors. The board meeting held twice a year to discuss different issues that facing our programs, meetings outcomes are improvement of curriculum and giving ideas of a plan for continuous improvement of our educational programs according to the needs of industry. The board consists of the following personalities:

No.	Job Title	Full Name	Workplace
1	Senior Engineer	Majed Nader Abed Alkader	Ministry of Electricity - General Directorate for Electro Power Production - Central Region
2	Senior Engineer	Emad Khanim Nagi	Ministry of Oil - Oil Pipeline Company - Al- Karkh Warehouse
3	Engineer	Nader Rasheed Saaid	Commercial Director of Al-Tamimi Engineering Group - Private sector
4	Professor	Dr Qasim Salih Mahdi	College of Engineering – Al-Mstansirya University
5	Lecturer / Engineer	Abedalkarim S. Abedlkarim	Universal Al-Esrah College
6	Engineer	Ali Zuhir Ali	Hexa Corp Carrier Company

7	Engineer	Basim Mahdi Jaffer	Iraqi Airways
8	Engineer	Raaid Salman Aliwi	Iraqi Airways
9	Engineer	Ihsan Ezet Salih	Iraqi Airways
10	Major General	Sabah Adem Mahmoud	Air Force Leadership - Director of Air Engineering
11	Engineer	Dr. Raouf Mohamed Almosawi	General Company for Automotive and Equipment Manufacturing - Alexandria
12	Engineer	Salah A. M. Ahmed	General Company for Automotive and Equipment Manufacturing - Alexandria
13	Engineer	Hassan Saad Abu Naylah	SAS Company for Automotive Trading and Services - Agent of Toyota Company in Iraq
14	Chief Engineer	Dr. Raad Abed Mahdi	Ministry of Electricity - Planning and Studies Department
15	Chief Engineer	Lamaan Sabri Majly	Directorate of Electricity Production – Central Region
16	Chief Engineer	Alaa Abed Aljebar Bedin	Ministry of Electricity - Training and Energy Researches Department
17	Consultant Engineer	Adel Bader Alryahi	Ministry of Planning – Bureau of Ministry Deputy
18	Engineer	Mazin Khadim Mohamed	Al-Kudis Thermal Generating Station

The last meeting was held on Thursday, May 25, 2017 in the presence of members of the Mechanical Engineering Department and the members of the Industrail Advisory Board, and the meeting included the following items:

1. The Head of ME department welcomed the attendants in the Department of Mechanical Engineering place presenting them the thanks and appreciation for accepting the invitation. Then, he turned to the ambition of University of Technology for entering the reliability by meeting the requirements of ABET, where he referred to the existence of a department concerns with the quality, known as Quality Assurance and University Performance, and from this department, a special section for quality assurance and university performance emerges in each department of the University of Technology. And for the purpose of achieving these requirements, a correlation between the theoretical output in the department and the industrial sector should be performed, for which this council is emerged.
2. The responsible of Quality Assurance and University Performance Section displayed the extracted data from the work of the section for all department branches, represented by the General Mechanical Engineering Branch, Air-conditioning and Refrigeration Engineering Branch, Automotive Engineering Branch, Aircrafts Engineering Branch and Power Plants Engineering Branch. He also exhibited through them the objectives of each scientific branch and the desire to shortcut these goals and refine them in line with the requirements of ABET, referring to the University of Missouri's experiment in this area.
3. In light of the displayed data, a discussion has been opened on the subject with the participation of all attendants.

4. The discussion outcome viewpoints distributed between the academic side and the industrial sector which pointed out clearly the importance of formation of this council being considered as a link between the educational and industrial sectors, and because it has a positive impact in giving the moral momentum to dear students.
5. Most of the attendants expressed their willingness to provide support to achieve the goals of scientific branches through their readiness to submit projects that include real industrial problems to study them as graduation projects for the fourth stage as a first step with the importance of organizing scientific trips to the industrial sector enhancing the student's self-confidence and his knowledge by application.
6. Forms were distributed to the members of the council and the required information were fixed in the form such that the communication should be done through the websites for the success of this experiment, which is considered by many of them a successful step that needs more support and cooperation to consolidate it.
7. The Head of department presented on behalf of the department council, the employees of the department and the presidency of the University of Technology the thanks and appreciation to all attendants, wishing them continual progress and prosperity.

E. Process for Review of the Program Educational Objectives

1. Assessment of our Program Educational Objectives (PEOs) occurs approximately every four years, and involves the department's constituents. Alumni also provide feedback regarding the PEOs. The Department Scientific Committee is responsible for determining the appropriateness of our PEOs based on the feedback from our constituents, to ensure that they remain consistent with the University's mission, our program constituents' needs, and the engineering accreditation criteria. The faculty at large review the Committee's recommendations regarding the PEOs and either accept them or suggest revisions.
2. The current Self-Study Report, SSR, for the PEO have been reviewed, corrected and revised to match the mission of the program. This process was documented since March 2015 in our first SSR report according to ABET.

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

First Class

Program Outcome	Courses
Outcome A: Apply knowledge of mathematics, science and engineering	ME221, ME831, ME631, ME931,ME731,ME321
Outcome B: Design and conduct experiments	ME221, ME831, ME631, ME321, ME731
Outcome C: Design a system, component, or process within realistic constraints	ME831, ME631,ME731,ME931
Outcome D: Function on multidisciplinary teams	ME221,ME321
Outcome E: Identify, formulate, and solve engineering problems	ME931
Outcome F: Understanding of professional and ethical responsibility	ME221, ME631,ME731
Outcome G: Communicate effectively	ME831,ME111,ME631
Outcome H: Impact of engineering solutions in a global and societal context	ME221,ME111
Outcome I: Lifelong learning	ME111
Outcome J: Contemporary issues	ME111
Outcome K: Use the techniques, skills, and modern engineering tools for engineering practice	ME321

Second Class

Program Outcome	Courses
Outcome A: Apply knowledge of mathematics, science and engineering	ME432, ME 222, ME 172, ME 632, ME832,ME942
Outcome B: Design and conduct experiments	ME 432, ME 222, ME 172, ME 632, ME 942,ME732
Outcome C: Design a system, component, or process within realistic constraints	ME 432, ME 222,ME632,ME832,ME942
Outcome D: Function on multidisciplinary teams	ME172,ME632,ME832
Outcome E: Identify, formulate, and solve engineering problems	ME832,ME823
Outcome F: Understanding of professional and ethical responsibility	ME432,ME172,ME942
Outcome G: Communicate effectively	ME 832,ME942,ME543
Outcome H: Impact of engineering solutions in a global and societal context	N/A
Outcome I: Lifelong learning	N/A
Outcome J: Contemporary issues	N/A
Outcome K: Use the techniques, skills, and modern engineering tools for engineering practice	ME 172

Third Class

Program Outcome	Courses
Outcome A: Apply knowledge of mathematics, science and engineering	M823,ME343
Outcome B: Design and conduct experiments	ME 543,ME343,ME473
Outcome C: Design a system, component, or process within realistic constraints	ME 823,ME543,ME473
Outcome D: Function on multidisciplinary teams	ME 823,ME543,ME343,ME473
Outcome E: Identify, formulate, and solve engineering problems	ME 832,ME823
Outcome F: Understanding of professional and ethical responsibility	ME 823,ME543,ME343,ME473
Outcome G: Communicate effectively	ME 343,ME473
Outcome H: Impact of engineering solutions in a global and societal context	ME 343
Outcome I: Lifelong learning	ME823,ME343
Outcome J: Contemporary issues	ME 543, ME 343,ME473
Outcome K: Use the techniques, skills, and modern engineering tools for engineering practice	ME 343

Fourth Class

Program Outcome	Courses
Outcome A: Apply knowledge of mathematics, science and engineering	ME134,ME234,ME374,ME574, ME674,ME774,ME924
Outcome B: Design and conduct experiments	ME234,ME374,ME574,ME674, ME774
Outcome C: Design a system, component, or process within realistic constraints	ME774, ME924
Outcome D: Function on multidisciplinary teams	ME674,ME774,ME924,ME374, ME574
Outcome E: Identify, formulate, and solve engineering problems	ME 234,ME574,ME924
Outcome F: Understanding of professional and ethical responsibility	ME924
Outcome G: Communicate effectively	ME 774
Outcome H: Impact of engineering solutions in a global and societal context	N/A
Outcome I: Lifelong learning	ME924
Outcome J: Contemporary issues	N/A
Outcome K: Use the techniques, skills, and modern engineering tools for engineering practice	ME674

Figure 3.1 shows the Degree Program Map for Automotive Engineering Program

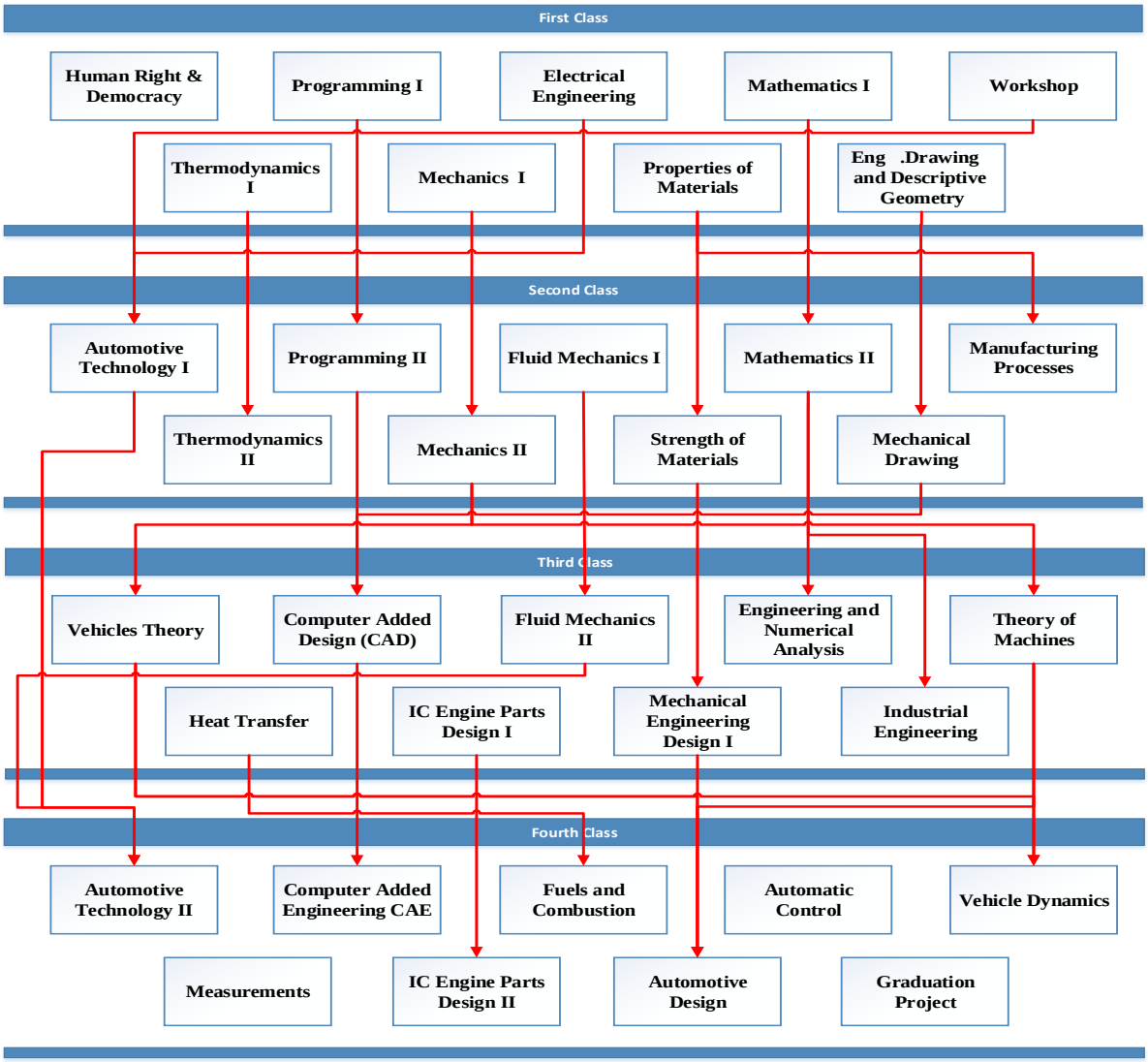


Figure 3.1: Degree Program Map for BSME – AE Degree.

B. Relationship of Student Outcomes to Program Educational Objectives

Table 3.1 explain the Relationship of Student Outcomes to Program Educational Objectives (POE) according to A-K ABET criterion.

Table 3.1: Relationship of Student Outcomes to Program Educational Objectives

Program Educational Objectives (PEOs)	Student Outcomes According to ABET										
	A	B	C	D	E	F	G	H	I	J	K
Objective 1	✓	✓	✓	✓	✓	✓	✓	✓			✓
Objective 2	✓				✓			✓	✓	✓	✓
Objective 3	✓	✓	✓		✓		✓			✓	

Table 3.2: Contribution of Required Courses to Student Outcomes

Subject	Code	Student Outcomes According to ABET										
		A	B	C	D	E	F	G	H	I	J	K
Programming I	ME221	✓	✓		✓		✓		✓			
Properties of Materials	ME831	✓	✓	✓				✓				
Human Rights & Democracy	ME111							✓	✓	✓	✓	
Thermodynamics	ME631	✓	✓	✓			✓	✓				
Engineering Drawing & Descriptive Geometry	ME431	✓	✓	✓			✓					
Mathematics I	ME321	✓	✓		✓							✓
Mechanics I	ME731	✓	✓	✓			✓					
Electrical Engineering	ME931	✓		✓		✓						
Mechanical Drawing	ME432	✓	✓	✓			✓					
Programming II	ME222	✓	✓	✓								
Automotive Technology I	ME172	✓	✓		✓		✓					✓
Thermodynamics II	ME632	✓	✓	✓	✓							
Mathematics II	ME322		✓									
Manufacturing Processes	ME832	✓		✓	✓	✓		✓				
Strength of Materials	ME542	✓	✓	✓			✓	✓	✓		✓	✓
Fluids Mechanics I	ME942	✓	✓	✓			✓	✓				
Mechanics II	ME732	✓	✓									
Computer Added Design	Me823	✓		✓	✓	✓	✓			✓		
Heat Transfer	ME543		✓	✓	✓		✓	✓			✓	
Engineering &Numerical Analysis	ME123	✓	✓		✓							✓
Machine Design	ME343	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
IC Engines	ME473		✓	✓	✓		✓	✓			✓	
Fluid Mechanics II	ME673	✓	✓			✓						
Theory of Machine	ME243			✓	✓	✓	✓	✓				
Vehicle Theory	ME773	✓	✓	✓	✓	✓						
Industrial Engineering	ME913	✓	✓	✓				✓				
CAD	ME924	✓		✓	✓	✓	✓			✓		
IC Engine Parts Design	ME774	✓	✓	✓	✓			✓				
Automotive Design	ME474	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Automotive Technology II	ME674	✓	✓		✓							✓
Vehicle Dynamics	ME574	✓	✓	✓	✓	✓						
Automatic Control	ME234	✓	✓			✓						
Measurements	ME134	✓										
Fuels &Combustion	ME374	✓	✓	✓	✓							

CRITERION 4. CONTINUOUS IMPROVEMENT

The improvement of our Automotive Engineering Program is considered by evaluating our current educational program. Generally, the aassessments is considered in twofold, the first one is concern with CRITERION 3 (Student Outcomes), while the other is mainly concern with CRITERION 5 (Curriculum).

During this academic year the steps performed toward improvement of our program are listed as follows:

1- Student Outcomes Survey is undertaken for a sample selected student of our educational program, Figure 4.1 shows a chart of A-K outcomes for the survey taken. Also, the survey includes a questionnaire about our PEOs, the output of this questionnaire is plotted in Figure 4.2.

2- Similar survey was taken for the program alumni (Alumni Outcomes Survey), the survey was taken for a sample selected alumni, also, of our educational program. This includes a survey of A-K outcomes, Figure 4.3. Student survey for the given courses for the firsr, second, third, and fourth year classes are shown in Figures 4.4 through 4.7. PEOs Questionnaire as shown in Figure 4.8.

3- Students Outcomes Assessments for Automotive Engineering Program for the academic year 2016-2017 is shown in Figure 4.9.

4- Evaluating of the curriculums and labs. A full review for evaluating our current educational system, which based on yearly bases, were performed. The decision taken was to convert this system to a courses based one. Our first year class students are now studying on courses based system, 2nd, 3rd, and 4th students classes still going on based on yearly bases. The transformation to this system will be gradual. Different meetings were held in order to study precisely this transition step, hoping to be smooth, to reduce the difficultes scompined with it.

5- Review the procedures of Committee of Absences and diagnose issues concern with it.

6- Adding a regular item concern ABET accreditation in Department Board meetings to discuss any issues and the achieved progress.

7- Helding meetings with Industrial Advisory Board. The board planned to achieve two meeting during the academic year. The last meeting was held on May 25th, 2017, during this meeting different ideas are discussed especially those concern on how to make our program alumni find jobs, or how to make real opportunities for them. During the meeting different ideas and opinions were discussed, some ideas are taken into consideration for the future improvements. A full detail about this Board is presented in Appendix 4.1.

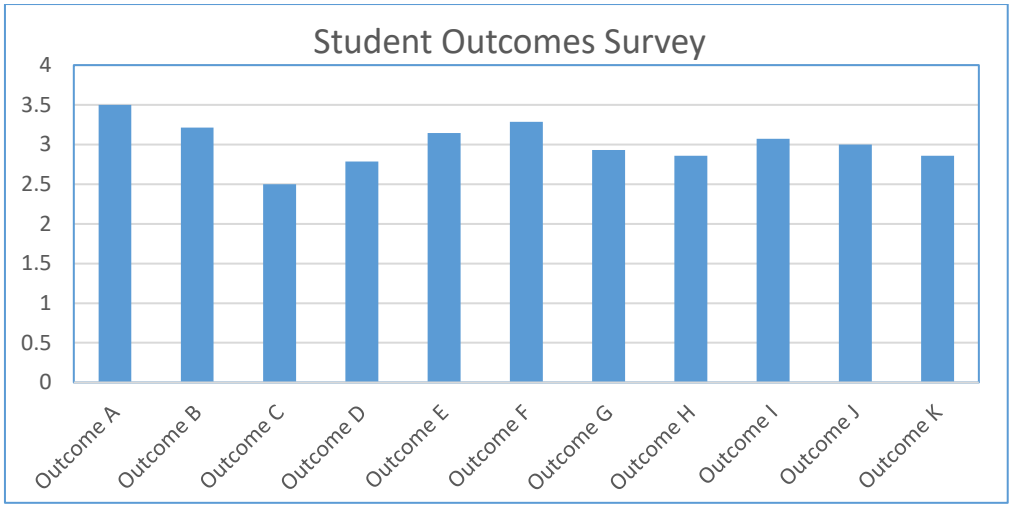


Figure 4.1: Student Outcomes Survey

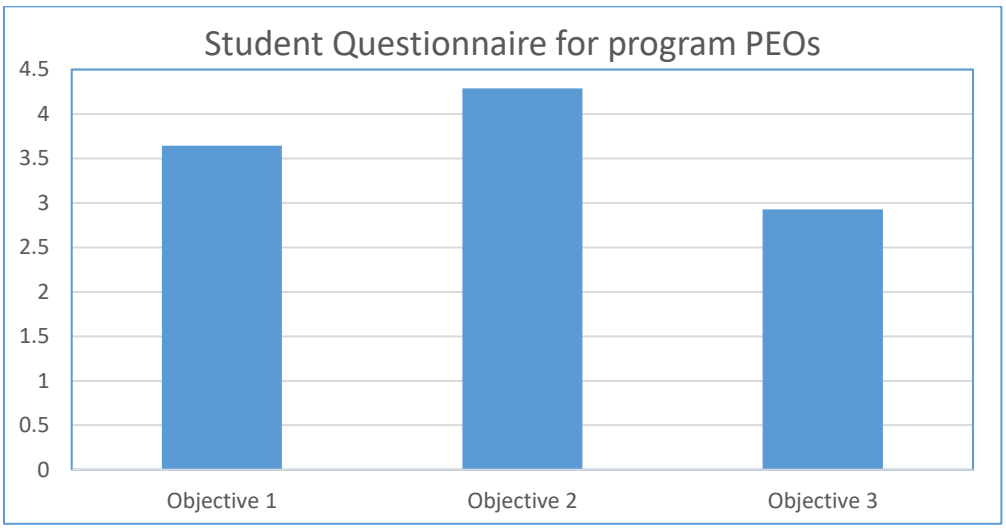


Figure 4.2: Student questionnaire for our program PEOs.

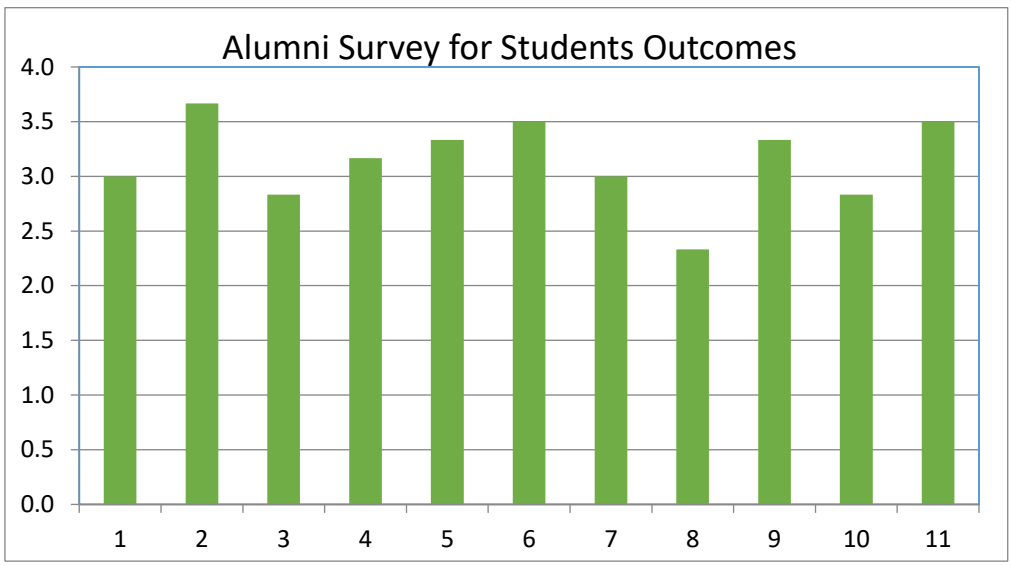


Figure 4.3: Alumni Outcomes Survey

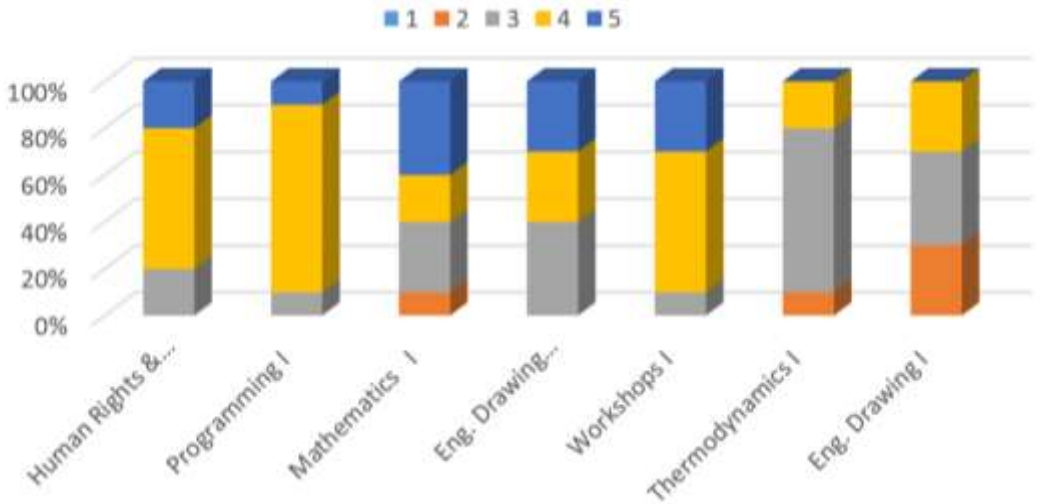


Figure 4.4: Student survey for the given courses (First Year)

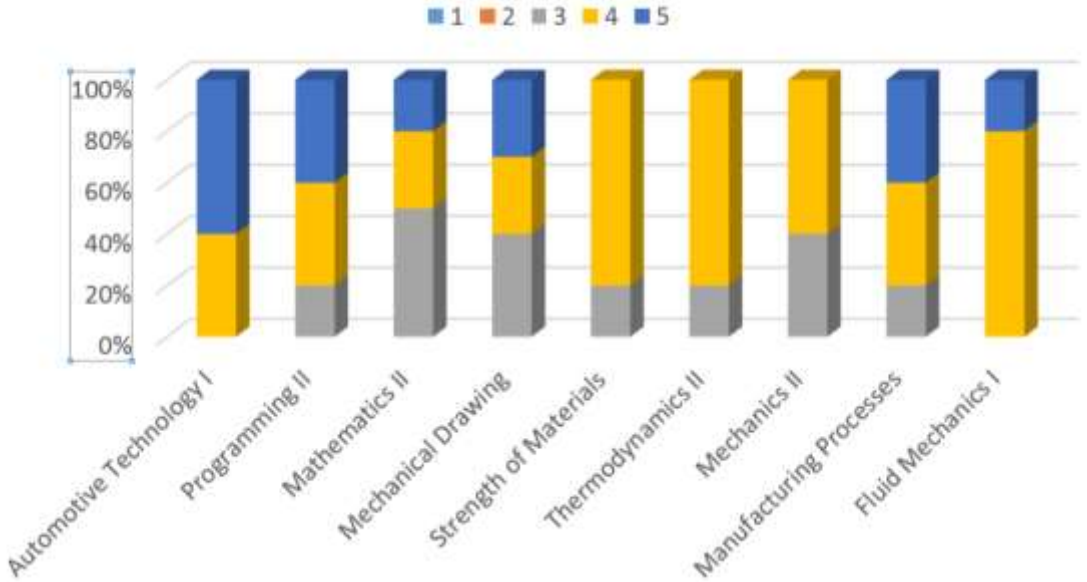


Figure 4.5: Student survey for the given courses (Second Year)

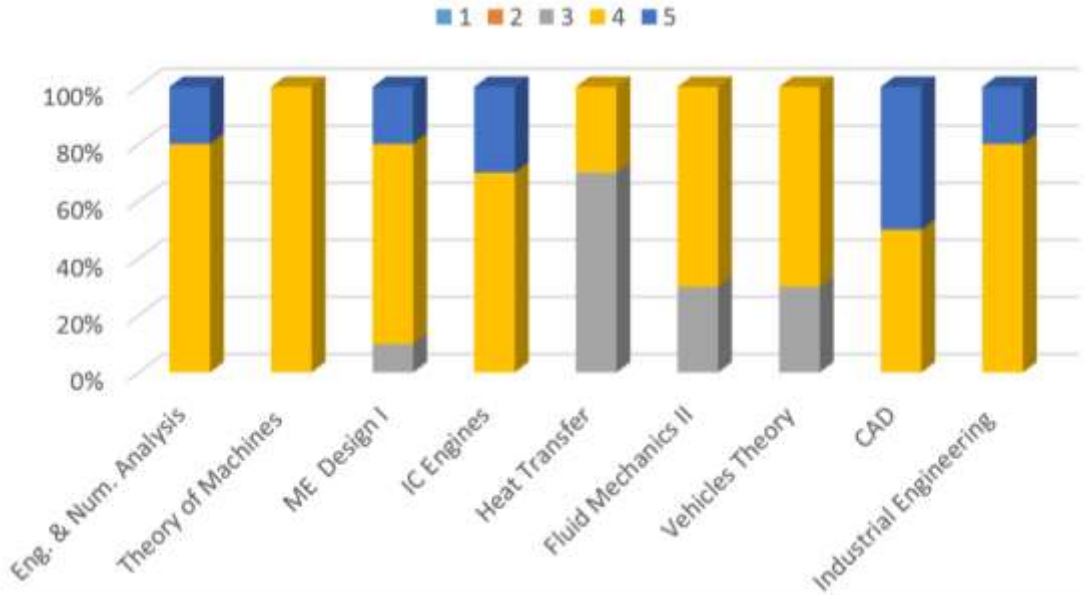


Figure 4.6: Student survey for the given courses (Third Year)

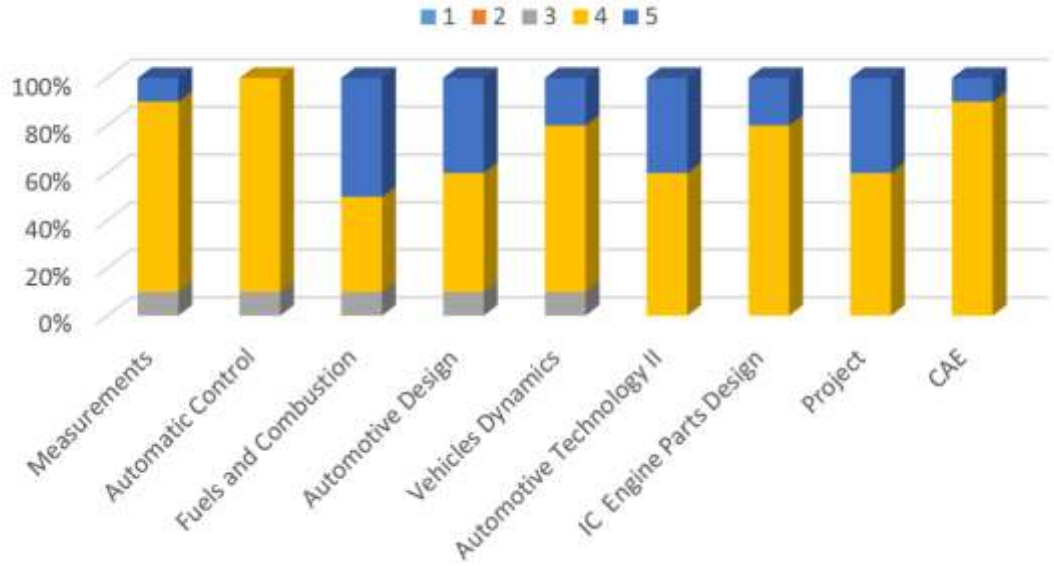


Figure 4.7: Student survey for the given courses (Fourth Year)

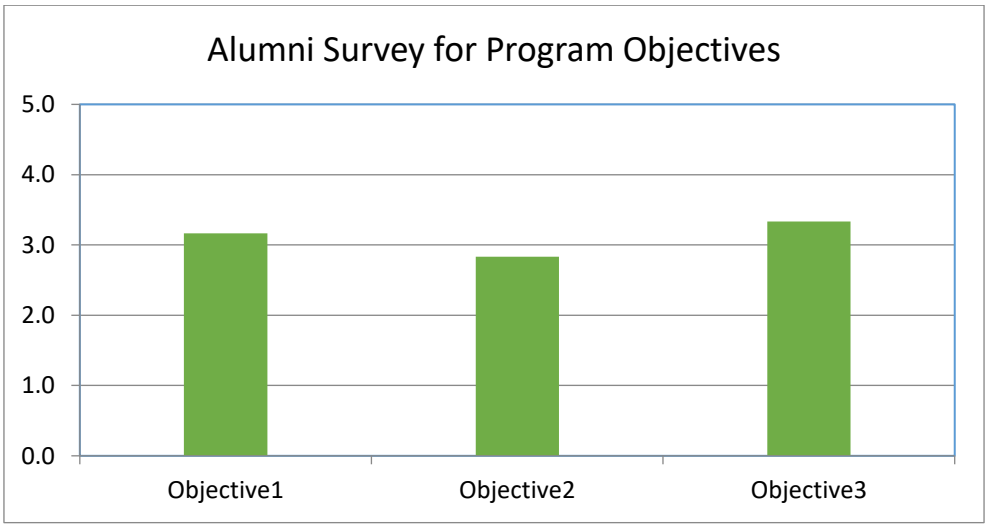


Figure 4.8: Alumni questionnaire for our program PEOs.

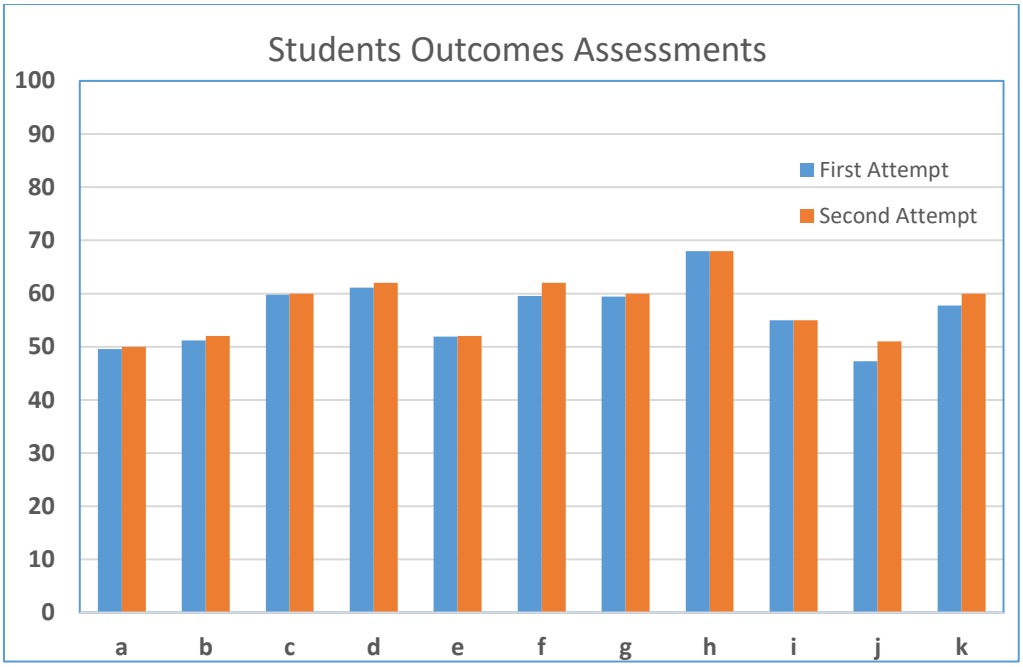


Figure 4.9: Students Outcomes Assessments for Automotive Engineering Program 2016-2017.

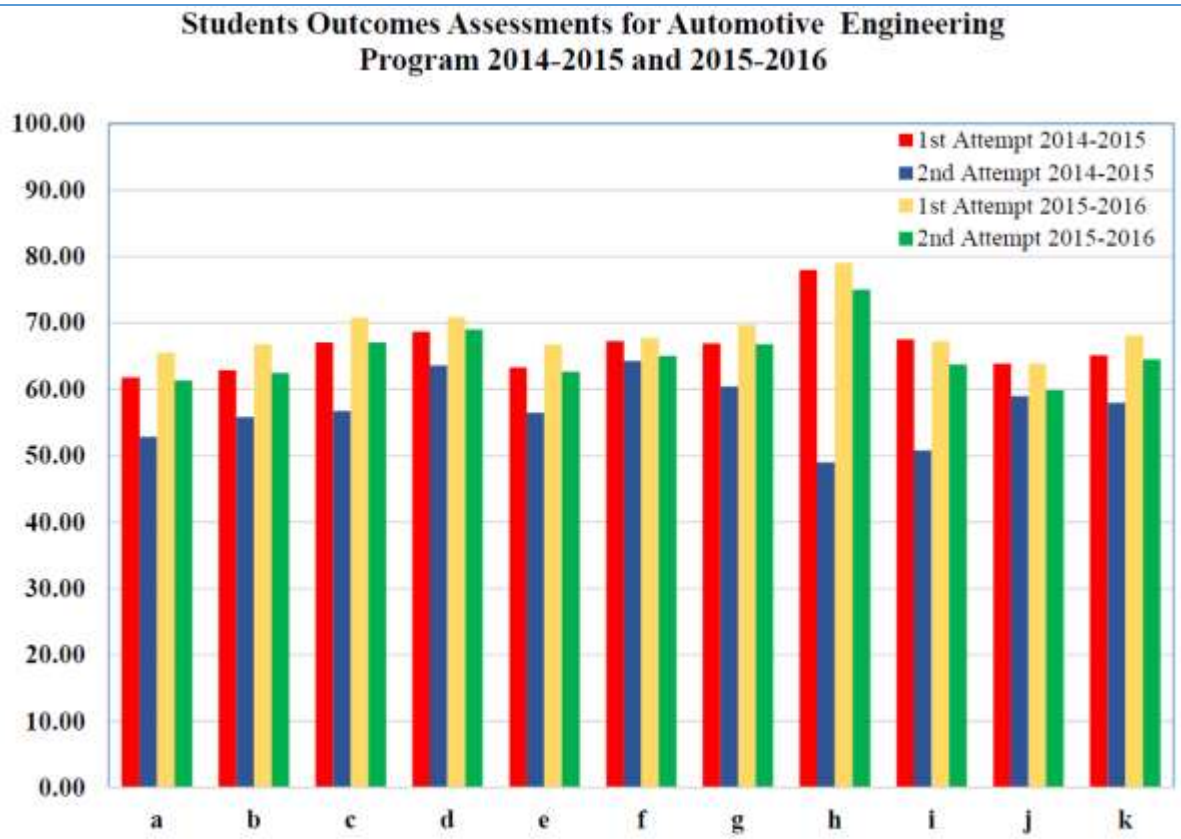


Figure 4.10: Students Outcomes Assessments for Automotive Engineering Program for Academic Year 2014-2015 and 2015-2016.

Students Outcomes Assessments for Automotive Engineering Program 2014-2015 and 2015-2016

Curriculum		Grade 2014-2015		Grade 2015-2016	
Code	Name	1st Attempt	2nd Attempet	1st Attempt	2nd Attempet
First Stage					
ME/111	Democracy & Human Rights	66	53	71	70
ME/221	Programming I	62	49	66	62
ME/321	Mathmatics I	58	59	66	62
ME/431	Eng. Drawing & Descriptive Geo.	62	48	64	61
ME/541	Workshops	71	71	71	71
ME/631	Thermodynamics I	59	48	63	59
ME/731	Mechanics I	59	47	66	61
ME/831	Properties of Material	66	59	68	63
ME/931	Electrical Engineering	60	56	62	59
Second Stage					
ME/172	Automotive Technology I	64	50	71	62
ME/222	Programming II	58	46	62	56
ME/322	Mathmatics II	60	46	60	55
ME/432	Mechanical Drawing	59	49	65	57
ME/542	Strength of Materials	59	46	74	65
ME/632	Thermodynamics II	54	44	58	53
ME/732	Mechanics II	51	49	61	56
ME/832	Manufacturing Methods	68	78	64	57
ME/942	Fluid Mechanics I	57	45	61	56
Third Stage					
ME/123	Engineering & Numerical Analysis	59	53	64	60
ME/243	Theory of Machines	59	50	62	58
ME/343	Mechanical Eng. Design I	65	51	64	60
ME/473	Internal Combustion Engines	60	56	61	59
ME/543	Heat Transfer	66	51	60	56
ME/673	Fluid Mechanics II	58	49	65	58
ME/773	Vehicles Theory	63	65	58	55
ME/823	Computer Aided Design	71	57	61	62
ME/913	Industrial Engineering	62	67	59	57
Fourth Stage					
ME/134	Measurements	57	56	62	61
ME/234	Automatic Control	66	52	68	66
ME/374	Fuels and Combustion	65	56	71	67
ME/474	Automotive Design	61	62	73	70
ME/574	Vehicles Dynamics	67	56	67	64
ME/674	Automotive Technology II	63	54	66	63
ME/774	Internal Combustion Engine Parts Design	74	74	82	80
ME/844	Project	76	76	79	77
ME/924	Computer Aided Eng.	78	49	79	75

CRITERION 5. CURRICULUM

A. Program Curriculum

1. Complete Table 5-1 that describes the plan of study for students in this program including information on course offerings in the form of a recommended schedule by year and term along with average section enrollments for all courses in the program over the two years immediately preceding the visit. If there is more than one curricular path, Table 5-1 should be provided for each path. State whether you are on quarters or semesters and complete a separate table for each option in the program.
2. Describe how the curriculum aligns with the program educational objectives.
3. Describe how the curriculum and its associated prerequisite structure support the attainment of the student outcomes.
4. Attach a flowchart or worksheet that illustrates the prerequisite structure of the program's required courses.
5. For each curricular area specifically addressed by either the general criteria or the applicable program criteria as shown in Table 5-1, describe how your program meets the specific requirements for this program area in terms of hours and depth of study.
6. If your program allows cooperative education to satisfy curricular requirements specifically addressed by either the general or program criteria, describe the academic component of this experience and how it is evaluated by the faculty.
7. Describe the materials (course syllabi, textbooks, sample student work, etc.), that will be available for review during the visit to demonstrate achievement related to this criterion.

B. Course Syllabi

Overview

Identifying the requirements of the curriculum in the fields of engineering does not only include specific topics (engineering), but also it has been taking into consideration the professional aspect which includes a combination of mathematics, general sciences and basic education. Engineering subjects consist of engineering sciences and engineering design appropriated to the specialization of student. Thus, the element of public education is complementary to the main content (technical) in the curriculum and fits with the objectives of the program and the department.

Table (5-1) shows the Curriculum with units in addition to the symbols and their depended hours for Mechanical Engineering Program, and laboratory course in addition to the addresses of graduation projects and textbooks.

TABLE 5-1 CURRICULUM
AUTOMOTIVE ENGINEERING PROGRAM

Course (Department, Number, Title) List all courses in the program by term starting with first term of the first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[2]	*Curricular Area (Credit Hours)*				Last Two Terms Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Discipline Specific Topics	General Education	Other		
Human Rights & Democracy	**R**			**2**		2016-2017	
Programming I	**R**	**2**				2016-2017	
Mathematics I	**R**	**3**				2016-2017	
Engineering Drawing & Descriptive Geometry	**R**			**4**		2016-2017	
Workshops	**R**	**6**				2016-2017	
Thermodynamics I	**R**		**4**			2016-2017	
Mechanics I	**R**	**4**				2016-2017	
Properties of Material	**R**	**2**				2016-2017	
Electrical Engineering	**R**	**3**				2016-2017	
FIRST YEAR							
Automotive Technology I	**R**		**5**			2016-2017	
Programming II	**R**	**2**				2016-2017	
Mathematics II	**R**	**3**				2016-2017	
Mechanical Drawing	**R**		**3**			2016-2017	
Strength of Materials	**R**		**3**			2016-2017	
Thermodynamics II	**R**		**4**			2016-2017	
Mechanics II	**R**		**3**			2016-2017	
Manufacturing Processes	**R**		**4**			2016-2017	
Fluid Mechanics I	**R**		**4**			2016-2017	

SECOND YEAR							
Engineering & Numerical Analysis	**R**	**3**				2016-2017	
Theory of Machines	**R**		**4**			2016-2017	
Machine Design I	**R**		**4**			2016-2017	
Heat Transfer	**R**		**4**			2016-2017	
Fluid Mechanics II	**R**		**4**			2016-2017	
Vehicles Theory	**R**		**4**			2016-2017	
Computer Aided Design	**R**			**4**		2016-2017	
Industrial Engineering	**R**		**2**			2016-2017	
Internal Combustion Engines	**R**		**3**			2016-2017	
THIRD YEAR							
Automotive Design	**R**		**4**			2016-2017	
Internal Combustion Engine Parts Design	**R**		**4**			2016-2017	
Measurement	**R**			**2**		2016-2017	
Automatic Control	**R**		**3**			2016-2017	
Automotive Technology II	**R**		**3**			2016-2017	
Vehicle Dynamics	**R**		**4**			2016-2017	
Fuels and Combustion	**R**		**4**			2016-2017	
Project	**R**		**4**			2016-2017	
Computer Aided Engineering	**R**	**4**				2016-2017	
FOURTH YEAR							
Add rows as needed to show all courses in the curriculum.							
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE		**123 hours per a week**				**3690 Hours for BSME-AE**	
PERCENT OF TOTAL		**26%**	**64%**	**10%**			

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

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

A sample of the course syllabi is given below for the first class of our program, full details of course syllabi are given in **Appendix 5.1**.

FIRST CLASS

Dept.	Course Number/ Title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME 221 Programming I	R	none	2 Hrs.	Engineering	A,B,D,F,H

Course (Catalog Description)

This guide provides an introduction to computer programming in the Fortran 90 programming language. The elements of programming are introduced in the context of Fortran 90 and a series of examples and exercises is used to illustrate their use.

Course Text

المرجع الاساس في برمجة وتطبيقات لغة البرمجة فورتران 90. د. عوض منصور د. محمود اباظة

Course Objectives

The aim of the course is to provide sufficient knowledge of programming and Fortran 90 to write straightforward programs.

Topics Covered

Week	Contents	المحتويات	الأسبوع
1	**Introduction** - Hardware And Software Computer Units	**مقدمة للحاسبة** - المكونات المادية والبرامجات للحاسبة و كيفية عملها	1
2	**Introduction to programming** - Problems Solution With Programming	**مقدمة في البرمجة** - التفكير البرمجي في حل المسائل,لغات البرمجة المختلفة	2
3	**Flow charts** - Flow Charts For Different Programming Examples Solution	**المخططات الانسيابية** - المخططات الانسيابية لحل المسائل البرمجية	3
4	- Flow Charts For Different Programming Examples Solution	- المخططات الانسيابية لحل المسائل البرمجية	4
5	**Fortran 90 programming language** - Introduction To Fortran 90	**لغة البرمجة فورتران 90** - مقدمة للغة البرمجة فورتران 90	5
6	- Introduction To Fortran 90	- مقدمة للغة البرمجة فورتران 90	6
7	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	7
8	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	8

9	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	**9**
10	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**10**
11	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**11**
12	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**12**
13	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**13**
14	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**14**
15	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**15**
16	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**16**
17	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**17**
18	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**18**
19	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**19**
20	- Loops	- التكرار (تمارين مختلفة)	**20**
21	- Loops	- التكرار (تمارين مختلفة)	**21**
22	- Loops	- التكرار (تمارين مختلفة)	**22**
23	- Loops	- التكرار (تمارين مختلفة)	**23**
24	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**24**
25	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**25**
26	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**26**
27	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**27**
28	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**28**
29	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**29**
30	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**30**

Lab Experiments

No.	Experiments
1-	A program to find square area.
2-	Program to use some intrinsic functions.
3-	To generate integer numbers (1 ... 100) with out using (Read statement).
4-	To generate even integer numbers (1 ... 100) with out using (Read statement).
5 -	To generate odd integer numbers (1 ... 100) with out using (Read statement).
6-	To use sine , cosine and tangent functions to get values for some angles without using (Read statement).
7-	To use Ohm law for some current values without using (Read statement).
8-	To generate integer numbers (1 ... 1000) that are multiple of (5) with out using (Read statement) and use the rule of multiplication.
9-	Using Fortran programming language to solve

	$Y = \sum_{k=1}^{k=n} X^k$
10-13	Using Fortran programming language to solve some power series
14-	Using Fortran programming language to calculate the average of 50 temperature .
15-	Using Fortran programming language to use the arrays, calculate the average and using conditional IF statement.
16-	Using Fortran programming language to use the arrays and reversing the array contents inside the same array
17-	Using Fortran programming language to find maximum and minimum temperatures
18-	Using Fortran programming language to print "slow". Medium" and "fast" depending on vehicle speed.

Dept.	Course Number/ Title	Req./ Elect	Prerequisite(s)	Class/ Lab. Schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	321/Math I	R	ME115	3	Engineering	A, B,D & K

Course (Catalog Description)

All lectures reflect the higher values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalization and choice.
In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.
This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

Course Objectives

Antun H, Bevins I, Davis S, Calculus, 7th edition, Von Hoffman Press, 2002.
Thompson S P, Gardner, Deferential Calculus and the Integral Calculus, ST. Martain's Press, New York, 1998.
Bird J, Engineering Mathematics, 4th edition, Newness, Great Britain, 2003.

Aims of the Course:
-To provide a course of high academic quality in Mathematics in a challenging and supportive learning environment that encourages students to reach their full potential, personally and academically.
_ to provide a course that is suitable both for students aiming to pursue research and for students going into other careers;
_ to provide an integrated system of teaching which can be tailored to the needs of individual students;

_ to develop in students the capacity for learning and for clear logical thinking;
_ to continue to attract and select students of outstanding quality;
_ to provide an intellectually stimulating environment in which students have the opportunity to develop their skills and enthusiasms to their full potential;

Topics Covered

No.	Contents	المحتويات
1-	Cartesian Coordinates, Slope of a line, Equations and distances, Graphs of equations	- الأحداثيات - ميل الخط المستقيم - انواع المعادلات والمسافات بين النقط
2-	Limits and intervals, Continuity test, Domain and Range	- رسم الدوال المختلفة - الغايات والفترات
3-	Elementary Operations with matrices	**المصفوفات** مقدمة وتعاريف
4-	Transpose and inverse of matrices	**المحددات والخواص** خواص المصفوفات ونقل المصفوفات
5-	Solution of system of equations using Gramer's rule method	حل مجموعة من المعادلات بطريقة قاعدة كرامر
6-	Introduction to complex numbers	مداخل الى الأعداد المركبة
7-	Argrand diagrams and product quotients	مخطط اركراند والضرب والقسمة
8-	Powers and roots	الأسس والجذور
9-	Properties and roots	خواص الجذور
10-	Cauchy-Riemann equation	معادلة كاتوشي-ريمية
11-	Properties, rules and graphing	خواص وقواعد ورسم
12-	Properties and rules	خواص وقواعد
13-	Graphing, rules and properties	
14-	Rules of derivatives, Chain rule and implicit derivatives	**مشتقات الدوال** قوانينها، قاعدة السلسله، المشتقات الضمنية
15-	Rules of derivatives of logarithmic and exponential functions	**مشتقة الدوال الأسية واللوغارتمية** - قوانينها
16-	Derivatives of trigonometric and inverse trigonometric functions	**مشتقة الدوال المثلثية** - قوانينها **مشتقة الدوال المثلثية العكسية** - قوانينها
17-	Derivatives of hyperbolic and Inverse hyperbolic functions	**مشتقة الدوال الزائدية** - قوانينها **مشتقة الدوال الزائدية العكسية** - قوانينها
18-	L'Hapital rule, Velocity and acceleration, , Max. and Min. and point of inflection	**تطبيقات المشتقة** - قاعدة اوبيتال - ميل المنحني
19-	Integration formulas and integration of logarithmic, exponential trigonometric and inverse trigonometric functions	**تطبيقات ـاخرى** - والسرعة والتعجيل - النقطة العظمى والصغرى
20-	Integration of Hyperbolic and Inverse hyperbolic functions	**التكامل غير المحدد** - صيغ التكامل - تكامل الدوال الأسية واللوغارتمية
21-	Integration by parts and integration for odd and even powers of sine and cosine	**تكامل الدوال المختلفة** تكامل الدوال المثلثية والمثلثية العكسية

22-	Trigonometric Substitutions and integral involving $a\,x^2 + b\,x + c$	**تكامل الدوال اخرى** - تكامل الدوال الزائدية والزائدية العكسية
23-	Partial fractions and rational functions of *sinx* and *cosx* and other trigonometric functions	**طرق التكامل** - التكامل بالتجزئه - تكامل الأس الزوجي والفردي للجيب والجيب تمام
24-	Definite integral and area	**تكامل التعويضات المثلثية** -التعويضات المثلثية تكامل الصيغة $ax^2 + bx + c$
25-	Length of the curve and surface area	**تجزئة الكسور والدوال النسبية** - التكامل بتجزئه الكسور - تكامل الدوال النسبية للدوال المثلثية
26-	Triple Integrals (volume)	**تطبيقات التكامل** - التكامل المحدد والمساحة تحت المنحني المنفرد
27-	Area between two curves	**تطبيقات عامة** طول المنحني والمساحة السطحية
28-	Vector in space, parallel vectors and product of vectors	**المتجهات** - المتجهات في الفراغ وتوازي المتجهاتو ضرب المتجهات
29-	Triple product, volume of box and projection of two vectors	**تطبيقات مختلفة** - الضرب الثلاثي وحجم المكعب واسقاط متجهيين وتطبيقات اخرى
30-	Quiz, answers and solutions	**تعويضات عامة وامتحانات مفاجئه** - حل اسئلة الأمتحانات السابقة ومراجعة

Department	Course Number/Title	Req./Elect.	Class/ Lab. Schedule	Contribution to Prof. component	Relevant program outcomes
Mechanical Engineering	ME/ 631 Thermodynamics 1	R	Theor : 2 Tutor : 1 Pract : 1	Engineering	ABET: a,b,c,f,g

Course prerequisites

Differential and integral calculus, basic physics and chemistry, good command of English language, high skills in computer and communication facilities.

Course description

Description of the substance and phases including the theories dealing with the analytical formulation of their properties. Description of the thermal system and its surrounding with interaction characteristics between them. Awareness of units and dimensions in standard systems of units. Definition of Energy and its forms, transformation means and tools. Mathematical formulation of First and second law of thermodynamics and their limitations. Application of the physical and mathematical concepts to thermodynamic processes and

evaluating their impacts on performance and developing techniques. Distinguishing between real and theoretical processes.

Course textbook

اساسيات داينمك الحرارة ، د. رحيم جوي محي ، الطبعة الاولى ، مطبعة الجامعة التكنولوجية ، 2008.

Course references

1. Thermodynamics: An Engineering Approach; by Yunus A. Cengel & M. Boles.
2. Basic Engineering Thermodynamics; by F.J.Wallce & W.A.Linning.

Course objectives

- Using dimensions and units in the description of the basic and derived physical quantities.
- Using and converting between international unit systems.
- Realizing phase change process and subject it to energy production procedures.
- Evaporation and condensation concept utilization in energy transfer in boilers and heat exchangers.
- Mathematical formulation of the transitional and stored energies specification as they changed during any process.
- Formulation for heat and work transfer in thermodynamic process and deriving the governing property change.
- The engineering application of power and refrigeration cycles.
- Applying the heat engine concept with performance assessment criteria.
- Energy degradation concept during transformation and transferring, as well as, the methods used to control the processes inherent losses.
- Using entropy as a measure for energy degradation while transferred and realizing the entropy minimization principle.

Topics covered

No.	**Contents**	المحتويات
1	Units & dimensions.	التعامل مع نظم الوحدات
2	Basic definitions.	التعاريف الاساسية
3	System and processes.	النظام الحراري والعمليات الثرموديناميةة
4	Zeroth law.	القانون الصفري للحرارة
5	Temperature scales.	درجة الحرارة وتدريجاتها
6	Energy.	الطاقة وانواعها.
7	Heat and specific heat capacity.	الحرارة و الحرارة النوعية.
8	Work and its types.	الشغل وانواعه.
9	Working substance.	خصائص مادة العمل.
10	Perfect gas law.	معادلة الحالة للغاز المثالي.
11	Real gases.	الغاز الحقيقي.
12	Energy conservation.	مبدا حفظ الطاقة.
13	Energy as system property.	الطاقة خاصية النظام.
14	First law of thermodynamics and	القانون الاول لديناميك الحرارة وموازنة الطاقة.

	Energy balance.	
15	Non-flow energy equation.	معادلة الطاقة لحالة اللاجريان.
16	Application of N.F.E.E. to closed systems.	تطبيق معادلة الطاقة لحالة اللاجريان على الانظمة المغلقة.
17	Steady-flow energy equation.	معادلة الطاقة للجريان المستقر.
18	Application of S.F.E.E. to open systems.	تطبيق معادلة الطاقة للجريان المستقرعلى الانظمة المفتوحة.
19	Heat engine and thermal efficiency.	الماكنة الحرارية والكفاءة الحرارية.
20	Reversed heat engine and COP.	الماكنة الحرارية المعكوسة ومعامل الاداء.
21	Reversibility and 2nd law of thermodynamics.	القانون الثاني لديناميك الحرارة والانعكاسية.
22	Carnot cycle for power and reversed Carnot cycle for refrigeration.	دورة كارنو للقدرة و دورة كارنو المعكوسة للتبريد.
23	Entropy and energy degradation.	الانتروبي ومفهوم انحطاط الطاقة.
24	Entropy as system property.	الانتروبي خاصية النظام.
25	Entropy equations for gases.	معادلات الانتروبي للغازات.
26	Entropy change in thermodynamic processes.	تغير الانتروبي في العمليات الثرموديناميكية.
27	Isentropic efficiency.	الكفاءة الايزنتروبية.
28	Molecular structure of elements, compounds and mixtures.	التركيب الجزيئي للعناصر والمركبات الكيمياوية والخلائط الغازية.
29	Avogadro's hypotheses / Dalton's law / Gibbs-Dalton law / Amagat's law.	نظرية افوكادرو \ قانون دالتون \ قانون جبس – دالتون \ قانون اماكات.
30	Volumetric & gravimetric analysis.	التحليل الحجمي والتحليل الوزني للخلائط الغازية.

Lab Experiments

1	Boyles' law	تطبيق قانون بويل
2	Specific heat capacity	حساب الحرارة النوعية
3	Measurement of for Oxygen	قياس نسبة الحرارتين النوعيتين لغاز الاوكسجين
4	Mechanical Heat Pump	المضخة الحرارية الميكانيكية
5	Stirling engine	ماكنة سترلنك
6	Calorific value of gaseous fuel	حساب القيمة الحرارية لوقود غازي

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. Schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical engineering	ME\831	R		2 hrs practice	Engineering	ABET: A,B, C, G

Course (Catalog Description)

The basic purpose of this course is to introduce 1st year Mechanical Students to the concepts of material properties through the study ofmaterial crystallization, mechanical tests and the heat treatments.

Course Text

Applied physical metallurgy –H- Higgins

Course Objectives

The basic purpose of this course is to introduce 1st year Mechanical Students to the concepts of material properties through the study ofmaterial crystallization, mechanical tests and the heat treatments.

Topics Covered

No.	Contents	المحتويات
1-	**Introduction** -Introduction to ores, elements and materials -Iron ores -Periodic table of elements -Engineering materials.	**المقدمة** مدخل الى الخامات والعناصروالمواد - خامات الحديد - الجدول الدوري للعناصر - المواد الهندسية. -
2-	**Classification of engineering materials** -Metallic and non metallic -Ferrous and non ferrous -Natural and synthetic materials	**تصنيف المواد الهندسية** معدنية وغير حديدية - حديدية وغير حديدية - مواد هندسية طبيعية وصناعية -
3-	**Crystal structure** Atomic arrangement BCC, FCC and HCP structures Atomic packing factor.	**التركيب البلوري** الترتيب الذري - المكعب المركزي الجسم - المكعب المركزي الوجه والسداسي المحكم - - معامل الرص الذري
4-	**Imperfections in crystals** - point defects - dislocations and grain boundaries - solidification of materials and alloys	**عيوب البلورات** العيوب النقطية - الانخلاعات وحدود الحبيبات - تصلب المعادن والسبائك -
5-	Structure of ingots chilled - columnar and central equi-axed grains - dendritic segregation	**بنية الصبات** منطقة الحبيبات المصقة والطولية - والمركزية تصلب المعادن والسبائك -
6-	**Thermal equilibrium dagrams** - solubility in the solid state - phases - solid solutions, compounds and mechanical mixtures	**مخططات الاتزان الحراري** قابلية الذوبان في الحالة الصلبة - الاطوار - المحاليل الصلبة والمركبات والخليط - الميكانيكي.
7-	Lever rule - Eutectic, Eutectoid and Periteetic reactions.	**قاعدة العتلة** التحولات اليوتكتيكية واليوتكتويدية والحلقية -
8-	Applications on binary phase diagrams - components completely soluble, completely insoluble or partially soluble in the solid state.	**تطبيقات على مخططات الاتزان الحرارية** مكونات السبيكة تامة الذوبان او عديمة - الذوبان او جزئية الذوبان في الحالة الصلبة

9- 10-	**Mechanical properties of metals** - specifications and standards - normal stress and shear stress - strain - tensile and compression test -stress-strain diagram Hardness tests: brinell, Rockwell and Vickers -impact tests: izod and charpy	الخواص الميكانيكية للمعادن - المواصفات القياسية - الاجهاد العمودي واجهاد القص - الانفعال - اختبارات الشد والضغط - منحني الاجهاد – والانفعال - اختبارات الصلادة برينيل وروكويل وفكرز - اختبارات الصدمة: ايزود وجاربي
11-	**Application on mechanical testing and properties** - determination or young modulus - yield stress - proof stress - ultimate tensile strength - fracture stress, ductility - hardness and impact toughness	**تطبيقات على الاختبارات الميكانيكية والخواص** حساب معامل يونك - اجهاد الخضوع - - االجهاد الصمود - مقاومة الشد القصوى - اجهاد الكسر والمطيلية - الصلادة ومتانة الصدمة
12-	**Iron and steel** - Fe-Fe3c phase diagram - Allotropy - microstructure of carbon steels - Effect of carbon content on microstructure and mechanical properties of carbon steel.	**الحديد والصلب** مخطط اطوار الحديد- كاربيد الحديد - ظاهرة تعدد الاطوار - - االبنية المجهرية للصلب الكاربوبي - تاثير المحتوى الكاربوني على البنية المجهرية والخواص الميكانيكية للصلب
13-	**Carbon steel** - types, properties and uses of carbon steel. - low, medium, and high carbon steel - tool carbon steel	**الصلب الكاربوني** انواع وخواص واستخدامات الصلب - الكاربوني - الصلب المنخفض والمتوسط والعالي الكاربون - صلب العدد الكاربوني
14- 15-	**Cast iron** - types, properties and uses of cast iron. - white, grey, nodular and malleable cast iron	**حديد الزهر** انواع وخواص واستخدامات حديد الزهر - حديد الزهر الابيض, الرمادي, المتكور - والمطاوع.
16- 17-	**Heat treatment of steel** - non- equilibrium cooling - TTT diagrams - Annealing, normalizing, hardening and tempering of steel.	المعاملات الحرارية للصلب - التبريد غير الاتزاني TTT- مخططات - تلدين ومعادلة وتقسية ومراجعة
18-	**Alloy steel** - role of alloying elements - types, properties and uses stainless steel and	**الصلب السبائكي** دور عناصر السبك - انواع وخواص واستخدامات الصلب السبائكي

	high speed tool steel-.	
19- 20-	**Copper and its alloys** - classification - properties - uses - brasses and bronzes	النحاس وسبائكه - انواعه - خواصه - استخداماته - النحاس الاصفر والبرونز
21- 22-	**Aluminum and its alloys** - classification - properties - uses - aging and precipitation hardening	الالمنيوم وسبائكه - انواعه - خواصه - استخداماته - التعتيق والتصليد بالترسيب
23- 24-	**Nano materials** - characterization of nano particles and nano structures - classifications - applications of nano materials in technology and medicine.	المواد متناهية الصغر - توصيف الجسيمات الدقيقة والتراكيب متناهية الصغر - التصنيف - تطبيقات المواد الدقيقة في الصناعات التقنية والطب.
25- 26-	**plastics** - introduction to plastics technology - microstructure and polymerization - structure of plastics materials - classification, properties and uses of plastics.	اللدائن - مقدمة لتقنيات اللدائن - البنية الداخلية والبلمرة -تركيب المواد اللدائنية - انواع وخواص واستخدامات اللدائن
27- 28-	**Ceramics and glass** - structure, defects, properties and uses of ceramics. - structure, properties and uses of glasses.	السيراميك والزجاج - تركيب وعيوب وخواص واستخدامات السيراميك -تركيب وخواص واستخدامات الزجاج
29- 30-	**Composite materials** - classification: metal matrix, ceramic matrix and polymer matrix	المواد المركبة تصنيفها: الخلفية المعدنية او السيراميكية او البوليمرية - طور التقوية: الياف او رقائق او جسيمات -التركيب والكسر الحجمي للمواد المركبة - خواص واستخدامات المواد المركبة.

CRITERION 6. FACULTY

A. Faculty Qualifications

Describe the qualifications of the faculty and how they are adequate to cover all the curricular areas of the program and meet any applicable program criteria. This description should include the composition, size, credentials, and experience of the faculty. Complete Table 6-1. Include faculty resumes in Appendix B.

Name	Ahmed Naif Ibrahim Al-khazraji			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Applied mechanics (vehicle dynamics)	Antonin Zapociky Academy	1986
	M.Sc.	Applied mechanics (vehicle dynamics)	Antonin Zapociky Academy	1982
	B.Sc.	Mechanical engineering	Baghdad University	1976

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Mechanical engineering (vehicle engineering division)	Associate Professor	Instructor	1986	FT

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations
Iraqi Engineers Association
Current membership in professional organizations
Honors and awards
1- The second symposium for nano materials in bio- medical applications/ nanotechnology and advanced materials research center/ U.O.T
Service activities (within and outside of the institution)
1- Member of the Post graduate and scientific research committee/ Dept. of mechanical engineering 2-Head of educational and health extension 3-Member of (PBL) / University of technology. 4- representative of IREX organization / Dept. of mechanical engineering
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
1. Effect of Heat Treatment on Notch Sensitivity Factor for Aluminum Alloys. Eng.& Tech. Journal ,Vol.28, No.3,2010. 2. Effect of heat treatment on fatigue life of aluminum alloys 2024 and 7075. Eng. & Tech. Journal, Vol.28, No.22, 2010. 3. Residual stress effect on fatigue behavior of 2024- aluminum alloy. Eng. & Tech. Journal ,Vol.29, No.3, 2011.

4. Mechanical properties of polyester fiberglass as a composite material used in a vehicle under dynamic loading.
5. Formation of compressive residual stresses by shot peening for spot welded stainless steel plates. Eng. &Tech .Journal, Vol.31, Part (A), No.11, 2013.
6. FE Analysis of residual stresses induced by spot welding of stainless steel type AISI 316. Eng. & Tech. Journal , Vol. 32, Part (A), No.2, 2014.
7. Influence of low temperature on the dynamic response of laminated composite material subjected to impact load. IJCET, Vol.3, No.3 August-2013.
8. Effect of fiber-reinforced type on the dynamic behavior of composite plate. IJSER Vol.4, Issue 9, September-2013.
9. Determination the optimum shot peening time for improving the buckling behavior of medium carbon steel. Eng. & Tech. Journal , Vol.32,Part (A), No.3, 2014.
10. Study the influence of shot peening time on buckling behavior of medium carbon steel CK35 under dynamic loading (experimentally and numerically). IJCET 2014.
11. Effect of shot peening on the endurance limit of fiber glass composite material. IJSER Vol.5, Issue 3, March-2014.
12. Effect of shot peening on dynamic buckling critical load parameter produced for carbon steel columns.Journal of Babylon University, Vol.22,No.3,2014.
13. Experimental Modeling and optimization of Fatigue Life and Hardness of Cabon Steel CK35 under Dynamic Buckling.Exceptance Letter.Journal of Al-Khwarizmi,2014.
14. Comparison of Fatigue Life Behaviour Between Two Different Composite Materials Subjected to Shot Peening at Different Times.Exceptance Letter.Journal of Al-Khwarizmi.2014.
15. Study the Effect of the Graphite Powder Mixing Electrical Discharge Machining on Creation of Surface Residual Stresses for AISI D2 Die Steel Using Design of Experiments, Eng.Technology journal, accepted letter No.1058 at 24/5/2015.
16. Prediction of Surface Roughness, Material Removal Rate and *Tool Wear Ratio Models for SiC Powder Mixing EDM, engineering and development journal, No.4693 at 31/5/2015.*
17. Studying and Modeling the Effect of Graphite Powder Mixing Electrical Discharge Machining on the Main Process Characteristics, Alkhwarizmi collage of engineering, no 207 at 11/5/2015
18. Surface residual stresses induced by shot blast peening after EMD of AISI D2 Die steel using two types of Electrode.INPRESSCO, Vol5, No.1, (Feb 2015).
19. Effect of different types of electrodes on surface residual stresses induced by DEM process for AISI D2 Die steel, IJESRT, Vol.4, No.1, (Jan 2015).
20. Effect of SiC powder mixing (PMEDM) on surface residual stresses using copper and graphite electrodes, Elixir 80(2015).
21. Enhancement of endurance limit of fiber glass composite material due to shot peening process, engineering and development journal, accepted letter No. 8424, at 25/12/2015.
22. Study the influence of shot peening time on buckling behavior of medium carbon

steel (CK35) under dynamic loading, the Iraqi journal for mechanical and materials engineering, accepted letter, No. 3206 at 21/10/2014.

23. Formation of compressive residual stress by face milling steel AISI1045, Al-Khwarizmi, accepted letter No.400 at 22/10/2014.
24. Dynamic behavior investigation of laminate composite plate, the Iraqi journal for mechanical and materials engineering, accepted letter, No.3269 at 13/1/2015.
25. The effect of shot peening on the notch sensitivity factor and Neuber characteristic length for 7075-T6 Aluminum alloy, accepted letter No.581 at 21/1/2015.

Briefly list the most recent professional development activities

1-Team Leader to prepare for design day / Dept. of mechanical engineering
2-patented in finding a new method to improve the mechanical properties of composite material.

Name	Asst. Prof. Dr. Mahmoud A. Mashkour			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Heat Engines/ Internal Combustion Engines	Saint Petersburg State Polytechnic University/ Russia	2004-2005
	MSc.	Power Generation.	University of Technology	1994-1995
	BS	Mechanical Eng.	University of Technology	1989-1990

Academic experience

Institution	Rank	Title	When	Full time or Part time
Automobile Engineering Division	Assist. Prof.			FT

Non-academic experience

Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Iraqi Engineers Association

Current membership in professional organizations

Honors and awards

- Greater than 25 -Acknowledgment from the Minister of Higher Education of Iraq, the President of University of Technology and Dean of Mechanical Engineering Department for scientific efforts.
- University Shield – 2012

Service activities (within and outside of the institution)

- Member in M.Sc. and Ph.D. examining committees.
- Director of laboratories, Department of mechanical Engineering, University of Technology, (2006-2009).
- Registration Director, Department of mechanical Engineering, University of Technology, (2012-2013).
- Supervision of combustion Laboratory.
- Participation in various committees such as examinations, field training, scientific, syllabus organization.

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

1. Analytical Investigation to Predict the Intake pipe Diameter in Naturally Aspirated Internal Combustion Engine- Journal of Applied Sciences, 2012: 161-167.
2. Two zone model simulating the combustion process of dual fuel in S.I.E.- Scientific Conference of Energy and Renewable Energy Applications-2011.
3. Effect of Diesel Fuel Sources on Engine Emissions – Association of Arab Universities Journal-2012.
4. Study the Effect of Ceramic Coating on the Performance and Emissions of Diesel Engine - Journal of Engineering University of Baghdad-2012.
5. The effect of ceramic coating on performance and emission of diesel engine operated on diesel fuel and biodiesel blends - Journal of Engineering University of Baghdad-2014.
6. Heat Transfer in a Partially Opened Cavity Filled with Porous Media - 3rd Scientific International Conference - 2012.
7. Natural convection in a partially Opened Box Filled with a Porous Medium - Journal of Engineering University of AL-Qadisiyia, 2014.
8. Experimental Study of Forced Convection Heat Transfer in a Partially Opened Box Filled with Porous Medium - ICEIT2012, Torento, Canada, 2012.

Briefly list the most recent professional development activities

- Coordinator of the Scientific Promotion Committee, Department of mechanical Engineering, University of Technology, (2014- Now).

Name	Abed-Alkadom Mohammed Hasan Hadi			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Mechanical Engineering	University of Technology	2006
	MSc.	Mechanical Engineering	University of baghdad	1996

	BS	Mechanical Engineering	University of Technology	1984

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Mechanical Engineering Division	Ast. Prof.	Instructor	1996	FT

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations
Current membership in professional organizations
Iraqi Engineers Association
Honors and awards
Service activities (within and outside of the institution)
Member of higher education committee 2014
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
Pollutants of continuous combustion chamber J. of Engineering 2013
Briefly list the most recent professional development activities

Name	Mohsin Noori Hamzah			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Mechanical Engineering-Applied mechanics	Baghdad University	2007
	M.Sc.	Mechanical Engineering-Applied mechanics	Al-Nahrain University	1996
	B.Sc.	Mechanical engineering	Baghdad university	1993

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Mechanical engineering	Associate Professor	Dr	2012	FT

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Current membership in professional organizations
Iraqi Engineering Union ASME International

Honors and awards

Service activities (within and outside of the institution)

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

1. Mohsin N. Hamzah, Mahmood S. Nima, "Experimental and Numerical Investigations of an Inflated Air-Spring Made of Fiber-Reinforced Rubber", *AL-Qadisiya Journal for Engineering Sciences*, Vol. 8, No. 3, 2015.
2. Mohsin N. Hamzah, Mahmood S. Nima, "Visco-Hyperelastic Constitutive Modelling For Fiber Reinforced Rubber Composites", *3rd International Scientific Conference*, Hilla-Babylon, IRAQ, 20-21 May 2015.
3. Mohsin N. Hamzah, Mahmood S. Nima, **"**Hyperelastic Constitutive Modelling for Fiber-Reinforced Rubber Materials", *1st International Conference on Engineering Scienes' Applications*, Holy Kerbala, 24-25 December, 2014.
4. Mohsin N. Hamzah, "Viscoelastic Response of the Thorax Under Dynamic Loading", *AL-Qadisiya Journal For Engineering Sciences*, Vol. 7, No. 3, 2014.
5. Mohsin N. Hamzah, Shibly A. Al-Samarraie, & Yasir K. Abbas, "Full Order Sliding Mode Control Design for Vehicle ABS System", *The Second Engineering Conference of Control, Computers and Mechatronics* (ECCCM), Baghdad, IRAQ, February 25-27, 2014.
6. Mohsin Hamzah, Damien Subit, Sourabh Boruah, Jason Forman, Jeff Crandall, *et al.*, "An Inverse Finite Element Approach for Estimating the Fiber Orientations in Intercostal Muscles", *IRCOBI Conference 2013*, Gothenburg, Sweden.
7. Mohsin N. Hamzah, Asia Abdulsattar Al-Abadi, "Nonlinear Visco-Hyperelastic Constitutive Modeling for Filled Elastomeric Materials", *AL-Qadisiya Journal For Engineering Sciences*, Vol. 6, No. 4, 2013.
8. Mohsin N. Hamzah, Asia Abdulsattar Al-Abadi, "Effect of Carbon Black Type on the Mechanical Behaviour of Elastomeric Material", *AL-Qadisiya Journal For Engineering Sciences*, Vol. 6, No. 3, 2013.
9. Mohsin N. Hamzah, Shibly A. Al-Samarraie, & Yasir K. Abbas, "Design of Nonlinear Robust Proportional Controller for Active Braking System," *Iraqi Journal of Mechanical and Material Engineering*, Vol. 13, No. 3, 2012
10. Mohsin N. Hamzah, "Nonlinear Finite Element Analysis for Elastomeric Materials

under Finite Strain," *Engineering & Technology Journal*, Vol. 30, No. 14, 2012.
11. Mohsin N. Hamzah, Shibly A. Al-Samarraie, & Yasir K. Abbas, "Design of a Nonlinear Robust Controller for Vibration Control of a Vehicle Suspension System", *Engineering & Technology Journal*, Vol. 29, No. 11, 2011.
12. Mohsin N. Hamza, Imad A. Hussain, & Muhsin J. Jweeg "Boundary Elements Modeling For Small/Large Strain Analysis Of Elastomeric Materials", *Journal of Engineering*, University of Baghdad, Vol. 16, No. 1, 2010.
13. Mohsin N. Hamza & Hassan M. Alwan, "Hyperelastic Constitutive Modeling of Rubber and Rubber-Like Materials under Finite Strain", University of Technology, *Engineering & Technology Journal*, Vol. 28, No. 13, 2010.
14. Mohsin N. Hamza & Hassan M. Alwan, "Dynamic Analysis of Gough-Stewart Platform Manipulator", University of Technology, *Engineering & Technology Journal*, Vol. 28, No. 16, 2010.
15. Mohsin N. Hamza, "Comparison between FEM and BEM for Axisymmetric Elastic Solids", *Fifth Maghrebine Conference for Mechanical Studies*, 5-7 Feb 2001, Brack, Libya.
16. Mohsin N. Hamza, "Stress Analysis of incompressible Axisymmetric Solids using Boundary Elements Method", *5th Maghrebine Conference for Mechanical Studies*, 5-7 Feb 2001, Brack, Libya.
17. Mohsin N. Hamza, & Imad A. Hussain, "Boundary Element Method for Axisymmetric Solids Under Non-Symmetrial Surface Loads", *Communications in Numerical Methods in Engineering*, UK, 2000, 16:867-875.

Briefly list the most recent professional development activities

Name	Laith Jaafer Habeeb			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Heat Transfer	University of Technology	2008
	M.Sc.	Power Generation	University of Technology	1999
	BS	Automotive Engineering	University of Technology	1996

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Mechanical Engineering Department	Associate Professor	Instructor	2001	FT

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Iraqi Engineers Association (Consulting Member)

Current membership in professional organizations

ASME (American Society of Mechanical Engineers)

AASCIT (American Association for Science and Technology) Industry Gateway
Honors and awards
- Several letters of appreciation from the dean of the college and the university president. - University Shield.
Service activities (within and outside of the institution)
Director of Laboratories Coordinator Adviser at the Ministry of Electricity / electric power generation in al-Dowra thermal plant Adviser at the Ministry of Defense / Air Force Rehabilitation Laboratory of the post-graduate studies Procurement Committee Supervision of maintenance work and receive Maintenance and repair of scientific instruments laboratory Student Affairs Rehabilitation of buildings University of Technology - Laboratory modulation Supervise the maintenance services of the department Supervising the elections of the National Union of Iraqi students Purchase of equipment and laboratory equipment Committees to publish a link to the university lectures and curriculum development Coordinator of the Department Council Official in the section of the Scientific Committee Chief, Division of documentation and alumni affairs
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
[1] "Simulation and Experiment Study of Gas-Solid Flow Behavior in the Standpipe of a Fluidized Bed", Proceedings of International Conference on Engineering and Information Technology Sep. 17-19, 2012, Toronto, Canada. [2] "Simulation of Natural Convection in Concentric Annuli between an Outer Inclined Square Enclosure and an Inner Horizontal Cylinder", World Academy of Science, Engineering and Technology 69 2012. ICAMAME 2012: International Conference on Aerospace, Mechanical, Automotive and Materials Engineering Berlin, Germany, September 19-20. [3] "Natural Convection Heat Transfer in Horizontal Open Ended Elliptical and Circular Annulus", Proceedings of International Conference on Engineering and Information Technology Sep. 17-19, 2012, Toronto, Canada. [4] "Experimental Study of Forced Convection Heat Transfer in a Partially Opened Box Filled With Porous Medium", Proceedings of International Conference on Engineering and Information Technology Sep. 17-19, 2012, Toronto, Canada. [5] "Heat Transfer in a partially Opened Cavity Filled With Porous Media", 3rd Scientific International Conference 2013 / Najaf, pp. 601-614. [6] "Natural convection in a partially Opened Box Filled With a Porous Medium", Qadisiya Journal for Scientific Engineering, Vol.6, No.4, 2013, pp. 400-414. [7] "Numerical Simulation of Convective Heat Transfer and Fluid Flow through Porous Media with Different Moving and Heated Walls", World Academy of Science, Engineering and Technology 69 2012. ICAMAME 2012: International

Conference on Aerospace, Mechanical, Automotive and Materials Engineering Berlin, Germany, September 19-20. [8] "Free Convective Heat Transfer in an Enclosure Filled with Porous media with and without Insulated Moving Wall", World Academy of Science, Engineering and Technology 69 2012. ICAMAME 2012: International Conference on Aerospace, Mechanical, Automotive and Materials Engineering Berlin, Germany, September 19-20. [9] "Experimental and Numerical Study of Two Phase Flow Regimes around a Circular Cylinder through Enlarging Channel", The Iraqi Journal for Mechanical and Materials Engineering, volume: 14 issue: 1, pp. 129-144, 2014. [10] "Experimental Study and CFD Simulation of Two-Phase Flow around Triangular Obstacle in Enlarging Channel", International Journal of Engineering Research and Applications (IJERA), Vol. 3, Issue 4, Jul-Aug 2013, pp.2036-2048. [11] "Experimental Study and CFD Simulation of Two-Phase Flow around Multi-Shape Obstacles in Enlarging Channel", American Journal of Mechanical Engineering (ajme) / Science and Education Publishing, Vol. 1, No. 8, 470-486, August 2013. [12] "Steady and Unsteady Bubbly Two-Phase Flow (Gas-Liquid Flow) around a Hydrofoil in Enlarging Rectangular Channel", International Journal of Computational Engineering Research, Vol. 03, Issue. 9, September 2013, pp.44-62. [13] "Studying the Heat Transfer Characteristics in a box with Horizontal Parallel Heated Plates", Mitteilungen Klosterneuburg Journal, Volume 64 (10), 2014, pp. 12-35. [14] "MATHEMATICS for Mechanical Engineering", Lambert Academic Publishing, 2014. [15] "Heat Transfer Augmentation Using Vortex Generators", Lambert Academic Publishing, 2014. [16] "Free and Forced Convection Heat Transfer Characteristics in an Opened Box with Parallel Heated Plates", The American Association for Science and Technology (AASCIT), American Journal of Energy and Power Engineering, Vol. 2, No. 1, 2015, pp. 1-11. [17] "Heat Transfer Analysis of Integral-Fin Tubes", The American Association for Science and Technology (AASCIT), Engineering and Technology, Vol. 2, No. 2, 2015, pp. 23-34.
Briefly list the most recent professional development activities
- Participate in Workshops Hosted by the IREX Organization with IRAQ UNIVERSITY LINKAGES PROGRAM – PROJECT GRANTS Enhancing teaching effectiveness in engineering through Problem-Based Learning - Invention and application of a new method of learning called Paperless Learning - Supervision on M.Sc. Degree Students - Supervision on Ph.D. Degree Student

Name	Dheya Ghanim Mutasher			
Education	Degree	Discipline	Institution	Year
			University of Baghdad University of Technology	2012 2005

	Ph.D. MSc. Higher Diploma BS	Mechanical Engineering Mechanical Engineering Engineering Computer Added Design Mechanical Engineering	University of Technology University of Technology	2002 2000

Academic experience

Institution	Rank	Title	When	Full time or Part time
Mechanical Engineering Division	Asst. Prof.	Instructor	2006	FT

Non-academic experience

Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Current membership in professional organizations

Iraqi Engineers Association

Honors and awards

Service activities (within and outside of the institution)

1-Member of the scientific committee of Automotive engineering/ University of Technology.
2- Certificate of undergone training in Gas chromatography from the Sigma Instruments PVT. LTD. , manufacturers and suppliers of analytical and scientific instruments, India, 5-9 December, 2014.

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

1. An investigation into heat transfer enhancement by using oscillating fins, J. of Engineering, Vol. 19, January, 2013.
2. Experimental investigation utilizing thermal image technique to the heat transfer enhancement using oscillated fins, J. of Engineering, Vol. 19, February, 2013.
3. Presenting a new paper entitled: "Numerical and experimental study of enhancement of heat transfer rate by using oscillating fins; in a conference held at Cardiff School of Engineering postgraduate research conference at Gregynog between 11th-13th July 2011 in UK.

Briefly list the most recent professional development activities
1- Number of novel condenser design of household refrigerator. For example: (Elliptical Flow Condenser) and (Dual-Loop Cycle Flow Condenser). 2- Heat transfer in heat sink of microprocessor with oscillation. 3- Developed and modification in solar collectors.

Name	Khalil Ibrahim Abass			
Education	Degree	Discipline	Institution	Year
	B.Sc.	Mechanical engineering	University of technology	1981
	M.Sc.	Solar energy engineering	University of technology	2006

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Solar energy	Associate professor	Instructar	2015	F.T.

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations
Current membership in professional organizations
Iraqi Engineering Association
Honors and awards
Service activities (within and outside of the institution)
1-refree for al-khwarizmi engineering journal 2-member of the examiner committee
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
1. Chaichan M T and Abaas K I, Experimental comparison of CO emissions emitted from single cylinder S I engine fueled with different kinds of hydrocarbon fuels and hydrogen, Iraqi Journal for Mechanical and Material Eng., vol. 10, No. 3, pp: 397-405, 2010. 2. Chaichan M T & Abaas Kh. I., Practical investigation for measurement of concentrating solar power prototype for several target cases at Iraqi summertime weathers, 1st Scientific Conference for Energy & Renewable Energies Applications, UOT, Baghdad, Iraq, 2011

3. Abaas Kh. I., Performance Characteristics of Methanol-Diesel Blends in CI Engines, Baghdad Engineering Journal, vol. 17, No.6, pp: 1492-1501, 2011
4. Abaas Kh. I., comparison of practical investigation of CO emissions emitted from single cylinder S I engine fueled with different kinds of hydrocarbon fuels and hydrogen, Al Khawarzmi Engineering Journal, vol. 7, No. 1, pp: 22-29, 2011
5. Chaichan M T & Abaas Kh. I., Emissions Characteristics of Methanol-Diesel Blends in CI Engines, Wassit Journal for Science & Medicine, vol. 5, No.1, 2012.
6. Chaichan M T & Abaas Kh I, Practical investigation for improving concentrating solar power stations efficiency in Iraqi weathers, Anbar J for Engineering Science, vol.5, No. 1, pp: 76-87, 2012.
7. Chaichan M T & Abaas Kh. I., Productivity amelioration of solar water distillator linked with salt gradient pond, Tikrit Journal of Engineering Sciences, vol. 19, No. 4, pp: 24-34, 2012.
8. Chaichan M T, Abaas Kh. I. & Kazem H A, The effect of variable designs of the central reciever to improve the solar tower efficiency, International J of Engineering and Science, vol. 1, No. 7, pp: 56-61, 2012.
9. Chaichan M T, Kazem H A & Abaas Kh. I., Improving productivity of solar water distillator linked with salt gradient pond in Iraqi weather, World Concress on Engineering 2012, London, UK, 4-6 July, 2012.
10. Chaichan M T, Abaas K I, Kazem H A, Al Jibori H S & Abdul Hussain U, Novel design of solar receiver in concentrated power system, International J. of Multidispl. Research & Advcs. in Eng. (IJMRAE), vol. 5, No. 1, pp: 211-226, 2013.
11. Chaichan M T, Abaas Kh I, Rasheed M A and Kazem H A, Using paraffin wax as a thermal storage material in a solar air heater, International Conference for Renewable Energies, UOT, Baghdad, Iraq, 2013
12. Chaichan M T, Abaas K I & Naser A H, Study of the effect of exhaust gas recirculation on performance and emitted noise of an engine fueled with diesel fuel, Association of Arab Universities Journal of Engineering Science, vol. 20, No. 1, pp: 43-59, 2013.
13. Chaichan M T, Abaas K I & Salih H M, Practical investigation for water solar thermal storage system enhancement using sensible and latent heats in Baghdad-Iraq weathers, Journal of Al-Rafidain University Collage for Science, Issue 33, 2014.
14. Chaichan M T, Abaas K I, EGR and Injection Timing Variation Effects of an Engine Run in HCCI Mode Performance and Emitted Emissions, International Journal of Engineering Trends and Technology (IJETT), vol. 19, No. 3, pp: 120-130, 2015.
15. Chaichan M T, Abaas K H, Performance amelioration of a Trombe wall by using phase change material (PCM), International Advanced Research Journal in Science, Engineering and Technology, vol. 2, No. 4, pp: 1-6, 2015.
16. Chaichan M T, Kazem H A, Kazem A A, Abaas Kh I, Al-Asadi K A H, The effect of environmental conditions on concentrated solar system in desertic weathers, International Journal of Scientific and Engineering Research, vol. 6, No. 5, pp: 850-856, 2015.

Briefly list the most recent professional development activities

Name	Qahtan Adnan Abass

Education	Degree	Discipline	Institution	Year
	M Sc	Thermal Power	Al-Nahrain University	2001
	B. Sc.	Thermal Power	Al Mustansrya University	1998

Academic experience				
Institution	Rank	Title	When	Full time or Part time
University of Technology/ Mechanical Engineering Dept	Lecturer	Instructor	2006	Full Time

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Iraqi Engineers Association since 1998

Current membership in professional organizations

Honors and awards

-Letter from Ministry of higher Education, Baghdad –Iraq – 2013
-Letter from Mechanical Dept. - University of Technology- Iraq- 2013
-Letter from Mechanical Dept. - University of Technology- Iraq-2013
-Letter from president of University of Technology- Iraq-2014
-Letter from Mechanical Dept. - University of Technology- Iraq-2014
-Letter from Mechanical Dept. - University of Technology- Iraq-2014
-Letter from president of University of Technology- Iraq-2014
-Letter from Mechanical Dept. - University of Technology- Iraq-2014
-Letter from Mechanical Dept. - University of Technology- Iraq- 2015
-Letter from president of University of Technology- Iraq-2015
-Letter from Mechanical Dept. - University of Technology- Iraq- 2015
-Letter from president of University of Technology- Iraq-2015

Service activities (within and outside of the institution)

-Automotive Branch coordinator.
- Membership of Examination Committee in Mechanical Engineering Dept/ University of Technology.

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

Briefly list the most recent professional development activities

1-Chaichan M T and Abaas Q A, Study of NOx emissions of SI engine fueled with different kinds of hydrocarbon fuels and hydrogen, Al Khwarizmi Eng. Journal, vol. 6, No. 2, pp: 11-20, 2010.
2- Abaas Q A, Investigation of the Accumulated Heat of Concentrating Thermal Storage System in Baghdad/Iraqi Weather., Association of Arab Universities Journal of Engineering Science, vol. 21, No. 1, pp: 81-97, 2014.
3- Effect of cool and hot exhaust gas recirculation (EGR) on the performance of multi-

cylinder compression ignition engine fueled with blends of diesel and methanol. Al-Nahrain Engineering Journal, Baghdad- Iraq.

Name	Rasha Mohammed Hussein			
Education	Degree	Discipline	Institution	Year
	MSc.	Applied mechanic	Baghdad University	2013
	BS	Mechanical engineering	Baghdad University	2010

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Mechanical Engineering Departement	Assistant Lecturer	Instructor	2013	FT

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Current membership in professional organizations

Honors and awards

Service activities (within and outside of the institution)

Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
Vibration Analysis of Laminated Composite Plate under Thermo-Mechanical Loading . Journal of Engineering ,Iraq , Volume 20 February 2014

Briefly list the most recent professional development activities

Name	Bashar Ali Mohammad			
Education	Degree	Discipline	Institution	Year
	MSc.	Mechanical Engineering	University of Technology	2013
	BS	Mechanical Engineering	University of Technology	2004
				Academic experience

Institution	Rank	Title	When	Full time or Part time
Mechanical Engineering Department \ Automotive Division	Assistant Lecturer	Instructor	2014	FT

Non-academic experience

Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations

Iraqi Engineers Association

Current membership in professional organizations

Honors and awards

Service activities (within and outside of the institution)

Member of the Examination committee/ Dept. of Mechanical Engineering.
Director of the Media committee/ Dept. of Mechanical Engineering.
Member of Section of Quality and University Performance.

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

1. Heat Transfer Enhancement in a Tube Fitted with NozzleTurbulators, Perforated Nozzle-Turbulators with Different hole shap, Eng. &Tech.Journal, Vol. 32,Part (A), No.10, 2014.
2. Effect of pollution and cleaning on photovoltaic performance based on experimental study, International Journal of Scientific & Engineering Research, Volume 6, Issue 4, April-2015 ISSN 2229-5518.

Briefly list the most recent professional development activities

Name	Enass H. Flaieh			
Education	Degree	Discipline	Institution	Year
	Ph.D.	Applied mechanics	University of Technology	2015
	MSc.	Applied mechanics	University of Technology	2005
	BS	Air conditioning	University of Technology	1997

Academic experience

Institution	Rank	Title	When	Full time or Part time
Automotive Engineering Division	Lecturer		2006	FT

Non-academic experience

Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations				
Certifications in a Capacity Building Mathematical Modelling ,Simulation and Design of Experiments in Technical Processes by DAAD at Mech.Dep. University of Salahddin-Hawler				
Current membership in professional organizations				
Iraqi Engineering Association				
Honors and awards				
Service activities (within and outside of the institution)				
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation				
1-"Position Control of Linkage Underactuated Robotic Finger ", Journal of Innovative Systems and Engineering,Vol.5,No.3,2015. (published by IISTE ,USA ,www.iiste.org.). 2-"Optimization and Analysis of Underactuated Linkage Robotic Finger" ,Journal of Innovative Systems and Engineering ,Vol.6,No.6,2015. (published by IISTE,USA, www.iiste.org.)				
Briefly list the most recent professional development activities				

Name	Lamyaa Mahdi Asaad			
Education	Degree	Discipline	Institution	Year
	MSc . BS	Mechanical Engineering Mechanical Engineering	University of Technology University of Technology	2006 1996
Academic experience				
Institution	Rank	Title	When	Full time or Part time
Technical Education Department	Lecturer	Instructor	2006	FT
Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time
Certifications or professional registrations				
Current membership in professional organizations				
Honors and awards				

- Certificate of valuation by Minister of education (1)
- Certificate of valuation by President of Univ. of Technology (2)
- Certificate of valuation by Dean of Mechanical Engineering Dept. (8)

Service activities (within and outside of the institution)

Attend seminars and conferences within the university(حضور)

1- Student Symposium of the summer training sites in the oil (oil IT department)2013
2-Second Scientific Conference of modern technologies in the oil filter(Chemical E.D)2013
3-The reality of the Iraqi cement and prospects of its development2013(Chemical E.D)2013
4- Seminar for automotive branch in 2013
5-Stem cells and their applications (Department of Applied Sciences) 2014
6-Future prospects Electromechanical Engineering 2014
7- Second Scientific Conference of the engineering control engineering, computer and Mechatronics 2014

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

1- Influence of Titanium and Carbon addition on the Phosphorous Modification Efficiency in Near Eutectie Al-14Si Alloy2011
2 -The Combined effect of rapid Solidification and Phosphor addition on the Microstruture of hypereutectic A390 Alloys2011
3-Study of the effect of the nozzle height on the shape and dimensions of ribbons produced by rapid Solidification 2013
4-The Effect of Exhaust Gas Recirculation (EGR)ON THE Emission of a Single Cylinder Spark Ignition Engine2013
5-Improvement of NOx-SmokeOpacity Trade –off in Multi Cylinders SIE Fueled With Blends of Ethanol and Gasoline2015

Briefly list the most recent professional development activities

1-Member of the Committee Altdab a 3 consecutive years in 2013 and 2014 and 2015
2-Commissioning of the Committee Documentation2013
3- commissioned an audit committee documents2015
4-Member of the Committee to discuss the fourth stage projects2015

Name	Imad Abdulhussein Abdulsahib			
Education	Degree	Discipline	Institution	Year
	Ph.D. MSc. BSc.	Applied Mechanic Applied Mechanic Mechanical Engineering	University of Technology University of Technology Baghdad University	2016 2009 1987

Academic experience				
Institution	Rank	Title	When	Full time or Part time
Applied Mechanic	Ass.	Instructor	2010	FT

	Lecture			

Non-academic experience				
Company or entity	Title	Brief description of position	When	Full time or Part time

Certifications or professional registrations
Iraqi Engineers Association member since 1987
Current membership in professional organizations
Honors and awards
1- Certificate of excellence from Minister of Higher Education & Scientific Research to be the first collage in Iraq in Quality. 2- Two certificate of excellence from the President of the University of Technology. 3- Three certificate of excellence from the Dean of the Mechanical Engineering Department.
Service activities (within and outside of the institution)
1- Member of the labs Re-arrangement Committee.2010-2011 2- Member of the examination Committee.2011-2012.
Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
1- Effect of heat treatment on notch sensitivity factor of aluminum alloy 2- Mechanical Behavior of Polyester And Fiber Glass As A Composite Material Used In Vehicle Under Dynamic Loading
Briefly list the most recent professional development activities
Preparing for Ph.D. discussion in the end of 2015

B. Faculty Workload

Complete Table 6-2, Faculty Workload Summary and describe this information in terms of workload expectations or requirements.

No.	Name	Work load	Theory	Pratical	Project	above a work load
1	Prof. Dr. Jaafer Mahdi Hassan	**4**	**6**	**1**	**1**	**2**
2	Asst. Prof. Dr. Ahmed Naif Al-khazraji	**6**	**6**	**1**	**1**	**2**
3	Asst. Prof. Dr. Abed-Alkadom M. Hasan	**6**	**6**	**1**	**1**	**2**
4	Asst. Prof. Dr. Mahmoud A. Mashkour	**8**	**10**	**-**	**1**	**3**
5	Asst. Prof. Dr. Adel Mahmood Salih	**6**	**4**	**2**	**1**	**1**
6	Asst. Prof. Dr. Mohsin Noori Hamzah	**4**	**6**	**1**	**1**	**4**

7	Asst. Prof. Dr. Kassim A. Atehia	**4**	**6**	**1**	**1**	**4**
8	Asst. Prof. Dr. Laith Jaafer Habeeb	**8**	**8**	**12**	**-**	**2**
9	Asst. Prof. Dr. Dheya Ghanim Mutasher	**8**	**6**	**4**	**1**	**2**
10	Lec. Khalil Ibrahim Abass	**8**	**8**	**8**	**1**	**9**
11	Dr. Alaa Abdolhadi Jaber	**10**	**6**	**4**	**1**	**2**
12	Dr. Enass Hassan Flaieh	**10**	**6**	**4**	**1**	**2**
13	Dr. Imad A. Abdulsahib	**8**	**8**	**8**	**1**	**9**
14	Lec. Lamyaa Mahdi Asaad	**10**	**6**	**10**	**1**	**7**
15	Lec. Qahtan Adnan Abass	**6**	**-**	**6**	**-**	**-**
16	Asst. Lec. Maysoon Adul Ameer	**-**	**-**	**-**	**-**	**-**
17	Asst. Lec. Yasameen Hamid Abas	**-**	**-**	**-**	**-**	**-**
18	Asst. Lec. Tamadher Mustafa Abbas	**10**	**4**	**8**	**1**	**3**
19	Asst. Lec. Akeel Zaki Mahdi	**6**	**-**	**6**	**-**	**-**
20	Asst. Lec. Rasha Mohammed Hussein	**12**	**5**	**12**	**1**	**6**
21	Asst. Lec. Bashar Ali Mohammad	**12**	**9**	**6**	**-**	**3**

C. Faculty Size

Discuss the adequacy of the size of the faculty and describe the extent and quality of faculty involvement in interactions with students, student advising, and oversight of the program.

The size of faculty is 21 instructors.

D. Professional Development

Describe the professional development activities that are available to faculty members.
In faculty vitae

E. Authority and Responsibility of Faculty

Describe the role played by the faculty with respect to course creation, modification, and evaluation, their role in the definition and revision of program educational objectives and student outcomes, and their role in the attainment of the student outcomes. Describe the roles of others on campus, e.g., dean or provost, with respect to these areas.

Table 6-2. Department Analysis for Automotive Engineering Program

Faculty Name	Highest Degree Earned –Field and Year	Rank	Type of Academic Appointment	FT or PT	Years of Experience			Professional Registration /Certification	Level of Activity H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organization	Professional development	Consulting/Summer work Industry
Mohsin Noori Hamzah	PhD, Applied Mechanics, 2007	AST	Abiding	FT	Govt.	18	10				-
Ahmed Naif Al-khazraji	PhD, Applied Mechanics, 1988	AST	Abiding	FT	Govt	31	10				-
Abed-Alkadom M. Hasan	PhD, Power, 2003	AST	Abiding	FT	Govt	29	29				-
Abdul Sattar J. M. Hasan	PhD, Power, 2006	AST	Abiding	FT	Govt	19	19				-
Mahmoud A. Mashkour	PhD, Power, 2006	AST	Abiding	FT	Govt	19	19				-
Adel Mahmood Salih	PhD, Power, 2006	AST	Abiding	FT	Govt	29	29				-
Laith Jaafer Habeeb	PhD, Power, 2009	AST	Abiding	FT	Govt	10	10				-
Dheya Ghanim Mutasher	PhD, Power, 2013	I	Abiding	FT	Govt	10	10				-
Sajeda Sabri Faris	MSc, Power, 2003	I	Abiding	FT	Govt	14	14				-
Khalil Ibrahim Abass	MSc, Solar Energy, 2006	I	Abiding	FT	Govt	26	26				-
Lamyaa Mahdi Asaad	MSc, Applied, 2006	I	Abiding	FT	Govt	17	17				-
Qahtan Adnan Abass	MSc, Power, 2006	I	Abiding	FT	Govt	9	9				-
Maysoon Adul Ameer	MSc, programming Science, 2005	A	Abiding	FT	Govt	9	9				-
Yasameen Hamid Abas	MSc, Power, 2009	A	Abiding	PT	Govt	9	9				-
Enass H. Flaieh	PhD, Applied, 2015	A	Abiding	PT	Govt	9	9				-
Imad A. Abdulsahib	MSc, Applied, 2005	A	Abiding	PT	Govt	9	9				-
Rasha Mohammed Hussein	MSc, Applied, 2013	A	Abiding	FT	Govt	2	2				-

Bashar Ali Mohammad	MSc, Power, 2013	A	Abiding	FT	Govt	2	2				-

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

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: TT = Tenure Track T = Tenured NTT = Non Tenure Track
3. At the institution
4. The level of activity, high, medium or low, should reflect an average over the year prior to the visit plus the two previous years.

CRITERION 7. FACILITIES[1]

A. Offices, Classrooms and Laboratories

Summarize each of the program's facilities in terms of their ability to support the attainment of the student outcomes and to provide an atmosphere conducive to learning.

1. Offices (such as administrative, faculty, clerical, and teaching assistants) and any associated equipment that is typically available there.
2. Classrooms and associated equipment that is typically available where the program courses are taught.
3. Laboratory facilities including those containing computers (describe available hardware and software) and the associated tools and equipment that support instruction. Include those facilities used by students in the program, even if they are not dedicated to the program, and state the times they are available to students. Complete Appendix C containing a listing of the major pieces of equipment used by the program in support of instruction.

The department size is detailed as follows:

A- Offices (Administrative, Faculty, Clerical, Teaching Assistants)

Table 7-1 shows the currently available and projected office space in the supplementary building on the main University of Technology campus. The Automotive Dept. occupies 2nd floor in the building, the space is primarily for member staff offices and 5 laboratories. Table 7-2 shows the current available office space at the 2nd floor of the supplementary building by Automotive Dept. staff.

Table 7-1. Office Space in ETC for Administration, Faculty, Staff and Students

Type	Current			Projected			Special Requirements or Comments
	Quantity	Area (SF)	Total (SF)	Quantity	Area (SF)	Total (SF)	
Suite Dept HQ	1	15	15	3	15	45	Chair, mail reception, copy etc.
Office	22	9	198	30	15	450	
Office Visit/ Adjunct/RA	1	45	45	2	45	90	
Office Active Emeritus	-	-	-	-	-	-	
Office Staff	22	9	198	30	15	450	Those not included in Dept HQ
Server Space	1	6	6	1	12	12	
Interaction/Conf	-	-	-	-	-	-	
Undergrad Spaces	1	15	15	1	15	15	e.g., student organizations

Storage	1	6	6	2	15	30	Office
Laboratories	5	100	500	5	100	500	
Other	3	40	120	3	40	120	Class Rooms, Internet Room,

B- Laboratories

Table 7-2 shows the laboratory space for the Automotive Program on the main UoT campus. The laboratory space divided between the supplementary building and the thermals Labs complex near the university factories.

Table 7-2 Laboratory Space for ME Program on Main UT campus

Type	Current			Projected			Special Requirements or Comments
	Quantity	Area (SF)	Total (SF)	Quantity	Area (SF)	Total (SF)	
Research Wet lab	2	220	220	3	330	330	Chair, reception, mail, copy etc.
Research Dry Lab	6	300	300	6	300	300	Chemicals, Hood, Sink, Drain, fuels
Teaching Wet Lab	2	40	40	3	90	90	
Teaching Dry Lab	5	40	40	5	60	60	Chemicals, Hood, Sink, Drain, fuels
Computer Labs	2	400	400	2	400	400	
Project Spaces	-	-	-	-	-	-	Need a project space.
Shops/Support	-	-	-	-	-	-	

Table 7-3, Labs names, their areas, instruments numbers, and the subjects it serves and the required instruments

No.	Lab Name	The Subjects Served by the Lab	Area m^2	Instruments Numbers	
				Available	Valid
1	Mechanics	Mechanics I, II	41	6	6
2	Thermo 1	Thermo	42	5	5
3	Electric	Electric	20	14	9
4	Thermo 2	Thermo	300	3	2
5	Strength of Material	Strength of Material	41	7	3
6	1Fluid	Fluid	198	5	5
7	Air Conditioning	Air Conditioning	65	9	8
8	ICE	ICE	145	7	3
9	Theory of machines	Theory of machines	55	15	14
10	Heat transfer	Heat transfer	52	5	5
11	Fluid 2	Fluid	198	5	5
12	Control	Control	45	5	3
13	Vibration	Vibration	45	5	4

14	Gases	Gas dynamics	36	1	1
15	Power plants	Power plants	300	4	4
16	Machines Technology	Machines Technology	35	4	4
17	Refrigeration	Refrigeration	65	9	8
18	Renewable energy	Renewable energy	41	5	5
19	Airplane engines	Airplane engines	36	4 Illustrative sections	–
20	Maintenance of Airplane	Maintenance	36	3 Illustrative sections	–
21	Plane dynamics	dynamics	36	3 Illustrative sections	–
22	Fuel	Fuel	145	2 Illustrative sections	2
23	Automotive theory	Automotive theory	11	3 Illustrative sections	–
24	Graduate workshop	Workshop for graduate students projects	30	Measurements instruments and equipment	
25	1Programming	Fortran +CAD	30	21	21
26	Programming 2	Matlab+CAD	69	29	29
27	Programming 3	Numerical analysis+Solid work	38	23	23
28	Programming 4	CAE	36	27	27

C-Classrooms

Table 7-4 shows the current and projected classroom space for the Automotive Department. The current classroom space is adequate for the ME curriculum.

Lecture or Section Size Range	Projected instances of Lectures/Sections		Projected instances of Lectures/Sections		
	Fall Courses	Spr. Courses	Fall Courses	Spr. Courses	Special Requirements or Comments
	Lec.	# Sec	Lec.	# Sec	
25 or fewer	24	-	27	-	
26 to 50	14	-	17	-	
51 to 100	4	-	7	-	
101 to 200	2	-	4	-	
More than 200	-	-	-	-	

B. Computing Resources

The general computer labs are located on the 1st floor of Mechanical Engineering Department main building, next to the halls study area. There are 40 seats, available to all ME students both

graduate and undergraduate, on a first come basis. The lab is proctored and open hours from 8:00 AM to 2 PM. A High Performance Computing (HPC) facility provides remote access to high level programming. The computer labs are primarily used by ME undergraduates students, but is also available to ME graduate. Also, these labs used for teaching the undergraduate students courses such as Computer Graphics, Computer languages. There are wide range of engineering software is available on all of these computing platforms. The software types include SolidWorks, AutoCAD, graphics simulation and analysis software (FEM, FEA, and CFD), materials databases, and mathematical modeling and programming software (Matlab, Labview, etc.).

Lab Equipment Planning: Area faculty, associated with the undergraduate laboratories, evaluate needs and present recommendations to the faculty area coordinator. The group then has a discussion to assess most relevant need and available funding to determine priorities.

Lab Equipment Acquisition: Small orders under $5k are usually purchased by the Purchases Committee using the department cash. Equipment from $5k to $25k are processed through the ME department fiscal office via purchase order. Items $5k - $25k can be purchased by obtaining 3 bids (informal bidding). "Informal bidding" requires that our departmental purchasing representative acquire at least three (3) quotes to determine the best value purchase source. At least one quote must be from an ethnic HUB (Historically Underrepresented Business). The third quote can be from any viable source. Items over $25k must go through the UoT purchasing office and be put out for competitive bidding. Purchasing statutes for higher education need to meet "best value" procurement possible. Best value means the optimum combination of economy and quality to achieve the objectives of the end user and the university. Funding sources comes from ME budget.

Lab Equipment Maintenance Processes: All equipment, when possible, is maintained by the ME lab manager and maintenance staff. The lab manager perform equipment set-up for various experiments and are readily aware when the equipment requires maintenance or repair. Some complex equipment, such as scanning electron microscopes, has service agreements and is routinely serviced by factory service technicians. Other complex equipment, such as electronic hardness testers and microscopes are regularly serviced by outside specialty technicians. Further support can be obtained from UoT Zone Maintenance. Repairs beyond the capabilities of the lab manager and support staff require bringing in qualified service technicians from outside companies.
The adequacy of all processes relating to equipment planning, acquisition, and maintenance seems adequate. Undergraduate labs in Mechanical Engineering require a large number of different types of modern testing equipment. The requirement for updating obsolete equipment and acquiring equipment with the latest technology to prepare our students for their future careers is critical, and the ME program is dedicated to maintaining this full array of laboratory equipment.

The ME Program has two full-time IT system administrators who install and maintain the computer hardware and software mentioned above. In addition, our IT Manager maintains the networks for the entire building and there is a Webmaster who maintains the ME departmental web pages.

The internal, departmental support for laboratory maintenance and management includes: 2 full-time scientific instrument makers, 1 full-time lab managers (Electronics Technicians), and one full-time staff support person who is also an Electronics Technician.

C. Guidance

Describe how students in the program are provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories.

D. Maintenance and Upgrading of Facilities

Describe the policies and procedures for maintaining and upgrading the tools, equipment, computing resources, and laboratories used by students and faculty in the program.

E. Library Services

Describe and evaluate the capability of the library (or libraries) to serve the program including the adequacy of the library's technical collection relative to the needs of the program and the faculty, the adequacy of the process by which faculty may request the library to order books or subscriptions, the library's systems for locating and obtaining electronic information, and any other library services relevant to the needs of the program.

F. Overall Comments on Facilities

Describe how the program ensures the facilities, tools, and equipment used in the program are safe for their intended purposes (See the 2013-2014 APPM Section II.G.6.b.(1)).

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

Describe the leadership of the program and discuss its adequacy to ensure the quality and continuity of the program and how the leadership is involved in decisions that affect the program.

B. Program Budget and Financial Support

Program Budget Process and Sources of Financial Support

The budget for the undergraduate program can be divided into the following major categories:
1. Support for Teaching Assistants (TA's).
2. Ministry Budget

The budgeting process for TA's starts with an accounting of courses that will be offered for the evening study students. The expected costs are determined using average appointment rates and taking into account any general raises in rates that have been approved for the coming academic year. Each year a budget is determined specifically for operations. This budget is split into staff support, equipment maintenance and upgrades, software licenses, and miscellaneous supplies. The budget for staff is based on the appointment rates for permanent staff and the estimated needs for temporary employees (generally student assistants). Major equipment, including computers, is upgraded using a five year replacement plan. Associated costs for these upgrades are estimated each year. Annual miscellaneous supplies and operation costs are estimated using historical data.

The Undergraduate Office handles student registration and records, course scheduling, and student advising. The budget for staff in this office is based on the appointment rates for permanent staff and the estimated needs for temporary employees (generally student assistants). Annual operation costs are estimated using historical data.

Funds needed for laboratory equipment maintenance are determined from known maintenance contracts and historical records. Each year additional funds are made available to the department for upgrading teaching laboratory equipment. The amount of these equipment upgrade funds is set each year by the Dean's office according to the needs submitted by the department. The budget for the staff responsible for operating and maintaining teaching laboratory facilities is based on the projected appointment rates for these permanent staff.

Sources of Financial Support

The primary source of funds is an operating budget fixed for the department by the Ministry of Higher Education. Additional funds are allocated specifically for UoT support. These funds are obtained from various sources, including a set allocation from the university, funds made available due to administrative and research leaves by faculty, and supplementary allocations by the Dean's office using "soft" money sources.

Adequacy of Budget

Although constrained by tightening budgets, allocation of funds has been sufficient to maintain operations and teaching needs. There was a reduction in allocations for the 2014-15 year, and this was handled by reducing non-essential purchases for the department.

Support of Facilities and Equipment

There are eight experimental laboratories which require maintenance and occasional upgrading of facilities in the responsibility of Automotive Eng. Dept. Funds needed for laboratory equipment maintenance are determined from known maintenance contracts and historical records. Each year additional funds are made available to the department for upgrading teaching laboratory equipment. The amount of these equipment upgrade funds is set each year by the Dean's office according to the needs submitted by the department.

Adequacy of Support Personnel and Institutional Services

The department has a wide range of support personnel including undergraduate office staff to advise and register students, technicians to operate and maintain teaching laboratory facilities, administrative assistance to aid faculty, and machine shop technicians to help students in construct models and equipment for projects. Each of these staff positions is adequately funded. Major services provided to the students are computer center, which give students access to specialized software, and the machine shop. These computer services and machine shop service are also adequately funded.

C. Staffing

Describe the adequacy of the staff (administrative, instructional, and technical) and institutional services provided to the program. Discuss methods used to retain and train staff.

D. Faculty Hiring and Retention

1. Describe the process for hiring of new faculty.
2. Describe strategies used to retain current qualified faculty.

E. Support of Faculty Professional Development

Describe the adequacy of support for faculty professional development and how activities such as sabbaticals, travel, workshops, seminars, etc., are planned and supported.

Table of the annual income and expenditures for the academic program. *جدول الإيرادات والمصروفات السنوية لبرنامج أكاديمي*		
No. of item	*Items of financial resources and sources* *بنود الموارد المالية ومصادرها*	*Amount in Iraqi Dinar* *المبالغ بالدينار العراقي*
1	*Total budget allocated to the academic program.* *الميزانية الإجمالية المخصصة للبرنامج الأكاديمي*	
	Financial resources and funding sources that academic program depends on them to cover the total annual expenditure. *الموارد المالية ومصادر التمويل التي يعتمد عليها البرنامج الأكاديمي لتغطية نفقاته السنوية*	
	Self-funding sources: مصادر التمويل الذاتي	
	- Rental Cafeteria - تأجير كافتريا	
	- Direct Fees - رسوم مباشرة	
	- Fees of Graduation documents - اجور وثائق التخرج	
	- Evening Studies - دراسات مسائية	

2	*Sources of donations and grants:* *مصادر الهبات والمنح* - - -- - -	
	Other sources: مصادراخرى - - -	
3	*Total salaries of the teaching staff at the academic program.* *مجموع رواتب أعضاء هيئة التدريس في البرنامج الأكاديمي.*	
4	*Total salaries of employees in the administrative and auxiliary services* *مجموع رواتب العاملين في الخدمات الإدارية والمساعدة*	
5	*Total additional lectures wages charged by faculty.* مجموع أجور المحاضرات الإضافية التي يتقاضاها التدريسيون	
6	*Total additional lectures wages charged by external lecturers.* مجموع أجور المحاضرات الإضافية التي يتقاضاها المحاضرون الخارجيون.	

فقرات صرف الميزانية المخصصة Paragraphs of the allocated budget exchange		The amount allocated. المبلغ المخصص	The amount spent. المبلغ المصروف
7	Total amounts for the purposes of building maintenance, the hardware, and equipment in the academic program. مجموع المبالغ لأغراض صيانة المباني، الأجهزة، والمعدات في البرنامج الأكاديمي.		
8	Total amounts for the purposes of equipment, materials, and supplies in the academic program. مجموع المبالغ لأغراض التجهيزات، المواد، واللوازم في البرنامج الأكاديمي		
9	Total amounts for the purchase of books, periodicals, and references in academic program. مجموع المبالغ لشراء الكتب، الدوريات، والمراجع في البرنامج الأكاديمي.		
10	Total amounts for conferences and seminars in the academic program. مجموع المبالغ للمؤتمرات والندوات في البرنامج الأكاديمي.		
11	Total amounts for the purposes of scientific research and postgraduate studies in the academic program. مجموع المبالغ لأغراض البحث العلمي والدراسات العليا في البرنامج الأكاديمي.		
12	Total amounts for the training of teaching staff and employees of the administrative system in the academic program. مجموع المبالغ لتدريب التدريسيين والعاملين في المنظومة الإدارية في البرنامج الأكاديمي.		
13	Total amounts for the purposes of other expenditures in academic program such as: festivities, scientific or artistic exhibitions... Etc. مجموع المبالغ لأغراض النفقات الأخرى في البرنامج الأكاديمي مثل : الاحتفالات، المعارض العلمية أو الفنية ... الخ .		
14	Total amounts of the workshops in the academic program. مجموع المبالغ للورش في البرنامج الأكاديمي.		
15	Total amount of student services in the academic program مجموع المبالغ للخدمات الطلابية في البرنامج الأكاديمي.		
16	Total amounts of scientific despatch in the academic program. مجموع المبالغ للإيفاد العلمي في البرنامج الأكاديمي.		
17	Total amounts for the purchase of textbooks in the academic program. مجموع المبالغ لشراء الكتب المنهجية في البرنامج الأكاديمي.		
18	Total amounts of incentives and rewards in the academic program. مجموع المبالغ للحوافز والمكافآت في البرنامج الأكاديمي		
19	Total amounts of other than those mentioned in above مجموع المبالغ من غير ما هو مذكور في اعلاه.		

PROGRAM CRITERIA

Describe how the program satisfies any applicable program criteria. If already covered elsewhere in the Self-Study Report, provide appropriate references.

APPENDICES

Appendix 1.1

Admission Regulations of the Iraqi Ministry of Higher Education and Scientific Research.

Please see the attached file, named Appendix 1.1 (pdf format)

Appendix 1.2

Admission Regulations of the Mechanical Engineering Department – University of Technology.

Please see the attached file, named Appendix 1.2 (pdf format)

Appendix 1.3

Details of working policy Committee of Absences in calculating student's absences.

Please see the attached file, named Appendix 1.3 (pdf format)

Appendix 1.4

The method of Evaluation and Distribution of Grades.

Please see the attached file, named Appendix 1.4 (pdf format)

Appendix 1.5

The method of distribution of students on the different disciplines in the ME Program.

Please see the attached file, named Appendix 1.5 (pdf format)

Appendix 1.6

Student Advising Committee of the Mechanical Engineering Department.

Please see the attached file, named Appendix 1.6 (pdf format)

Appendix 4.1

Industrial Advisory Board of the Mechanical Engineering Department.

Please see the attached file, named Appendix 4.1 (pdf format)

Appendix A – Course Syllabi

Please use the following format for the course syllabi (2 pages maximum in Times New Roman 12 point font)

1. Course number and name

2. Credits and contact hours

3. Instructor's or course coordinator's name

4. Text book, title, author, and year
    a. other supplemental materials

5. Specific course information
    a. brief description of the content of the course (catalog description)
    b. prerequisites or co-requisites
    c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

6. Specific goals for the course
    a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.
    b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

7. Brief list of topics to be covered

Appendix B – Faculty Vitae

Please use the following format for the faculty vitae (2 pages maximum in Times New Roman 12 point type)

1. Name
2. Education – degree, discipline, institution, year
3. Academic experience – institution, rank, title (chair, coordinator, etc. if appropriate), when (ex. 1990-1995), full time or part time
4. Non-academic experience – company or entity, title, brief description of position, when (ex. 1993-1999), full time or part time
5. Certifications or professional registrations
6. Current membership in professional organizations
7. Honors and awards
8. Service activities (within and outside of the institution)
9. Briefly list the most important publications and presentations from the past five years – title, co-authors if any, where published and/or presented, date of publication or presentation
10. Briefly list the most recent professional development activities

Appendix C – Equipment

No.	Instrument Name and Origin	Quantity
1	Forced in a crane jib (UK)	
2	Forced in a simple bar structure (UK)	1
3	Equilibrium in a single plane, statically determinate system (UK)	1
4	Forces in various single plane truss (UK)	1
5	Forces in an over determine truss (UK)	1
6	Forces in a home truss (UK)	1
7	Multi-channel measurement amplifier (UK)	1
8	Beam on 2 supports: shear forces (UK)	1
9	Deformation of straight beam (UK)	1
10	Torsion of bars (UK)	1
11	Deformation of curved-axis beams (UK)	1
12	Photo elastic equipment (UK)	1
13	Dynamic experiments module (UK)	1
14	Static experiments module(UK)	1
15	Beam defection unit (UK)	1
16	Universal material testing unit (UK)	1
17	Strength of material basic module (UK)	1
18	Pressure transducer and sensor (India)	1
19	Laser Gas Analyzer (Norway)	1
20	4-cylinder petrol engine (India)	1
21	4-cylinder diesel engine (India)	1
22	Computer based single cylinder 4 Stroke Petrol engine Test rig (India)	1
23	Water Cooled Pressure Transducer with Charge amplifier (India)	1
24	Training system : pressure control (UK)	2
25	Training system : speed control (UK)	1
26	Calibration trainer (UK)	1
27	Control of four variable from process engineering (UK)	1
28	Universal vibration system (UK)	1
29	Free and forced vibration apparatus (UK)	1
30	Free and damped torsional equipment(UK)	1
31	Static and dynamic balance apparatus (UK)	1
32	Balance of reciprocating masses(UK)	1
33	Torsional oscillators equipment (UK)	1
34	Hydrodynamics trainer /PC (UK)	1
35	Falling ball viscometer (UK)	1
36	Fluid friction in pipes and fittings (UK)	1
37	Water hammer apparatus (UK)	1
38	Two-stage axial-flow fan (UK)	1
39	Characteristic variables of centrifugal fan (UK)	1

40	Comparison of pumps (UK)	1
41	Compressible flow unit (UK)	1
42	Francis turbine trainer(UK)	1
43	Basic hydraulic bench (UK)	1
44	Free and forced convection unit (UK)	1
45	Natural convection and radiation apparatus (UK)	1
46	Thermal conductivity of building materials apparatus (UK)	1
47	Boiling heat transfer unit (UK)	1
48	Gas turbine jet engine (UK)	1
49	Basic heat pump demonstrator(UK)	1
50	Double chamber refrigerator module (UK)	1
51	Absorption refrigeration unit(UK)	1
52	Air conditioning system with climate chamber (UK)	1
53	Heat pump unit computer controlled (water condenser and air evaporator) (UK)	1
54	Thermal conductivity of liquid and gas module (UK)	1
1	Boiling heat equipment (UK)	55
1	Laser Doppler anemometer (UK)	56
1	Computer based single cylinder, Diesel Engine test Rig (India)	57
1	Drop Evaporation and Combustion Test Rig (Germany)	58

Appendix D – Institutional Summary

The Institution

a. Name and address of the institution:
Automotive Engineering Department
Mechanical Engineering Department
University of Technology
Baghdad
Iraq

b. Name and title of the chief executive officer of the institution:
Dr. Moayad Rezouki Hassan

c. Name and title of the person submitting the Self-Study Report
Dr. Mohsin Noori Hamzah
Dr. Enass H Flaieh
Mrs Lamyaa M Asaad

d. Name the organizations by which the institution is now accredited: N/A

Type of Control

Automotive Eng. Department As A branch from ME is a comprehensive state-funded institution by the Ministry of higher Education of Iraq. Overall responsibility for the university resides in an autonomous Board of Regents appointed from the University deans and confirmed by the Ministry. The board delegates authority for the internal management of the institution to the president. The faculty Dean is specified by the University Board. The University Board has legislative jurisdiction over policies affecting the academic mission of the university.
Automotive Eng. Department is dedicated to teaching, research, and service at the undergraduate and graduate levels. The department provides the continuous learning center in the University with academic staff that is well to provide the graduate engineers with the mist recent knoeledge.

Educational Unit

Automotive Eng. Department is one of four programs located within the Department of Mechanical Engineering. Mechanical Engineering is one of 15 academic departments within the University of Technology.

Academic Support Units

Automotive Eng. Department has no individuals responsible for each of the units that teach courses required by the program being evaluated, e.g., mathematics, physics, etc. All the former units are taught by ME staff.

Non-academic Support Units

Automotive Eng. Department depends on some individuals responsible for the units that provide non-academic support to the program being evaluated as:

ME Library
Mrs. Intsar

Sport Centre
Dr. Ahlam

Credit Unit
It is assumed that one semester or quarter credit normally represents one class hour or three laboratory hours per week. One academic year normally represents at least 28 weeks of classes, exclusive of final examinations. Automotive Eng. Department and the College of Mechanical Engineering use the course hour as the basic unit of academic credit. A credit hour is defined as 750 minutes of lecture (including exams) or 2,250 minutes of laboratory time. Over the course of a 15 week semester, that translates into 50 lecture minutes per week per credit hour. Laboratories meet for 2½ hours per week per credit hour. A typical two courses class consists of one 2½ hour laboratory and either three 50 or two 75 minute lectures. The last week of each semester is dedicated to final exams, with each course typically meeting once for a single 150 minute test. One academic year, consisting of two semesters, provides 28 weeks of instruction, exclusive of final examinations.

1. Tables

Complete the following tables for the program undergoing evaluation.

Complete the following tables for the program undergoing evaluation.

Table D-1. Program Enrollment and Degree Data
Automotive Engineering

Academic Year	Enrollment						Degrees Awarded		
	Status	1st Year Freshman	2nd Year Sophomore	3rd Year Junior	4th Year Senior	Total	Associates	Bachelors	Total
2013-2014	FT	678							76
2012-2013	FT	720							130
2011-2012	FT	683							168
2010-2011	FT	695							155
2009-2010	FT	713							143

Table D-2. Personnel
Bachelor of Science in Mechanical Engineering-Automotive Engineering

Year: 2014-2015

	HEAD COUNT		FTE
	FT	PT	
Administrative	1	-	1.5
Faculty (tenure-track)	15	11	2
Other Faculty (excluding student Assistants) Student Teaching Assistants	-	-	-
Student Teaching Assistants	7	-	7
Student Research Assistants	8	-	8
Technicians/Specialists	2		
Office/Clerical Employees	2		
Others			

Signature Attesting to Compliance

By signing below, I attest to the following:

That _____ (*Name of the program(s)*) has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Computing Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*

_____
Dean's Name (As indicated on the RFE)

_____ _____
Signature **Date**

Appendix 5.1

FIRST CLASS

Dept.	Course Number/ Title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME 221 Programming I	R	None	2 Hrs.	Engineering	A,B,D,F,H

Course (Catalog Description)

This guide provides an introduction to computer programming in the Fortran 90 programming language. The elements of programming are introduced in the context of Fortran 90 and a series of examples and exercises is used to illustrate their use.

Course Text

المرجع الاساس في برمجة وتطبيقات لغة البرمجة فورتران 90. د. عوض منصور د. محمود اباظة

Course Objectives

The aim of the course is to provide sufficient knowledge of programming and Fortran 90 to write straightforward programs.

Topics Covered

Week	Contents	المحتويات	الأسبوع
1	**Introduction** - Hardware And Software Computer Units	**مقدمة للحاسبة** - المكونات المادية والبرامجات للحاسبة و كيفية عملها	1
2	**Introduction to programming** - Problems Solution With Programming	**مقدمة في البرمجة** - التفكير البرمجي في حل المسائل,لغات البرمجة المختلفة	2
3	**Flow charts** - Flow Charts For Different Programming Examples Solution	**المخططات الانسيابية** - المخططات الانسيابية لحل المسائل البرمجية	3
4	- Flow Charts For Different Programming Examples Solution	- المخططات الانسيابية لحل المسائل البرمجية	4
5	**Fortran 90 programming language** - Introduction To Fortran 90	**لغة البرمجة فورتران 90** - مقدمة للغة البرمجة فورتران 90	5
6	- Introduction To Fortran 90	- مقدمة للغة البرمجة فورتران 90	6

7	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	**7**
8	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	**8**
9	- Data Types ,Variables & Constants	- أنواع البيانات والمتغيرات والثوابت (تمارين مختلفة)	**9**
10	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**10**
11	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**11**
12	- Arithmetic Operations And Intrinsic Functions	- العمليات الرياضية والدوال الرياضية (تمارين مختلفة)	**12**
13	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**13**
14	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**14**
15	- If Conditional Statements	- الجمل الشرطية (إذا .....) (تمارين مختلفة)	**15**
16	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**16**
17	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**17**
18	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**18**
19	- Inputs/ Outputs Formats	- صيغ المدخلات والمخرجات (تمارين مختلفة)	**19**
20	- Loops	- التكرار (تمارين مختلفة)	**20**
21	- Loops	- التكرار (تمارين مختلفة)	**21**
22	- Loops	- التكرار (تمارين مختلفة)	**22**
23	- Loops	- التكرار (تمارين مختلفة)	**23**
24	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**24**
25	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**25**
26	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**26**
27	- Subprograms & Functions	- البرامج الفرعية والدوال (تمارين مختلفة)	**27**
28	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**28**
29	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**29**
30	- Arrays	- المصفوفات ومعالجتها (تمارين مختلفة)	**30**

No.	**Contents**	**المحتويات**
1-	Hardware And Software Computer Units	المكونات المادية والبرمجية.
2-	Problems Solution With Programming	مقدمة الى البرمجة في حل المسائل العلمية.
3-	Flow Charts For Different Programming Examples Solution	المخططات الانسيابية.
4-	Introduction To Fortran 90	لغة فورتران 90 - المقدمة
5-	Data Types &Variables & Constants	انواع المتغيرات والثوابت

6-	Conditional Statements	معالجة الشروط في فورتران – 90
7-	Inputs/ Outputs Formats	المدخلات والمخرجات
8-	Loops	التكرار
9-	Arrays	المصفوفات
10-	Functions	الدوال الخارجية
11-	Subroutines	البرامج الفرعية

Lab Experiments

No.	Experiments
1-	A program to find square area.
2-	Program to use some intrinsic functions.
3-	To generate integer numbers (1 ... 100) with out using (Read statement).
4-	To generate even integer numbers (1 ... 100) with out using (Read statement).
5 -	To generate odd integer numbers (1 ... 100) with out using (Read statement).
6-	To use sine , cosine and tangent functions to get values for some angles without using (Read statement).
7-	To use Ohm law for some current values without using (Read statement).
8-	To generate integer numbers (1 ... 1000) that are multiple of (5) with out using (Read statement) and use the rule of multiplication.
9-	Using Fortran programming language to solve $Y = \sum_{k=1}^{k=n} X^k$
10-13	Using Fortran programming language to solve some power series
14-	Using Fortran programming language to calculate the average of 50 temperature .
15-	Using Fortran programming language to use the arrays, calculate the average and using conditional IF statement.
16-	Using Fortran programming language to use the arrays and reversing the array contents inside the same array
17-	Using Fortran programming language to find maximum and minimum temperatures
18-	Using Fortran programming language to print “slow”. Medium” and “fast” depending on vehicle speed.

Dept.	Course Number/ Title	Req./ Elect	Prerequisite(s)	Class/ Lab. Schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	321/Math I	R	ME115	3	Engineering	A, B,D & K

Course (Catalog Description)

All lectures reflect the higher values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalization and choice.
In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.
This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

Course Objectives

Antun H, Bevins I, Davis S, Calculus, 7th edition, Von Hoffman Press, 2002.
Thompson S P, Gardner, Deferential Calculus and the Integral Calculus, ST. Martain's Press, New York, 1998.
Bird J, Engineering Mathematics, 4th edition, Newness, Great Britain, 2003.

Aims of the Course:
-To provide a course of high academic quality in Mathematics in a challenging and supportive learning environment that encourages students to reach their full potential, personally and academically.
_ to provide a course that is suitable both for students aiming to pursue research and for students going into other careers;
_ to provide an integrated system of teaching which can be tailored to the needs of individual students;
_ to develop in students the capacity for learning and for clear logical thinking;
_ to continue to attract and select students of outstanding quality;
_ to provide an intellectually stimulating environment in which students have the opportunity to develop their skills and enthusiasms to their full potential;

Topics Covered

No.	Contents	المحتويات
1-	Cartesian Coordinates, Slope of a line, Equations and distances, Graphs of equations	- الأحداثيات - ميل الخط المستقيم - انواع المعادلات والمسافات بين النقط
2-	Limits and intervals, Continuity test, Domain and Range	- رسم الدوال المختلفة - الغايات والفترات

3-	Elementary Operations with matrices	**المصفوفات** مقدمة وتعاريف
4-	Transpose and inverse of matrices	**المحددات والخواص** خواص المصفوفات ونقل المصفوفات
5-	Solution of system of equations using Gramer's rule method	حل مجموعة من المعادلات بطريقة قاعدة كرامر
6-	Introduction to complex numbers	مداخل الى الأعداد المركبة
7-	Argrand diagrams and product quotients	مخطط اركراند والضرب والقسمة
8-	Powers and roots	الأسس والجذور
9-	Properties and roots	خواص الجذور
10-	Cauchy-Riemann equation	معادلة كاتوشي-ريمية
11-	Properties, rules and graphing	خواص وقواعد ورسم
12-	Properties and rules	خواص وقواعد
13-	Graphing, rules and properties	
14-	Rules of derivatives, Chain rule and implicit derivatives	**مشتقات الدوال** قوانينها، قاعدة السلسله، المشتقات الضمنية
15-	Rules of derivatives of logarithmic and exponential functions	**مشتقة الدوال الأسية واللوغارتمية** - قوانينها
16-	Derivatives of trigonometric and inverse trigonometric functions	**مشتقة الدوال المثلثية** - قوانينها **مشتقة الدوال المثلثية العكسية** - قوانينها
17-	Derivatives of hyperbolic and Inverse hyperbolic functions	**مشتقة الدوال الزائدية** - قوانينها **مشتقة الدوال الزائدية العكسية** - قوانينها
18-	L'Hapital rule, Velocity and acceleration, , Max. and Min. and point of inflection	**تطبيقات المشتقة** - قاعدة اوبيتال - ميل المنحني
19-	Integration formulas and integration of logarithmic, exponential trigonometric and inverse trigonometric functions	**تطبيقات ـاخرى** - والسرعة والتعجيل - النقطة العظمى والصغرى
20-	Integration of Hyperbolic and Inverse hyperbolic functions	**التكامل غير المحدد** - صيغ التكامل - تكامل الدوال الأسية واللوغارتمية
21-	Integration by parts and integration for odd and even powers of sine and cosine	**تكامل الدوال المختلفة** تكامل الدوال المثلثية والمثلثية العكسية
22-	Trigonometric Substitutions and integral involving $ax^2 + bx + c$	**تكامل الدوال اخرى** - تكامل الدوال الزائدية والزائدية العكسية
23-	Partial fractions and rational functions of *sinx* and *cosx* and other trigonometric functions	**طرق التكامل** - التكامل بالتجزئه - تكامل الأس الزوجي والفردي للجيب والجيب تمام
24-	Definite integral and area	**تكامل التعويضات المثلثية**

		-التعويضات المثلثية تكامل الصيغة $ax^2 + bx + c$
25-	Length of the curve and surface area	**تجزئة الكسور والدوال النسبية** - التكامل بتجزئه الكسور - تكامل الدوال النسبية للدوال المثلثية
26-	Triple Integrals (volume)	**تطبيقات التكامل** - التكامل المحدد والمساحة تحت المنحني المنفرد
27-	Area between two curves	**تطبيقات عامة** طول المنحني والمساحة السطحية
28-	Vector in space, parallel vectors and product of vectors	**المتجهات** - المتجهات في الفراغ وتوازي المتجهاتو ضرب المتجهات
29-	Triple product, volume of box and projection of two vectors	**تطبيقات مختلفة** - الضرب الثلاثي وحجم المكعب واسقاط متجهيين وتطبيقات اخرى
30-	Quiz, answers and solutions	**تعويضات عامة وامتحانات مفاجئه** - حل اسئلة الأمتحانات السابقة ومراجعة

Department	Course Number/Title	Req./Elect.	Class/ Lab. Schedule	Contribution to Prof. component	Relevant program outcomes
Mechanical Engineering	ME/ 631 Thermodynamics 1	R	Theor : 2 Tutor : 1 Pract : 1	Engineering	ABET: a,b,c,f,g

Course prerequisites

Differential and integral calculus, basic physics and chemistry, good command of English language, high skills in computer and communication facilities.

Course description

Description of the substance and phases including the theories dealing with the analytical formulation of their properties. Description of the thermal system and its surrounding with interaction characteristics between them. Awareness of units and dimensions in standard systems of units. Definition of Energy and its forms, transformation means and tools. Mathematical formulation of First and second law of thermodynamics and their limitations. Application of the physical and mathematical concepts to thermodynamic processes and evaluating their impacts on performance and developing techniques. Distinguishing between real and theoretical processes.

Course textbook

اساسيات داينمك الحرارة ، د. رحيم جوي محي ، الطبعة الاولى ، مطبعة الجامعة التكنولوجية ، 2008.

Course references

3. Thermodynamics: An Engineering Approach; by Yunus A. Cengel & M. Boles.
4. Basic Engineering Thermodynamics; by F.J.Wallce & W.A.Linning.

Course objectives

- Using dimensions and units in the description of the basic and derived physical quantities.
- Using and converting between international unit systems.
- Realizing phase change process and subject it to energy production procedures.
- Evaporation and condensation concept utilization in energy transfer in boilers and heat exchangers.
- Mathematical formulation of the transitional and stored energies specification as they changed during any process.
- Formulation for heat and work transfer in thermodynamic process and deriving the governing property change.
- The engineering application of power and refrigeration cycles.
- Applying the heat engine concept with performance assessment criteria.
- Energy degradation concept during transformation and transferring, as well as, the methods used to control the processes inherent losses.
- Using entropy as a measure for energy degradation while transferred and realizing the entropy minimization principle.

Topics covered

No.	**Contents**	المحتويات
1	Units & dimensions.	التعامل مع نظم الوحدات
2	Basic definitions.	التعاريف الاساسية
3	System and processes.	النظام الحراري والعمليات الثرموديناميةة
4	Zeroth law.	القانون الصفري للحرارة
5	Temperature scales.	درجة الحرارة وتدريجاتها
6	Energy.	الطاقة وانواعها.
7	Heat and specific heat capacity.	الحرارة و الحرارة النوعية.
8	Work and its types.	الشغل وانواعه.
9	Working substance.	خصائص مادة العمل.
10	Perfect gas law.	معادلة الحالة للغاز المثالي.
11	Real gases.	الغاز الحقيقي.
12	Energy conservation.	مبدا حفظ الطاقة.
13	Energy as system property.	الطاقة خاصية النظام.
14	First law of thermodynamics and Energy balance.	القانون الاول لديناميك الحرارة وموازنة الطاقة.

15	Non-flow energy equation.	معادلة الطاقة لحالة اللاجريان.
16	Application of N.F.E.E. to closed systems.	تطبيق معادلة الطاقة لحالة اللاجريان على الانظمة المغلقة.
17	Steady-flow energy equation.	معادلة الطاقة للجريان المستقر.
18	Application of S.F.E.E. to open systems.	تطبيق معادلة الطاقة للجريان المستقرعلى الانظمة المفتوحة.
19	Heat engine and thermal efficiency.	الماكنة الحرارية والكفاءة الحرارية.
20	Reversed heat engine and COP.	الماكنة الحرارية المعكوسة ومعامل الاداء.
21	Reversibility and 2nd law of thermodynamics.	القانون الثاني لديناميك الحرارة والانعكاسية.
22	Carnot cycle for power and reversed Carnot cycle for refrigeration.	دورة كارنو للقدرة و دورة كارنو المعكوسة للتبريد.
23	Entropy and energy degradation.	الانتروبي ومفهوم انحطاط الطاقة.
24	Entropy as system property.	الانتروبي خاصية النظام.
25	Entropy equations for gases.	معادلات الانتروبي للغازات.
26	Entropy change in thermodynamic processes.	تغير الانتروبي في العمليات الثرموديناميكية.
27	Isentropic efficiency.	الكفاءة الايزنتروبية.
28	Molecular structure of elements, compounds and mixtures.	التركيب الجزيئي للعناصر والمركبات الكيمياوية والخلائط الغازية.
29	Avogadro's hypotheses / Dalton's law / Gibbs-Dalton law / Amagat's law.	نظرية افوكادرو \ قانون دالتون \ قانون جبس – دالتون \ قانون اماكات.
30	Volumetric & gravimetric analysis.	التحليل الحجمي والتحليل الوزني للخلائط الغازية.

Lab experiments

1	Boyles' law	تطبيق قانون بويل
2	Specific heat capacity	حساب الحرارة النوعية
3	Measurement of for Oxygen	قياس نسبة الحرارتين النوعيتين لغاز الاوكسجين
4	Mechanical Heat Pump	المضخة الحرارية الميكانيكية
5	Stirling engine	ماكنة سترلنك
6	Calorific value of gaseous fuel	حساب القيمة الحرارية لوقود غازي

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. Schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical engineering	ME\831	R		2 hrs practice	Engineering	ABET: A,B, C, G

Course (Catalog Description)

The basic purpose of this course is to introduce 1st year Mechanical Students to the concepts of material properties through the study ofmaterial crystallization, mechanical tests and the heat treatments.

Course Text

Applied Physical Metallurgy –H. Higgins

Course Objectives

The basic purpose of this course is to introduce 1st year Mechanical Students to the concepts of material properties through the study ofmaterial crystallization, mechanical tests and the heat treatments.

Topics Covered

No.	Contents	المحتويات
1-	**Introduction** -Introduction to ores, elements and materials -Iron ores -Periodic table of elements -Engineering materials.	**المقدمة** مدخل الى الخامات والعناصروالمواد - خامات الحديد - الجدول الدوري للعناصر - المواد الهندسية. -
2-	**Classification of engineering materials** -Metallic and non metallic -Ferrous and non ferrous -Natural and synthetic materials	**تصنيف المواد الهندسية** معدنية وغير حديدية - حديدية وغير حديدية - مواد هندسية طبيعية وصناعية -
3-	**Crystal structure** Atomic arrangement BCC, FCC and HCP structures Atomic packing factor.	**التركيب البلوري** الترتيب الذري - المكعب المركزي الجسم - المكعب المركزي الوجه والسداسي المحكم - - معامل الرص الذري
4-	**Imperfections in crystals** - point defects - dislocations and grain boundaries - solidification of materials and alloys	**عيوب البلورات** العيوب النقطية - الانخلاعات وحدود الحبيبات - تصلب المعادن والسبائك -
5-	Structure of ingots chilled - columnar and central equi-axed grains - dendritic segregation	**بنية الصبات** منطقة الحبيبات المصقة والطولية - والمركزية تصلب المعادن والسبائك -
6-	**Thermal equilibrium dagrams** - solubility in the solid state phases - solid solutions, compounds and mechanical mixtures	**مخططات الاتزان الحراري** قابلية الذوبان في الحالة الصلبة - الاطوار - المحاليل الصلبة والمركبات والخليط - الميكانيكي.
7-	Lever rule - Eutectic, Eutectoid and Periteetic reactions.	**قاعدة العتلة** التحولات اليوتكتيكية واليوتكتويدية والحلقية -
8-	Applications on binary phase diagrams - components completely soluble, completely insoluble or partially soluble in the solid state.	**تطبيقات على مخططات الاتزان الحرارية** مكونات السبيكة تامة الذوبان او عديمة - الذوبان او جزئية الذوبان في الحالة الصلبة

9- 10-	**Mechanical properties of metals** - specifications and standards - normal stress and shear stress - strain - tensile and compression test -stress-strain diagram Hardness tests: brinell, Rockwell and Vickers -impact tests: izod and charpy	الخواص الميكانيكية للمعادن - المواصفات القياسية - الاجهاد العمودي واجهاد القص - الانفعال - اختبارات الشد والضغط - منحني الاجهاد – والانفعال - اختبارات الصلادة برينيل وروكويل وفكرز - اختبارات الصدمة: ايزود وجاربي
11-	**Application on mechanical testing and properties** - determination or young modulus - yield stress - proof stress - ultimate tensile strength - fracture stress, ductility - hardness and impact toughness	**تطبيقات على الاختبارات الميكانيكية والخواص** حساب معامل يونك - اجهاد الخضوع - - االجهاد الصمود - مقاومة الشد القصوى - اجهاد الكسر والمطيلية - الصلادة ومتانة الصدمة
12-	**Iron and steel** - Fe-Fe3c phase diagram - Allotropy - microstructure of carbon steels - Effect of carbon content on microstructure and mechanical properties of carbon steel.	**الحديد والصلب** مخطط اطوار الحديد- كاربيد الحديد - ظاهرة تعدد الاطوار - - االبنية المجهرية للصلب الكاربوبي - تاثير المحتوى الكاربوني على البنية المجهرية والخواص الميكانيكية للصلب
13-	**Carbon steel** - types, properties and uses of carbon steel. - low, medium, and high carbon steel - tool carbon steel	**الصلب الكاربوني** انواع وخواص واستخدامات الصلب الكاربوني - - الصلب المنخفض والمتوسط والعالي الكاربون - صلب العدد الكاربوني
14- 15-	**Cast iron** - types, properties and uses of cast iron. - white, grey, nodular and malleable cast iron	**حديد الزهر** انواع وخواص واستخدامات حديد الزهر - حديد الزهر الابيض, الرمادي, المتكور - والمطاوع.

16- 17-	**Heat treatment of steel** - non- equilibrium cooling - TTT diagrams - Annealing, normalizing, hardening and tempering of steel.	المعاملات الحرارية للصلب - التبريد غير الاتزاني TTT- مخططات - تلدين ومعادلة وتقسية ومراجعة
18-	**Alloy steel** - role of alloying elements - types, properties and uses stainless steel and high speed tool steel-.	**الصلب السبائكي** دور عناصر السبك - انواع وخواص واستخدامات الصلب السبائكي
19- 20-	**Copper and its alloys** - classification - properties - uses - brasses and bronzes	النحاس وسبائكه - انواعه - خواصه - استخداماته - النحاس الاصفر والبرونز
21- 22-	**Aluminum and its alloys** - classification - properties - uses - aging and precipitation hardening	الالمنيوم وسبائكه - انواعه - خواصه - استخداماته - التعتيق والتصليد بالترسيب
23- 24-	**Nano materials** - characterization of nano particles and nano structures - classifications - applications of nano materials in technology and medicine.	المواد متناهية الصغر - توصيف الجسيمات الدقيقة والتراكيب متناهية الصغر - التصنيف - تطبيقات المواد الدقيقة في الصناعات التقنية والطب.
25- 26-	**plastics** - introduction to plastics technology - microstructure and polymerization - structure of plastics materials - classification, properties and uses of plastics.	اللدائن - مقدمة لتقنيات اللدائن - البنية الداخلية والبلمرة -تركيب المواد اللدائنية - انواع وخواص واستخدامات اللدائن
27- 28-	**Ceramics and glass** - structure, defects, properties and uses of ceramics. - structure, properties and uses of glasses.	السيراميك والزجاج - تركيب وعيوب وخواص واستخدامات السيراميك -تركيب وخواص واستخدامات الزجاج
29- 30-	**Composite materials** - classification: metal matrix, ceramic matrix and polymer matrix	المواد المركبة تصنيفها: الخلفية المعدنية او السيراميكية او البوليمرية - طور التقوية: الياف او رقائق او جسيمات -التركيب والكسر الحجمي للمواد المركبة - خواص واستخدامات المواد المركبة.

SECOND CLASS

Department	Course Number/ Title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineerin	ME/172 Automative Technology I	R	ME215	3	Engineering	A, B,D , F, K,

All lectures reflect the higher values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalization and choice.
In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.
This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

Course (Catalog Description)

Course Objectives

Aims of the Course :

The aim of the course is to produce postgraduates with advanced knowledge and understanding of automotive engineering; higher order critical, analytical, problem solving and transferable skills; ability to think rigorously and independently to meet higher level expectations of automotive industry, academics, research or take up entrepreneurial route.

Topics Covered

No.	Contents	المحتويات
1-	Historical developments	**التطور التاريخي**: نظرة تاريخية على صناعة السيارات (المكائن الحرارية)
2-	IC Engines classifications	**تصنيف المحركات** نوع الدورة نوع الوقود طريقة الاشعال
3-	Basic engine nomenclature	**المحرك ومكوناتة الاساسية**: حجم المحرك حجم الخلوص نسبة الانضغاط

4-	Engine components	**مكونات المحرك**: الكتلة محور الكامات الحذافة
5-	Combustion chamber	**الاسطوانة وملحقاتها**: الاسطوانة المكبس ذراع التوصيل
6-	Camshaft	**عمود الكامات**: أذرع الدفع آلية فتح وغلق الصمام التابتات
7-	Diesel engine cycle	**دورة محرك الديزل**: الدورة القياسية لمحركات الديزل وحسابات الكفاءة
8-	Otto cycle	**دورة محرك البنزين**: الدورة القياسية لمحركات الاشعال بالشرر وحسابات الكفاءة
9-	Engine cooling system	**منظومة التبريد**: منظومات التبريد السائلة منظومات التبريد الهوائية المقارنة بين الدورتين مع حساب الحمل الحراري
10-	Heat transfer	**انتقال الحرارة**: حساب الموازنة الحرارية للمحرك
11-	Friction and lubrication	**الاحتكاك والتزييت**: احتكاكات المحرك طرق التزييت حسابات نوع الزيت
12-	Lubrication oil	**زيوت التزييت**: منظومات التزييت المضخات الفلاتر
13-	Fuels	**الوقود**: الوقود الهيدروكاربوني
14-	Fuels	وقود محرك الديزل وقود محرك البنزين العدد الاوكتاني
15-	Fuel systems	**منظومة الوقود**: الخزان المضخة
16-	Fuel systems	حساب كتلة الوقود
17-	Air and fuel induction	**الهواء والوقود الداخل للمحرك**: حساب النسبة المكافئة Ø انواع الاحتراق
18-	Ignition systems	**منظومة الاشعال**:

		انواع ومكونات المنظومة
19-	Rotary combustion engine	**المحركات الدوارة**: محرك فانكل فوائدة
20-	Clutch	**القابض (الفاصل)**: دراسة طريقة عملة اذا كان امامي ام خلفي
21-	Gear box	**صندوق التروس**: دراسة مجموعة التروس داخل صندوق تحديد السرع مع الحسابات
22-	Sun gears	**المسننات الشمسية**: المكونات الداخلية الاتجاة الامامي والخلفي مع الحسابات
23-	Tools	**اساسيات المعدات والعدد في صيانة السيارة**: الوقاية العدد المستخدمة في السيارات
24-	Measurements	**القياسات**: القياسات المستخدمة في تكنولوجيا السيارة
25-	Two stroke engines	**محرك ثنائي الاشواط**: أساس عمل محرك ثنائي الاشواط
26-	Maintenance	**الصيانة**: تعريف الصيانة الصيانة انواع
27-	Trouble shootings	اصلاح العطلات
28-	Trouble shootings	- اصلاح العطلات
29-	Trouble shootings	- اصلاح العطلات
30-	Trouble shootings	- اصلاح العطلات

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Dep.	ME/222 Programming II	R.	Me/321	2 hours	Engineering	a, b, c

Course (Catalog Description)

In MATLAB ,both theoretically and Experimentally, the student learn how to deal with MATLAB software, and how to solve different mathematical equations , linear equations, deal with matrices in addition to learn plotting different relations in 2D and 3D.
The student also learn how to write a function to solve specific engineering problems in different fields such as strength of materials, fluids, mathematics ….etc. That enables the

students to use MATLAB as a tool to solve different engineering problems .

Course Text

Different lectures

Course Objectives

1-The objective of MATLAB course is to make the student able to use this programming language for modeling and solving the engineering problems like strengths of materials, fluids, heat transfer…etc.
2-Using MATLAB language to solve problems in mathematics like, derivatives, integrations solving linear equations that couldn't be solved manually, series …etc.
3-Learning 2D, 3D plotting to plot all science experiments in different student labs.

Topics Covered

No.	Contents	المحتويات
1-	**Introduction to programming using (Matlab)** - Introduction to (MATLAB) - Menu bar , tool bar, and program windows	**Matlab)مقدمة إلى البرمجة باستخدام (** MATLAB- مدخل إلى برنامج ( ) - استخدام أدوات وأشرطة ونوافذ البرنامج
2-	**Format & numbers** - Real, Integer , Inf , NaN , Complex numbers	2- **الصيغ والأرقام** - الأنواع المختلفة من الأرقام Real, Integer, Complex, NaN, Inf( )
	Variables 3 - Variable Names - Examples on variable names 4 - Show the results - Examples on (+ , - , * , /) 5 - Outputs - Intermediate results during calculations	**المتغيرات** - شروط أسماء المتغيرات 3 أمثلة على استخدام أسماء المتغيرات- 4- عرض النتائج لأي عملية رياضية باستخدام متغير (ans) النظام الافتراضي - أمثلة على (+ , - , * , /) 5- المخرجات - عدم إظهار نتائج العمليات الوسطية أثناء الحسابات
6-	**Built-in-functions** - Trigonometric Functions (sin , cos , tan , sec) - Elementary Functions (abs, log10 , log, exp, sqrt)	6- **الدوال المضمنة** - الدوال الهندسية (sin , cos , tan , sec .) - الدوال الأولية abs, log10 , log, exp, sqrt( )

	Functions 7- polyarea (X,Y) - polygon - Standard Deviation - abs function 8- (max) - (min) - (mean)	7- **بناء الدوال** . ((polyarea (X,Y)دالة مساحة المضلع 7- .(polygon)دالة حساب مساحة المضلع - .Standard Deviationدالة الانحراف المعياري - .function abs- دالة إيجاد القيمة المطلقة للعدد: تطبيق بعض الدوال الجاهزة- (max)دالة 8 - (min) دالة (mean) دالة
9	**Logical commands** - Logical Operations >greater than >=greater than or equal <less than <=less than or equal = =equal = ~ not equal - Logical commands or (|), and (&)	9- **الاوامر المنطقية** العمليات المنطقية- > اكبر من => اكبر من أو يساوي < اصغر من <= اصغر من أو يساوي = = يساوي ~ = لا يساوي الأوامر المنطقية - and (&) و or (|)
10	**Strings manipulation** - Creating Strings - save	10- **معالجة النصوص** بناء النصوص - لحفظ المعلومات الرقميةsaveاستخدام صيغة -
11 12	**Conditional commands** - if end If elseif else function - Examples - Problems	**الاوامر الشرطية** الصيغ العامة للأوامر الشرطية11- end if صيغة if elseif else صيغة function صيغة - أمثلة12 - تمرينات
13 14	**loops** - for - while - Program control - Example - Problems	**التكرار** forالتكرار باستخدام إيعاز 13- 14while- التكرار الشرطي باستخدام إيعاز .Matlabايعازات السيطرة على البرنامج - أمثلة- تمرينات -
15-	**Matrices** - Matrices manipulation	15- **المصفوفات** معالجة المصفوفات -
16-	**Matrices Operations** - Matlab as a calculator - Basic mathematical operations	**العمليات في المصفوفات**16- - عمل النظام كحاسبة يدوية ^ , / , * , - , + - أداء العمليات الرياضية الأساسية

	+ , - , * , / , ^	
17 18 19 20 21	**Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product - Logical commands - Comparison tests - Examples - Problems	**- بناء المصفوفة** عرض جزء معين من المصفوفة. ضرب المصفوفات .18- عرض الدوال المجدولة كمصفوفة19- 20- ضرب المصفوفة في المتجه - ضرب المصفوفات مع بعضها - الأوامر المنطقية في المصفوفات 21- تركيب اختبارات المقارنة في المصفوفات - أمثلة - تمرينات
22-	**Vectors** - Row Vectors, Colon Notation (:) - Extracting Bits of a vector - Column Vectors - Transposing	22- **المتجهات** - المتجهات الأفقية، توليد المتجهات باستخدام (:) عرض جزء معين من المتجه - - المتجهات العمودية - التحويل
23-	- Examples and Problems	أمثلة و تمرينات- 23
24-	**Transformation functions** - Rotation, Scaling, Shearing, Reflection, Translation	**- دوال التحولات الهندسية**24 تدوير , تكبير , تصغير , انعكاس , نقل , قص-
25-	**Write formatted data to file** - fid=fopen(filename,'w') fprintf(fid,'format',list of variables) - Examples	25- **حفظ المعلومات في ملفات** لتخزين المعلومات داخل ملف (fprintf)إيعاز - (fid) وباسم ملف (format) بصيغة محددة .(fopen) يفتح باستخدام ايعاز أمثلة -
26-	**Read formatted data from file** - fid=fopen(filename,'r') fscanf(fid,'format',size) - Examples	- **قراءة المعلومات من الملفات** 26 لقراءة المعلومات بصيغة محددة (fscanf) إيعاز - بعد fid) من الملف الذي يحمل أسم ((format) (fopen) والذي يفتح باستخدام إيعاز (r) إعداده للقراءة . أمثلة -
27 28 29 30	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems	**Matlab- الرسم بواسطة** لرسم مصفوفات البيانات(plot) الإيعاز 27- - رسم أكثر من مخطط في الشكل الواحد باستخدام 28 subplot (m,n,p) إيعاز - رسم ثنائي الأبعاد 29 30 - رسم ثلاثي الأبعاد - أمثلة و تمرينات

Lab Experiments

No.	Experiments	التجارب
1-	Learn how to deal with MATLAB different windows , how to use command windows	1-التعرف على واجهة ماتلاب وكيفية التعامل مع نوافذ البرنامج المختلفة
2-	Learn types of variables , deal with working space ,using clc, clear commands	2- التعرف على انواع المتغيرات في البرنامج والغاية من استخدام الامرين clc, clear
3-	Basic calculations like add, sub, multiplication, division, pi	3- العمليات الحسابية البسيطة مثل الجمع والطرح والقسمة والضرب
4-	Learn to define constants and variables within equation to solve it	4- تعلم كيفية كتابة المعادلات الرياضية بلغة ماتلاب وحلها
5-	Trigonometric and inverse trigonometric functions	5- استخدام الدوال المثلثية والدوال المثلثية العكسية
6-	Hyperbolic and inverse hyperbolic functions	6- استخدام الدوال الزائدية والدوال الزائدية العكسية
7-	Working with vectors, examples, problems	7- العمليات على المتجهات
8-	Working with matrices, examples, problems	8- العمليات على المصفوفات
9-	Plotting ,examples	9- امثلة تطبيقية عن الرسم
10-	Plotting, examples	10- امثلة تطبيقية عن الرس
11-	Difference between product and dot product ,division and dot division with examples	11- الفرق بين الضرب الاعتيادي والضرب النقطي والقسمة الاعتيادية والقسمه النقطيه
12-	For loop and while loop with examples	12- امثلة عن For loop ,while loop
13-	If statements with examples, problems	13- امثلة عن If statement
14-	Relational and logical operations examples	14- امثلة عن العمليات النسبية والمنطقية
15	Nested loops examples, problems	15- امثلة عن Nested loops

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME432/ Mechanical Drawing	R	ME431	3	Engineering	ABET: A, B, C, F

Course (Catalog Description)

The basics of mechanical engineering drawing and applications.

Course Text

- mechanical drawing / Abdul Rasul pumice 2
- lectures article + External article exercises

Course Objectives

The course aims to teach students the principles of mechanical drawing and its importance to the engineer and the completion of what the student has learned in engineering drawing and descriptive for the first stage through first identify the types of connection methods, fit and tolerances, drawing assembly and the types of gears. In addition to its applications and computer-assisted drawing.

Topics Covered

No.	Contents	المحتويات
1-	**Screws** - Classifications of Screws	**البراغي** البراغي أنواع - سداسي برغي - الطرفين من مسنن برغي - كروي / عدسي/ مسطح برغي -
2-	- Joining by bolts or screws	(سداسي) وصامولة برغي بواسطة الربط - الطرفين من مسنن مسمار بواسطة الربط -
3-	**Application on computer** - Using AutoCAD to draw an example of joining by bolts	**الحاسبة على تطبيق** عن موضوع الأوتوكاد باستخدام تطبيقي مثال رسم - البراغي
4-	**Keys** - Classifications of Keys	**الخوابير** الخوابير أنواع - الموشوري الخابور - المسلوب الخابور - المدور الخابور -
5-	**Pins & Rivets** - Classifications of Pins & Rivets	**والبراشيم المسامير** استعمالاتها - بالرسم تمثيلها - أنواعها -
6-	**Application on computer** - Using AutoCAD to draw joining of keys or pins	**الحاسبة على تطبيق** او الخوابير بواسطة الربط موضوع تمرين عن- المسامير
7-	**Springs** - Classifications of Springs	**النوابض** تصنيفها - ضغط نابض - سحب نابض - ورقي / التوائي نابض - الأسطواني النابض رسم -
8-	**Tolerances** - Basic size	**التفاوتات** :أساسية تعريفات -

	- Limits of size - Deviation	الأساس المقاس - المقاس حدي - الانحرافات - الرسم على التفاوتات وضع -
9-	**Fits** - Classes of fit / clearance - Transition - Interference	**التوافقات** خلوصي توافق : التوافقات أنواع - انتقالي - تداخلي -
10-	- Calculation of fits & tolerance	التوافقات على تمارين - والعمود للثقب التوافق نوع تحديد - التداخل وكذلك والأدنى الأعلى الخلوص حساب -
11-	**Surface finishing** - Application of surface finishing Symbols	**التشغيل علامات** رموز او علامات بواسطة السطح نوعية تحديد - التشغيل
12-	**Application on computer** - Using AutoCAD drawing to represent the fits & surface finishing	**الحاسبة على تطبيق** التوافقات وعلامات التشغيل وضع كيفية على تمرين - الرسم على
13-	**Assembly Drawing** - Draw a sectional front view & a side view for general assembly	**التجميع** جانبي لتمرين ومسقط لمجمع كامل أمامي مقطع رسم - معين
14-	- Draw a sectional front view for general assembly	ميكانيكية منظومة لأجزاء كامل أمامي مقطع رسم -
15-	- Draw a sectional front view for general assembly	منظومة ميكانيكية لأجزاء مقطوع نصف أمامي مسقط -
16-	- Draw a sectional front view for general assembly	منظومة لأجزاء أمامي ومسقط أمامي مقطع رسم - ميكانيكية
17-	**Application on computer** - Using AutoCAD to draw general Assembly	**الحاسبة على تطبيق** التجميع على تمرين رسم -
18-	- Using AutoCAD to draw general assembly	التجميع على تمرين رسم -
19-	**Welding** - Types of welding - Gas welding - Arc welding - Resistance welding	**اللحام** للحام الرئيسية الطرق - غاز لحام - الكهربائي القوس لحام - الكهربائية المقاومة لحام -
20-	- Basic symbols for welding gas & arc welding	الرسم على اللحام تمثيل - الغاز للحام الأساسية الرموز - اللحام على تمرين -
21-	**Application on computer** - Using AutoCAD to draw welding assembly	**على اللحام رموز وضع كيفية الحاسبة على تطبيق معين رسم** الرسم على اللحام رموز وضع كيفية عن تمرين - التجميعي
22-	**Gears : Spur Gear** - Classification of gears - Applications	**العدلة الاسطوانية التروس : التروس** التروس أنواع - تطبيقاتها -

	- Drawing of spur gear	العدل الاسطواني الترس رسم -
23-	- Spur gears assembly Drawing	الاسطوانية التروس تعشيق رسم -
24-	**Application on computer** - Using AutoCAD to draw spur gears assembly	**الحاسبة على تطبيق** التروس الأسطوانية تعشيق رسم موضوع عن تمرين -
25-	**Bevel gear** - Drawing of bevel gear	**المخروطية التروس** المخروطية التروس رسم -
26-	- Bevel gears assembly drawing	المخروطية التروس تعشيق رسم -
27-	**Application on computer** - Using AutoCAD to draw bevel gears assembly	**الحاسبة على تطبيق** التروس المخروطية تعشيق رسم موضوع على تمرين -
28-	**Worm and worm wheel** - Drawing of warm and worm wheel	**الدودي والدولاب الدودة** الدودة رسم - الدودي الدولاب رسم - الدودي والدولاب الدودة تعشيق -
29-	**Application on gears** - Drawing of sluice valve operating gear	**التروس على تطبيق** مع بعضهما متعشقين ترسين تضم أداة أو ماكنة رسم -
30-	**Detailed drawing** - Detailed drawing	**التفصيلي الرسم** مجمعة منظومة ميكانيكية لأجزاء تفصيلي -رسم

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME/632 Thermodynamics (I I)	R	Thermodynamics (I)	5 hrs	Engineering	ABET: A, B,C, D

Course (Catalog Description)

1. Identify the components or parts of steam and gas stations .
2. to learn how to work the accounts of steam and use steam schemes .
3. to identify the application of the equations for the flow of energy to the stable parts of the plant steam.
4. to know courses steam and gas turbine cycles and cooling cycles and applications.

Course Text

1- Applied Thermodynamics for Engineering Technologists, by Estop, T. D. and McConky, A.

2- Engineering Thermodynamics, Work and Heat Transfer, by Rogers, C. F.C. and Mayhew, Y.R.

3- thermodynamics an Engineering Approach ,Youns.

Course Objectives

-Definition of the second stage students in the Department of Engineering machinery and equipment concepts of science thermodynamic .
-Learn the basics of science hemodynamic using the basic laws of dynamics and heat application.
-Helping to understand and apply the accounts as well as the use of steam and steam schemes .
-Learn all of the steam cycles and gas.

Topics Covered

No.	Contents	المحتويات
1-	Fundamentals of Thermodynamics II	IIاساسيات ديناميك الحرارة
2-	Definitions, Pure Matter , Phase Change	خواص المادة النقية
3-	Saturated Vapor Tables, Superheated Vapor Tables. Illustrative Example	جداول البخار
4-	Determine Parameters of State of Steam and Basic Relations.	حسابات البخار
5-	Study of T-s, P-v Diagrams and h-s Chart.	مخططات البخار
6-	V=c, p=c, T=c, Illustrative Example	اجراء ثبوت الحجم واجراء ثبوت الضغط واجراء ثبوت درجة الحرارة
7-	Isentropic Process and Polytropic Processes Illustrative Example	الاجراء الايزنتروبي والبولتروبي
8-	Throttling Process. Separation-Throttling Calorimeter. Illustrative Example	اجراء الخنق
9-	Separation-Throttling Calorimeter. Illustrative Example	مسعر الفصل -الخنق
10-	Introduction, Carnot Cycle: Diagrams and Processes.	دورة كارنوت
11-	Rankine Cycle, Basic Cycle, Diagrams and Processes. Illustrative example	دورة رانكن المثالية.
12-	Rankine Cycle with Superheat; Diagrams and Processes. Illustrative Example	دورة رانكن مع التحميص
13-	Rankine Cycle with Reheat; Diagrams and Processes. Illustrative Example	دورة رانكن مع اعادة التسخين
14-	Regenerative Rankine Cycle Open Type Feed Water Heater; illustrative Example.	دورة رانكن المنشطة مع مسخنات ماء التغذية النوع المفتوح
15-	Regenerative Rankine Cycle. Closed Type Feed Water Heater with Drains Pumped Forward; illustrative Example	دورة رانكن المنشطة مع مسخنات ماء التغذية النوع المغلق.
16-	Otto Cycle; Diagrams and Processes. Illustrative Example	دورة اوتو المخططات والاجراءات.
17-	Diesel Cycle; Diagrams and Processes. Illustrative Example	دورة ديزل المخططات والاجراءات.
18-	Dual Combustion Cycle; Diagrams and	دورة المزدوجة المخططات والاجراءات.

	Processes. Illustrative Example	
19-	Comparison of I.C. Air Standard Cycles.	مقارنة بين دورات الهواء القياسية.
20-	Brayton Cycle; Diagrams and Processes. Illustrative Example	دورة التوربين الغازي البسيطة(برايتن)
21-	Brayton Cycle with Regeneration. Illustrative Example	دورة برايتن مع اعادة التنشيط.
22-	Brayton Cycle with Intercooling and Reheating. Illustrative Example	دورة برايتن مع التبريد الداخلي واعادة التسخين.
23-	Introduction, Definition, Components,Indicated Work For Reciprocating Positive Displacement Air Compressors. Illustrative Example	مقدمة ضواغط الهواء الترددية ذات الازاحة الموجبة
24-	The Condition of Minimum Work, Isothermal Efficiency. Illustrative Example	شرط اقل شغل والكفاءة الايزوثرمية.
25-	Effect of Clearance Volume. Volumetric Efficiency, Illustrative Example	تاثير حجم الخلوص والكفاءة الحجمية والمخطط البياني الحقيقي.
26-	Actual Indicator Diagram. Multi-Stage Compressor , Inter-Cooling Effect on Multi Stage Reciprocating Compression.	الضاغط متعدد المراحل وتاثير التبريد الداخلي على الضغط متعدد المراحل.
27-	The ideal intermediate pressure, Energy balance of a two-stage machine with inter-cooler Illustrative example	الضغط البيني المثالي وموازنة الطاقة لضاغط ترددي ذي مرحلتين مع تبريد داخلي.
28-	Rotary Air Compressors, Radial and Axial Compressors.	ضواغط الهواء الدوارة.
29-	Refrigeration cycles, Ideal Vapor Compression Refrigeration Cycle. Illustrative Example	دورة التبريد بانضغاط البخار المثالية.
30-	Ideal Gas Refrigeration Cycle. Illustrative Example	دورة التبريد الغازية المثالية.

Lab Experiments

No.	Experiments	التجارب
1-	The relation between the pressure and saturation temperature of the water vapor	تجربة العلاقة بين ضغط ودرجة حرارة التشبع لبخار الماء
2-	Measurement the dryness fraction of wet steam	تجربة قياس نسبة جفاف البخار الرطب
3-	Part1:Study the performance of steam power plant Part2: study the performance of steam power plant with variable load	تجربة دراسة اداء المحطة البخارية – الجزء (1) التعرف الى خصائص اداء الماكنة البخارية تجربة دراسة اداء المحطة البخارية – الجزء (2) التعرف الى اداء الماكنة البخارية تحت احمال متغيرة
4-	Energy balance	تجربة موازنة الطاقة

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab.	Contribution to	Relevant Program

				schedule	Prof. Component	Outcomes
Mechanical Engineering	ME \ 832 Manufacturing Processing	R	Basic information from the subjects of production and material properties	2 hrs. Theory	Engineering	ABET: A, C, D, E, G

Course (Catalog Description)

Definition Phase II students - all the different branches of the basic concepts and production processes and methods of manufacturing in all its forms, as well as modern methods in manufacturing productivity and various properties of materials.

Course Text

- Manufacturing Processes , 2nd Edition, (H.N. Gubta & R.C Gubta , 2010)

References:

-Introduction to basic Manufacturing Processes , (Rajender Singh, 2007).
-Manufacturing Process Design and Costing, (Simmy Grewal, 2011).
-Manufacturing Processes 1 and 2, (H.C. Fritz Klocke, 2011).

Course Objectives

1. Recognize the basic concepts in manufacturing processes.
2. Knowledge of different manufacturing methods.
3. Realize the importance of mechanical, chemical and physical properties of the different manufacturing materials and the impact of the difference in those values.
4. Differentiate between the different manufacturing methods and knowledge of the advantages and disadvantages of each method.
5. Capability weighting method to another in a given manufacturing process by realizing the goal of that process.
6. Identify and calculate the optimal way certain or specific production process.
7. Differentiate between industrial materials and find out the most suitable for various manufacturing processes.
8. Realize the advantages of the different manufacturing methods in terms of overlapping use and function Hand similarities and differences points.
9. Access to the latest methods used in various manufacturing processes.
10. Found on modern machines and rapid development in the field of industrial materials and metals.

Topics Covered

No.	Contents	المحتويات
1-	**Iron and steel making** -Iron ores -Pig iron making -Blast furnace	صناعة الحديد الصلب + الفرن العالي -خامات الحديد -طريقة تحضير الأهين -الفرن العالي النفاخ
2-	**Steelmaking** -Process of steel making	صناعة الصلب -طريقة صناعة الصلب

3-	**Casting fundamentals** -Casting processes characteristics -Casting techniques	السباكة ومبادئها -مزايا عمليات السباكة -تقسيم عمليات السباكة
4-	**Sand casting**	السباكة الرملية -رمال السباكة -اختبار خصائص رمال السباكة -النماذج -السباكة بالماكنات -أفران صهر المعادن للسباكة -تنظيف وفحص المسبوكات
5-	-Molding sand -Sand testing -Patterns - Molding machines -Foundry furnaces -Cleaning and inspection of casting	السباكة بالقوالب الدائمة -طرق السباكة بالضغط
6-	**Die casting methods** -Pressure die casting methods	السباكة بطرق أخرى -السباكة بالطرد المركزي -السباكة بالشمع الضائع -مقالبة القشرة -السباكة المستمرة
7-	**Other casting methods** -Centrifugal casting - Lost-wax casting -Shell molding process - Continuous casting	التشكيل للمعادن -التشكيل على الساخن -التشكيل على البارد
8-	**Metal forming** -Hot working of metal -Cold working of metal	الحدادة والطرق -أقسام عملية الحدادة -الأدوات المستخدمة في الحدادة -الحدادة بالمكابس والمطارق الآلية -ماكنات الحدادة المقيدة
9-	**Rolling** -Types of Rolling machines - Calculation the angle of contact -Hot and cold Rolling processes	الدرفلة / الدلفنة -ماكنات الدلفنة -حساب زوايا التلامس -الدلفنة على الساخن وعلى البارد
10-	**Extrusion** -Methods of Extrusion -Tube Extrusion -Impact Extrusion	البثق -طرق البثق -بثق الأنابيب -البثق التصادمي
11-	**Drawing** -Wire drawing machines -Tube drawing machines -Metal preparation for drawing	السحب -ماكنات سحب الأسلاك -ماكنات سحب الأنابيب -إعداد المعادن للسحب
12-	**Sheet metal work** -Processes of sheet metal forming -Joining of sheet metal -Soldering	تشكيل الصفائح -عمليات السمكرة -عمليات ربط الألواح المعدنية الرقيقة -لحام السمكرة بالسبائك اللينة
13-	**Metal cutting** -Chiseling steel metal -Filing steel metal -Sawing steel metal	قطع المعادن -عمليات القطع بالأجنة -عمليات البرادة -عمليات النشر

14-	**Turning operations** -Types of turning machines	الخراطة -الأنواع الرئيسية لماكنات الخراطة
15-	-Parts of turning machines -The lath as a general purpose machine	-أجزاء المخرطة -بعض عمليات الخراطة
16-	**Shaping operations** -Classification of shapers	عمليات التشكيل
17-	**Milling operations** -Types of milling machines	التفريز -أنواع ماكنات التفريز
18-	**Drilling operations** -Drills -Reamers -Drilling machines -Boring machines	التثقيب -المثاقب -الموسعات -ماكنات التثقيب -ماكنات التخويش
19-	**Grinding operations** -Types of grinding machines -Grinding tools	التجليخ -أنواع ماكنات التجليخ -عدد وأدوات التجليخ
20-	**Welding** -Electric Arc Welding -Metal Arc Welding	اللحام -لحام القوس الكهربائي -لحام القوس المعدني MIGولحام - TIG لحام -لحام البلازما
21-	-Tungsten and Metal Inert gas welding -Plasma welding	اللحام الانصهاري -اللحام اوكسي اسيتلين -الترابط الانتشاري -اللحام الوميضي
22-	**Fusion welding**	-اللحام الثرميتي
23-	-Oxy acetylene welding -Thermite welding - Electron beam welding Diffusion welding -Projection welding -Flash welding	اللحام بالضغط وطرق اللحام الأخرى -لحام المقاومة الكهربائية -اللحام الاحتكاكي
24-	-Laser welding -Ultrasonic welding -	اللحام بالليزر والموجات فوق الصوتية
25-	welding -Explosion welding	-لحام المتفجرات
26-	**Soldering and Brazing** -Brazing and Soldering metals and alloys -The factors that the process depends on	اللحام بالقصدير والمونة -المعادن والسبائك المستخدمة في اللحام اللحام على المؤثرة العوامل -
27-	**Solid-state welding and other types**	-اللحام الاسقاطي
28-	**welding** -Electric resistance welding -Friction	-اللحام بالحزم الإلكترونية
29-	Non Traditional Cutting	عمليات قطع لا تقليدية -طريقة القطع باستخدام الذبذبات فوق الصوتية -طريقة التشغيل الكيماوي -طريقة التشغيل الكهروكيمياوي -طريقة التشغيل بالشرر الكهربائي -طريقة التشغيل بالشعاع الالكتروني -طريقة التشغيل باستخدام الليزر -طريقة التجليخ الالكتروني

30-	**CNC machines**	المكائن المبرمجة -تعريف لنظام التحكم الرقمي والمقارنة بينها -المقارنة بين ماكنات العدد التقليدية وماكنات الCNC -المزايا والعيوب الاقتصادية لماكنات التحكم الرقمي CNCبالحاسوب - DNCالسيطرة الرقمية المباشرة والتحكم الرقميCAD/CAM

THIRD CLASS

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME\ 123 Engineering and Numerical Analysis		Mathematics I Mathematics II	2 hrs	Engineering	

Course (Catalog Description)

- Define the principle of Engineering and Numerical analysis.
- Define and solution the non-linear and linear equations.
- Solution the first and second order differential equations.
- Applied the numerical analysis on the data tables, which are obtained from experimental work.
- Study the relation between numerical analysis and mechanical engineering problems as heat transfer and fluid flow.

Course Text

التحليل الهندسي و العددي التطبيقي, تاليف د.حسن مجيد الدلفي و د. محمود عطا الله مشكور, الطبعة الاولى 1999 بغداد – العراق.

Course Objectives

Give the knowledge to the student for dealing with numerical analysis for mechanical engineering problems especially by used computers program.

Topics Covered

No.	Contents	المحتويات
1-	**Solution of non- linear equations**	**الحل العددي للمعادلات غير الخطية:**

	- Introduction - Simple iteration method	- مقدمة, - طريقة التكرار البسيطة
2-	- Bisection method	- طريقة الانشطار
3-	- Newton –Raphson method	- طريقة نيوتن – رافسون
4-	**Solution of simultaneously linear equations** - Introduction	**الحل العددي لنظام المعادلات الخطية انيا:** - مقدمة
5-	- Solution using matrices	- الحل بطريقة المصفوفات
6-	- Direct methods	- الطرق المباشرة
7-	- Direct methods	- الطرق المباشرة
8-	- Indirect methods	- الطرق غير المباشرة
9-	- Indirect methods	الطرق غير المباشرة
10-	**Laplace Transformations** - Introduction	**تحويلات لابلاس:** - مقدمة
11-	- Laplace Transformations	- بعض خواص تحويلات لابلاس
12-	- Inverse Laplace Transformations	تحويلات لابلاس المعكوسة
13-	- Solution of differential equations using Laplace Transformations	حلول المعادلات التفاضلية عن طريق تحويلات لابلاس
14-	**Solution of 2nd order D.E. using power series method** - Introduction - Solution near the ordinary point	**حلول المعادلات التفاضلية عن طريق متسلسلات القوى:** - مقدمة, - الحل بالقرب من النقطة الاعتيادية
15-	- Solution near the singular point	- الحل بالقرب من النقطة الشاذة
16-	**Solution of partial differential equations**: - Using of separation variable method	**حلول المعادلات التفاضلية الجزئية باستخدام طريقة فصل المتغيرات:**
17-	- Applications of heat transfer	- تطبيقات انتقال الحرارة
18-	- Applications of vibrations	- تطبيقات على اهتزاز السلك
19-	**Numerical interpolation** - Introduction	**الاستكمال العددي :** - مقدمة,
20-	- Newton formula and Stirling formula for equal segment	- صيغة نيوتن وصيغة سترلنك للمسافات المتساوية
21-	- Lagrange formula for unequal segments	- صيغة لاكرانج للمسافات غير المتساوية
22-	**Numerical differentiation:** - Introduction	**التفاضل العددي:** - مقدمة,
23-	- Newton formula and Stirling formula for first and second derivatives of equal segment	صيغة نيوتن وصيغة سترلنك للمشتقة الاولى والثانية وللمسافات غير المتساوية
24-	- Lagrange formula for first and second derivatives of unequal segments	- صيغة لاكرانج للمشتقة الاولى والثانية وللمسافات غير المتساوية
25-	**Numerical Integration**: - Introduction -/- equal segments - trapezoidal rule	**التكامل العددي:** - مقدمة. - مسافات متساوية - طريقة شبه المنحرف
26-	- Simpson Rule (1/3) - Simpson Rule(3/8) -/- unequal segments	- طريقة (3/1) سمبسون, طريقة (8/3) سمبسون, - مسافات غير متساوية

27-	**Curve fitting:** - Introduction - linear Regression	**تطابق المنحنيات:** - مقدمة, - الانحدار الخطي,
28-	- Applications of linear regression	- تطبيقات الانحدار الخطي
29-	**Solution of ordinary differential equations O.D.E.** - Introduction - Simple Euler method	**الحل العددي للمعادلات التفاضلية الاعتيادية:** - مقدمة, - طريقة اويلر البسيطة
30-	- Modified Euler method - Runge-kutta method	- طريقة اويلر المطورة, - طريقة رانج-كوتا

Lab Experiments

No.	Experiments	التجارب
1-	Non-linear equations	المعادلات غير الخطية
2-	Simultaneously linear equations	انظمة المعادلات الخطية
3-	Numerical interpolation	الاستكمال العددي
4-	Numerical differentiation	التفاضل العددي
5-	Numerical Integration	التكامل العددي
6-	Numerical solution of ODE	الحل العددي للمعادلات التفاضلية الاعتيادية

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME 243/ Theory of Machines	R	ME452 Me322 ME732	2 hrs theory 1 hr practice 1 hr tutorial	Engineering	c,d,f,e,g

Course (Catalog Description)

The course provides students with instruction in the fundamentals of theory of machines. The Theory of Machines and Mechanisms provides the foundation for the study of displacements, velocities, accelerations, and static and dynamic forces required for the proper design of mechanical linkages, cams, geared systems, belt systems, Gyroscope and others.

Course Text

1- Mechanics of Machines by J. Hanna & R.C. Stephens

Course Objectives

- All students who are study this course combine theory, graphical and analytical skills to understand the Engineering Design. At the completion of this course, the student will be able:
- To develop the capability to analyze and understand the kinematics and dynamics (position, velocity, acceleration, force and torque) characteristics of mechanisms such as linkages and cams.

- To progress the skill to systematically design and analysis mechanisms to perform a detailed task.
- To growth the ability of students to effectively existing written, oral, and graphical solutions to design and manipulate the problems.
- To progress the ability of students to work helpfully on teams in the improvement of mechanism designs and constructions.

Topics Covered

No.	Contents	المحتويات
1-	Linkages or Mechanisms	الآليات والروابط او الوصلات
2-	Velocity in mechanisms by method of relative velocities	مخططات السرعة باستخدام طريقة السرعة النسبية
3-	=	=
4-	Acceleration in mechanisms	مخططات التعجيل
5-	=	=
6-	=	=
7-	Static & Dynamic (Inertia) forces in Machines	قوى القصور الذاتي
8-	=	=
9-	Gears (Toothed gears)	المسننات
10-	=	=
11-	Gear Trains	سلسلة المسننات البسيطة والمركبة والكوكبية
12-	=	=
13-	=	=
14-	Flywheel	الحذافة
15-	=	=
16-	Speed governors	منظمات السرعة الدورانية
17-	=	=
18-	Friction belts	السيور الاحتكاكية
19-	=	=
20-	Balancing of rotating masses	الاتزان في الكتل الدوارة
21-	=	=
22-	=	=
23-	Cams & followers	الحدبات والتوابع
24-	=	=
25-	Gyroscopic Motion	الجيرسكوب
26-	=	=
27-	Critical Whirling Speeds of Shafts	الدوران الحرج في الاعمدة
28-	=	=
29-	Robotics	الروبوتات
30-	=	=

Lab Experiments

No.	Experiments	التجارب
1-	Slider crank mechanism	آلية المرفق والمنزلق
2-	Four bar mechanism	آلية الاذرع الاربعة
3-	Fly wheel	الحذافة
4-	Belt friction	الاحتكاك في السير الحبلي
5-	Balancing of rotating masses	اتزان الكتل الدوارة
6-	Gyroscope	الجيروسكوب
7-	Governors	منظم السرعة
8-	Epicyclic gear train	سلسلة المسننات الكوكبية ذات المرحلتين

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME\343 Mechanical Engineering Design I	R	ME/454	2 /2	Engineering	ABET: A,B,D,E,F, G,H,I,J and K

Course (Catalog Description)

This course introduces the fundamental of design methodology by following up the system design flowchart. Topics include the failure analysis of machine elements such as columns, belts, chain and gears. Upon completion, students should be able to analyze and solve any mechanical design problem and arriving to optimum idea.

Course Text

1. Machine Element in Mechanical Design by Robert L. Mott.
2. Engineering Design Method by Nigel Cross.
3. Design Method by G.Johnes.
4. Optimization of Mechanical Elements by Ray Johnson.

Course Objectives

1. Define of design activities according to system design flowchart.
2. Training the students for solving the design problems in working fields.
3. Find many alternative ideas for solving the problems, then find best solutions .
4. Use tools and subjects that taken in previous years i.e solidworks, mdesign …. ,
5. Using mdesign for certain parts that may be used in the system i.e chain, belts, gears.…,
6. Make optimum design for simple parts to suite some of initial specifications that considered during the system design flowchart.

Topics Covered

No.	Contents	المحتويات
1-	Structure of Lectures	وصف مختصر لهيكلية المقرر
2-	Introduction to the System Design Flow Chart	مقدمة في المخطط الانسيابي لتصميم المنظومات
3-	Advantages of Questionnaire and How to Write an Initial Specification of the System	مزايا الاستبيان وكيفية كتابة المواصفات الأولية للنظام

4-	Examples of Design (Initial) Specifications Part I	أمثلة في المواصفات الأولية للتصميم ج1
5-	Examples of Design (Initial) Specifications Part II	أمثلة في المواصفات الأولية للتصميم ج2
6-	System Conception	الأفكار وتكوين النظام مفهوم
7-		
8-		
9-	Decision Making	تقييمها بعد الأفكار أختيار
10-		
11-	Production of system specification	النهائي التصميم - تكوين مواصفات
12-	Production of system scheme Feasibility Study	- تكوين الرسوم التصميمية النهائية النهائي للتصميم المعقولة والدراسة - الوثوقية
13-	Columns Design	تصميم الأعمدة ضد الانبعاج
14-		
15-	Design of Chain Drive	تصميم سلاسل نقل القدرة
16-	Design of Belt Derive	تصميم احزمة نقل القدرة
17-		
18-	Design of Spur Gear	تصميم التروس المستقيمة
19-		
20-	Design of Helical Gear	تصميم التروس الحلزونية
21-		
22-	Design of Bevel Gear	تصميم التروس المخروطية
23-		
24-	Design of Worm Gear	تصميم التروس الدودية
25-		
26-	Software applications in the design	تطبيقات البرامجيات في التصميم
27-		
28-	Introduction to Optimum Design	مقدمة في التصميم الامثل
29-	Summary of Design Equations in Optimum Design	استعراض للمعادلات التصميمية للتوصل الى التصميم الامثل

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME\473 Internal Combustion	R	Thermodynamics I & II Fluid Mechanics	2 hrs	Engineering	

	Engine -					

Course (Catalog Description)

This course provides the material needed for the basic understanding of the operation and performance of internal combustion engines;

- Learn to classify different types of internal combustion engines and their applications.
- Know the fundamental thermochemistry as applied to fuels, types of fuels, combustion and pollution.
- Estimate the performance of internal combustion engines.
- Follow the various operational processes from intake to exhaust.
- Be familiar with supercharging and turbocharging systems.

The course also includes an experimental part which allows the student to estimate the performance of both spark ignition and compression ignition engines, effect of some parameters on engine performance like ignition timing, Air/Fuel ratio, compression ratio and perform an energy balance of the compression ignition engine.

Course Text

- C.F.Taylor, 1986, The Internal Combustion Engine in Theory and Practice
- Engineering Fundamentals of the Internal Combustion Engine, by Willard Pulkrabek 2004)

Course Objectives

The students should attain a fundamental understanding of the function of modern Internal Combustion Engines, including identification of each major component, knowledge of its function and how it relates to the other components in the engine. The student should also understand the basics of combustion chemistry, thermodynamics and heat transfer as applied to an ICE.
Calculations of torque, power, efficiency, air/fuel ratio and fuel consumption will be required of students in the course.

Topics Covered

No.	Contents	المحتويات
1-	- History of ICEs - Engine Classification.	- نبذه تاريخية عن محركات الاحتراق الداخلي, - تصنيف المحركات.
2-	Basic Idea of I.C. Engines; Different Parts of I.C. engines	- الفكرة الاساسية لعمل محركات الاحتراق الداخلي, - الاجزاء المختلفة لمحركات الاحتراق الداخلي.
3-	**Terminology of IC engines.** - TDC & BDC - Bore, Stroke & swept volume - Compression ratio CR - Slider-Crank Mechanism,	**مصطلحات المحركات:-** - النقطة الميتة العليا والنقطة الميتة السفلى, - الشوط, و حجم الشوط, - نسبة الانضغاط.

		- الية المنزلق والمرفق
4-	**Air Standard Cycles & Ideal Engines** - General review; - Constant Volume or Otto Cycle; - Constant Pressure or Diesel Cycle; - Dual Combustion Cycle.	**دورات الهواء القياسية والمحركات المثالية:** - مراجعة عامة, - دورة ثبوت الحجم او دورة اوتو, - دورة ثبوت الضغط او دورة الديزل, - دورة الاحتراق المزدوجة.
5-	- Comparison between Otto, Diesel and dual cycles; i. Same CR and the same heat input; ii. Same CR and the same heat rejection; iii. Same peak pressure, peak temperature and heat rejection; iv. Same maximum pressure and heat input; v. Same maximum pressure and work output.	- مقارنة ين دورات اوتو, ديزل, والمزدوجة, i. نفس نسبة الانضغاط ونفس الحرارة المضافة, ii. نفس نسبة الانضغاط ونفس الحرارة المطروحة, iii. نفس الضغط الاعظم والحرارة العظمى والحرارة المطروحة, iv. نفس الضغط الاقصى والحرارة الداخلة, v. نفس الضغط الاقصى والشغل الخارج.
6-	- Atkinson Cycle; - Ericsson Cycle; - Brayton Cycle; - Miller Cycle; - Lenoir Cycle.	- دورة اتكنسن, - دورة ايركسن, - دورة برايتون, - دورة ميلر, - دورة لينيور.
7-	**Fuel & Combustion:** - Sources of fuel - Types - Properties	**الوقود والاحتراق:** - مصادر الوقود, - انواعه, - خواصه.
8-	- Basic chemistry - Combustion equations, - Exhaust gas analysis	- الكيمياء الاساسية للاحتراق, - معادلات الاحتراق, - تحليل غازات العادم.
9-	- Internal energy and enthalpy of combustion; - enthalpy of formation	- الطاقة الداخلية وانثالبي الاحتراق, - انثالبي التكوين.
10-	- Calorific value of fuel - Dissociation	- القيمة الحرارية للوقود, - التحلل.
11-	**Fuel-Air Cycles** - Factors considered for fuel-air cycle analysis; - Variable specific heats; - Dissociation; - Thermal efficiency and fuel consumption; - Effect of common engine variables.	**دورات الوقود والهواء:** - فرضيات تحليل دورة الوقود والهواء, - تغير الحرارة النوعية, - التحلل, - الكفاءة الحرارية واستهلاك الوقود, - تاثير متغيرات المحرك العامة.
12-	**Actual Cycles**	**الدورات الحقيقية:**

	- Comparison of Air-Standard and Actual cycles; - Time loss factor; - Heat loss factor; - Exhaust blowdown; - Loss due to friction	- مقارنة بين دورة الهواء القياسية والدورة الحقيقية, - عامل خسائر الوقت, - عامل الخسائر الحرارية, - تفريغ العادم - خسائر بسبب الاحتكاك.
13-	**Valve & Spark Timing:** - Valve timing - Spark timing - Firing order	**الصمامات وتوقيتات الشرر:** - توقيتات الصمامات, - توقيتات الشرارة, - ترتيب الاشعال.
14-	**Engine Test & Performance:** - Fuel consumption measurement - Air consumption measurements - Volumetric efficiency	**اختبار المحرك والاداء:** - قياس استهلاك الوقود, - قياس استهلاك الهواء, - الكفاءة الحجمية.
15	- Methods of measuring of indicated Power - Methods of measuring of brake power - Methods of measuring of friction power - Speed; - Exhaust and coolant temperature; - Emission.	- طرق قياس القدرة البيانية, - طرق قياس القدرة المكبحية, - طرق قياس القدرة الاحتكاكية, - السرعة, - درجة حرارة العادم والتبريد, - الانبعاث.
16-	**Engine Heat Balance:** - Heat balance - Heat losses - Analytical method of performance estimation.	**موازنة الطاقة للمحرك:** - موازنة الطاقة, - خسائر الطاقة, - الطريقة التحليلية لتخمين الاداء.
17	**Engine electronics:** - Measurement of pressure; - Measurement of Temperature; - Measurement of intake air flow; - Exhaust oxygen sensor; knock sensor**.**	**الكترونيات المحرك:** - قياس الضغط, - قياس درجة الحرارة, - قياس انسياب دخول الهواء, - متحسس الاوكسجين لغازات العادم, متحسس الضغط.
18-	**Supercharging & Turbocharging:** - Purpose of Supercharging; - Supercharging of S.I. engines; - Supercharging of C.I. engines; - Thermodynamic analysis of supercharged engine cycle	**الشحن المفرط:** - الغرض من الشحن المفرط, - الشحن المفرط في محركات الاحتراق بالشرر, - الشحن المفرط في محركات الاحتراق بالانضغاط, - التحليل الثرموديناميكي لدورة المحرك مع الشحن المفرط.
19	- Turbocharging: i. Introduction; ii. Altitude compensation; iii. Method of turbocharging;	- الشحن التوربيني: i. مقدمة, ii. تعويض الارتفاع, iii. طرق الشحن التوربيني,

	iv. Limitations of turbocharging; v. Charge cooling.	iv. محدوديات الشحن التوربيني, v. تبريد الشحنة.
20-	**Two-Stroke Engines:** - Types of two-stroke engines; - Terminologies and Definitions; - Theoretical scavenging processes; - Actual scavenging processes;	**محركات ثنائية الاشواط:** - انواع محركات ثنائية الاشواط, - مصطلحات وتعاريف, - عمليات الكسح النظرية, - عمليات الكسح الفعلية.
21-	- Advantages and Disadvantages of two-stroke engines; - Comparison of two stroke SI and CI engines.	- محاسن ومساوئ محركات ثنائية الاشواط, - مقارنة بين محركات الاحتراق بالشرر وبالانضغاط ثنائية الاشواط .
22-	**Combustion in gasoline engines:** - Stages of combustion in SI engines; - Flame front propagation; - Factors influencing the flame speed;	**الاحتراق في محركات البنزين:** - مراحل الاحتراق في محركات الاحتراق بالشرر, - تقدم جبهة اللهب, - العوامل المؤثرة على سرعة اللهب.
23	- Abnormal combustion; - The phenomenon of knock in SI engines; - Effect of engine variables on knock; - Octane number;	- الاحتراق الطبيعي, - ظاهرة الطرق في محركات الاحتراق بالشرر, - تاثيرات متغيرات المحرك على الطرق, - الرقم الاوكتاني.
24	- Highest useful compression ratio; - Combustion chamber design-SI engines.	- نسبة الانضغاط النافعة العليا, - تصميم غرف الاحتراق في محركات الاحتراق باشرر.
25-	**Combustion in Diesel engines:** - Cetane number - Stages of combustion in CI engines; - Factors affecting the delay period.	**الاحتراق في محركات الديزل:** - الرقم السيتاني, - مراحل الاحتراق في محركات الاحتراق بالانضغاط, - العوامل المؤثرة على فترة التاخير.
26	- The phenomenon of knock in CI engines; - Comparison of knock in SI & CI engines; - Combustion chambers design in CI engines.	- ظاهرة الطرق في محركات الاحتراق بالانضغاط, - مقارنة بين الطرق في محركات الاحتراق بالشرر وبالانضغاط. - تصميم غرف الاحتراق في محركات الاحتراق بالانضغاط.
27-	**Emissions & Air Pollution:** - Poisoning gases - Acidic gases - Particulate matters	**الانبعاثات وتلوث الهواء:** - الغازات السمية: - الغازات الحامضية, - المواد الصلبة,
28-	- Measurements - Control - International regulates	- القياسات, - السيطرة, - المحددات الدولية
29-	- Comparison of gasoline and diesel emissions	- مقارنة بين انبعاثات البنزين والديزل,

	- Zero emission.	- الانبعاث الصفري
30-	- Effects of engine emissions on Human health.	- تاثيرات انبعاثات المحرك على صحة الانسان.

Lab Experiments

No.	Experiments	التجارب
1-	Engine parts & determination of valve timing diagram-Stirling engine performance	التعرف على اجزاء محرك الاحتراق الداخلي ومخطط توقيتات الصمامات – واجراء تجربة اداء محرك سترلنك.
2-	Diesel engine test at constant speed	اختبار اداء محرك ديزل عند سرعة ثابتة
3-	Diesel engine test at variable speed	اختبار اداء محرك ديزل عند سرعة متغيرة
4-	Petrol engine test at constant speed	اختبار اداء محرك بنزين عند سرعة ثابتة
5-	Petrol engine test at variable speed	اختبار اداء محرك بنزين عند سرعة متغيرة
6-	Heat Balance	موازنة الطاقة
7-	Exhaust gas analysis	تحليل غازات العادم

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME/773Fluid Vehicles Theory	R		3 hrs practice	Engineering	ABET: A, B, C, D, E

Course (Catalog Description)

It is the subject of specialization for students of automotive engineering, is designed to teach the students the fundamental issues in the theory of the vehicles.

Course Text

-Dr. Sheerco Shaker Fattah "Theory of vehicles" 1989

Course Objectives

It is the subject of specialization for students of automotive engineering ,is designed to teach the students the fundamental issues in the theory of the vehicles.

Topics Covered

No.	Contents	المحتويات
1-	Introduction, mechanics of rolling tire, rolling tire on hard road. Causes of creation of rolling resistance. Factors affect on rolling resistance.	مقدمة. ميكانيكية تدحرج الاطار , تدحرج الاطار على طريق صلب. اسباب نشوء مقاومة التدحرج. العوامل المؤثرة على مقاومة التدحرج. خواص. خواص الاطارات وانصاف اقطارها
2-		
3-		
4-		
5-		

	Properties of pneumatic tires. Radii of tire	
6- 7- 8- 9- 10-	Forces& moments effect on moving vehicle. Essential equ. moving resistances& tractive effort, problems, total resistances. Required tractive effort.	القوى والعزوم المؤثرة على السيارة اثناء سيرها, معادلة الدفع الرئيسية. مقاومة المسير وجهد السحب. مسائل. مقاومة المسير الكلية, قوة الدفع اللازمة.
11- 12- 13- 14- 15-	Relationship between vehicle& engine. Relation between engine& transmission. Performance of mechanical gearbox. Specific tractive effort &specific moving resistances. Performance characteristics of vehicle with (TC).calculation	العلاقة بين المحرك والسيارة. توافق المحرك مع الية الادارة. خصائص الاداء لصندوق التروس الاعتيادي. قوة الدفع النوعية ومقاومة المسير النوعية. خصائص الاداء للسيارات ذات اجهزة التبديل الاوتوماتيكي. حساب نسب التخفيض.
16- 17- 18- 19- 20-	Fuel consumption. Problems. Braking theory of vehicles, types of brakes. Times Behavior of braking. Allowable braking distance	استهلاك الوقود. مسائل. نظرية الكبح بالسيارات, انواع الكوابح. المسار الزمني لعملية الكبح ومسافة الكبح المسموح بها.
21- 22- 23- 24- 25-	Relative deceleration& braking force. Directional stability of vehicle during braking. Ideal braking forces. Linear distribution of braking forces	التباطؤ النسبي وقوى الكبح. الاستقرار الاتجاهي للسيارة اثناء الكبح. قوة الكبح المثالية التوزيع الخطي لقى الكبح. مخطط توزيع القوى.
26- 27- 28- 29- 30-	Diagram of braking distribution. Study the braking force distribution according to international standard. Braking of vehicle& carrage as a system, problems	توزيع قوى الكبح حسب المعايير العالمية. كبح مجموعة المسير (القاطرة والمقطورة). مسائل.

Lab Experiments

No.	Experiments
1-	Frictional desk clutch
2-	Gear box of the vehicle
3-	Coupled gear box
4-	Borg warner automatic transmission
5-	Determination of vehicle performance

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes

Mechanical Engineering	ME-823 / Computer Aided Design	R	ME\ 431 & ME\ 432	2 hrs. practice	Engineering	A, C, D, E, F, I

Course (Catalog Description)

The objective of this course is to introduce the student to the language of graphics used in engineering and technology. The student will acquire an understanding of orthographic projections, sections, conventions, threads and fasteners, pictorial drawings, auxiliaries and revolutions. Mechanical assembly and detail drawings are discussed and illustrated. Other topics covered are lettering, scaling, dimensions, holes, fillets, rounds fasteners, fittings and title block specifications.

Course Text

Different lectures

Course Objectives

-Definition concepts of CAD system used in mechanical engineering.
-Helping students understanding basic phases of generic CAD package.
-Creation of geometries including parts, components, assemblies and subassemblies.
-Modifying entities to optimize CAD system.

Topics Covered

No.	Contents	المحتويات
1-	Introduction to CAD and parametric modeling: advantages and disadvantages.	مقدمة في CADوالنمذجة البرامترية: المزايا والعيوب.
2-	Sketch Entities, Relations, Editing sketch and relation.	رسم الكيانات ، العلاقات، وتحرير الرسوم والعلاقات.
3-	Sketch Entities, Relations, Editing sketch and relation.	رسم الكيانات ، العلاقات، وتحرير الرسوم والعلاقات.
4-	Dimension sketch using smart dimension.	رسم الابعاد باستخدام الابعاد الذكية.
5-	Dimension sketch using smart dimension.	رسم الابعاد باستخدام الابعاد الذكية.
6-	Creating parts using features.	إنشاء الاجزاء باستخدام الميزات.
7-	Creating parts using features.	إنشاء الاجزاء باستخدام الميزات.
8-	Creating parts using features.	إنشاء الاجزاء باستخدام الميزات.

9-	Creating parts using features.	إنشاء الاجزاء باستخدام الميزات.
10-	Creating parts using features.	إنشاء الاجزاء باستخدام الميزات.
11-	Editing futures and Boolean operation.	تحرير الميزات والعمليات المنطقية.
12-	Adding reference geometry: plane, axis.	اضافة مراجع الاشكال:المسستويات و المحاور.
13-	Adding reference geometry: plane, axis.	اضافة مراجع الاشكال:المسستويات و المحاور.
14-	Adding reference geometry: plane, axis.	اضافة مراجع الاشكال:المسستويات و المحاور.
15-	Working with assemblies, mating parts.	تجميع الاجزاء.
16-	Working with sub-assemblies.	تجميع الاجزاء الفرعية.
17-	Adding standard parts: bolt, nut, key.	اضافة الأجزاء القياسية: البراغي ، والصامولات، المفاتيح.
18-	Adding standard parts: bolt, nut, key.	اضافة الأجزاء القياسية: البراغي ، والصامولات، المفاتيح.
19-	Adding standard parts: bolt, nut, key.	اضافة الأجزاء القياسية: البراغي ، والصامولات، المفاتيح.
20-	Adding standard parts: washer, screw.	اضافة الأجزاء القياسية: الواشرات والتسنين .
21-	Power transmission: Gears, shaft, keys.	نقل القدرة :التروس، والمحاور، المفاتيح.
22-	Power transmission:, Belt, pulleys and chain	نقل القدرة : الاحزمة، البكرات و السلاسل.
23-	Presentation using drawing.	العرض باستخدام الرسومات.
24-	Presentation using drawing.	العرض باستخدام الرسومات.
25-	Presentation using drawing.	العرض باستخدام الرسومات.
26-	Presentation using detailing.	العرض باستخدام التفاصيل.
27-	Presentation using section.	العرض باستخدام المقاطع.
28-	Presentation using part list.	العرض باستخدام قوائم الاجزاء.
29-	Conducting project and seminars.	إجراء المشاريع والندوات .
30-	Conducting project and seminars.	إجراء المشاريع والندوات .

FOURTH CLASS

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Engineering	ME/374 Fuel &combustion	R	Fuel	5 hrs	Engineering	ABET: A, B,C, D

Course (Catalog Description)

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmed specification.

Course Text

1-internal combustion engine by obert,2-fuel and fuel technology by w.francis

Course Objectives

-Inform the students in Auto Eng. Branch with the subject of fuel and combustion

-Explain the basic principles of the subject through a detailed program

-Helpful to learn the basics of its science and applications

-Provide the items for the subject in the engineering problems

Topics Covered

No.	Contents	المحتويات
1-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
2-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
3-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
4-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
5-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
6-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
7-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
8-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
9-	Fuel /Properties of fuel that affect the combustion process	خصائص الوقود المؤثرة في عملية الاحتراق
10-	combustion /Description of combustion	- وصف عمليات الاحتراق وأنواعها

	process	
11-	combustion/Description of combustion process	- وصف عمليات الاحتراق وأنواعها
12-	combustion /Description of combustion process	- وصف عمليات الاحتراق وأنواعها
13-	Analysis of products /Methods of analysis	تحليل نواتج الاحتراق
14-	Analysis of products /Methods of analysis	تحليل نواتج الاحتراق
15-	Analysis of products /Methods of a Analysis of	تحليل نواتج الاحتراق
16-	Analysis of products /Methods of analysis	تحليل نواتج الاحتراق
17-	Applying of thermal laws on comb. process /Thermochemistry	تطبيق القوانين الحرارية على عمليات الاحتراق
18-	Applying of thermal laws on comb. process /Thermochemistry	تطبيق القوانين الحرارية على عمليات الاحتراق
19-	Applying of thermal laws on comb. process /Thermochemistry	تطبيق القوانين الحرارية على عمليات الاحتراق
20-	Applying of thermal laws on comb. process /Thermochemistry	تطبيق القوانين الحرارية على عمليات الاحتراق
21-	Applying of thermal laws on comb. process /Thermochemistry	تطبيق القوانين الحرارية على عمليات الاحتراق
22-	Flame/ Kinds and speed	انواع و سرعة اللهب
23-	Flame/ Kinds and speed	انواع و سرعة اللهب
24-	Flame/ Kinds and speed	انواع و سرعة اللهب
25-	Flame/ Kinds and speed	انواع و سرعة اللهب
26-	Pollutions/ Kinds, reasons, and methods of treatment	انواع واسباب تكون الملوثات و طرق علاجها
27-	Pollutions/ Kinds, reasons, and methods of treatment	انواع واسباب تكون الملوثات و طرق علاجها
28-	Pollutions/ Kinds, reasons, and methods of treatment	انواع واسباب تكون الملوثات و طرق علاجها
29-	Pollutions/ Kinds, reasons, and methods of treatment	انواع واسباب تكون الملوثات و طرق علاجها
30-	Pollutions/ Kinds, reasons, and methods of treatment	انواع واسباب تكون الملوثات و طرق علاجها

Lab Experiments

No.	**Experiments**	التجارب
1-	Calorific value of gaseous fuel	القيمه الحراريه للوقود الغازي
2-	Measurement of flame speed	قياس سرعة اللهب
3-	Measurement of viscosity of fuel	قياس اللزوجه
4-	Measurement of aniline point	قياس نقطة الانيلين

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical engineering	ME/574 Vehicles Dynamics	R		3 hrs practice	Engineering	ABET: A, B, C, D, E

Course (Catalog Description)

Studying the concepts of vehicles dynamics science specially in a vertical & lateral dynamics for the 4th year automotive engineering students in the Machines and Equipment Engineering Department.

Course Text

Dr. Sherco Fatah "Vehicle Dynamics" 1989.

Course Objectives

1- Develop the basic principles of the vehicles science (vertical dynamics & lateral dynamics).
2- Helping to understand the basic principles of handling characteristics during turning of the vehicles.
3- Deriving the essential equation which describe the steer angle & the essential behaviors.

Topics Covered

No.	Contents	المحتويات
1-	Introduction, in turning of vehicle. Theory of steering. Overturning of vehicle during turning. Skidding of vehicle during turning. Problems	مقدمة في استدارة السيارة
2-		نظرية استدارة السيارة
3-		انقلاب السيلرة
4-		انزلاق السيارة اثناء الاستدارة
5-		مسائل في انقلاب السيارة
6-	Problems. Introduction in lateral dynamics. Lateral forces &factors effect on sliding angles weight of vehicle. Lateral acceleration & moment of inertia about Z-axis. Oscillation behavior of vehicle during turning.	مسائل في انزلاق السيارة
7-		مقدمة في الديناميكا العرضية
8-		القوى الجانبية على الاطار
9-		التعجيل الجانبي وعزم القصور الذاتي
10-		السلوك الترددي للسيارة اثناء الاستدارة
11-	Free& forced vibration of lateral dynamics of vehicle	الاهتزازات الحرة والقسرية في الديناميكا العرضية
12-	Natural frequency & damping ratio. Determination of stability in lateral dynamics. Problems. Steady state handling characteristics.	التردد الطبيعي ومعامل التخميد
13-		تحديد الاستقرارية في الديناميكا العرضية
14-		الاستقرارية في حالة الكبح والتخميد
15-		الاستقرارية في حالة الاستدارة في الكبح
16-		والتعجيل تحت تاثير الرياح
17-		دراسة خصائص وسلوكيلت السيارة الثلاث استجابة المركبة لمعطيات زاوية المقود
18-	Steady state response to steering input. Testing	فحص خصائص سلوكيات المركبة اثناء

19-	of handling characteristics. Natural frequency of vertical vibration of vehicle. Vertical vibration of vehicle &human comfort. Two degrees of freedom model for the vehicle.	الاستدارة التردد الطبيعي من الديناميكا العمودية الاهتزاز العمودي وراحة الراكب في السيارة نموذج سيارة بدرجتين من الحرية السلوك التوافقي لعدم استوائية الطريق
20-		
21-		
22-		
23-	Harmonic behavior for irregulartion of road. Undamped forred vibration of vertical motion. Damped natural vibration. Damped forced vibration	الاهتزاز القسري غير المخمد في الاتجاة العمودي الاهتزاز الطبيعي المخمد الاهتزاز القسيري المخمد
24-		
25-		
26-		
27-	Two masses model. Forced vibration for two masses system. Forces effect on the suspension system. Factors Effect on vibration calculation. Problems.	الاهتزاز القسري لمنظومة ذات كتلتين القوى المؤثرة في اجهزة التعليق العوامل المؤثرة في حساب الاهتزازات مسائل مختلفة
28-		
29-		
30-		

Lab Experiments

No.	Experiments	التجارب
1-	Free vibration without damping	الاهتزاز الحر الغير مخمد
2-	Free vibration with damping	الاهتزاز الحر المخمد
3-	forced vibration without damping	الاهتزاز القسري الغير مخمد
4-	forced vibration with damping	الاهتزاز القسري المخمد

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Eng.	ME/674 Automotive Technology II	R	ME415	3	Engineering	A, B,D & K

Course (Catalog Description)

All lectures reflect the higher values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalization and choice.
In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.
This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

Course Objectives

Aims of the Course :
to provide a course that is suitable both for students aiming to pursue research and for students going into other careers;

_ to provide an integrated system of teaching which can be tailored to the needs of individual students;
_ to develop in students the capacity for learning and for clear logical thinking;
_ to continue to attract and select students of outstanding quality;
_ to provide an intellectually stimulating environment in which students have the opportunity to develop their skills and enthusiasms to their full potential;

Topics Covered

No.	Contents	المحتويات
1-	Fuel System	نظام الوقود
2-	Carburetion	نظام المفحمة
3-	Basic principles for carburetion	المبادئ الأساسية لنظام المفحمة
4-	- Fluid carburetors - Gas carburetors	مفحمة الموائع مفحمة الغاز
5-	- Fuel injectors - Type of fuel injectors	حاقنات الوقود انواع حاقنات الوقود
6-	- Diesel fuel systems - Diesel electronic unit injector	نظام وقود الديزل وحدة حقن الديزل اللكترونية
7-	Sound	الصوت
8-	Noise	الضزضاء
9-	Silencers	كاتمات الصوت
10-	Battery charging system	نظام شحن البطارية
11-	Spark plug	قادح الشرارة
12-	Starters	البادئ
13-	Battery types	انواع البطاريات
14-	Electronic control system	نظام التحكم الألكتروني
15-	Emission and air pollution	- الملوثات وتلوث الهواء
16-	gas Exhaust oxygen concentration	- تركيز الأوكسجين في غاز العادم
17-	Engine sensors	- متحسسات المحرك
18-	Throttle position	- وضع الخنق
19-	Inlet air and manifold pressure	- ضغط الهواء في مشعب الدخول
20-	Testing and performance	- الفحص والأداء
21-	Brake system	**نظام التوقيف**
22-	ABS	- ABS
23-	Exhaust muffler	- كاتم الصوت للعادم
24-	Air condition	مكيف الهواء
25-	Trouble shootings	- اصلاح العطلات
26-	Trouble shootings	- اصلاح العطلات
27-	Trouble shootings	اصلاح العطلات
28-	Trouble shootings	- اصلاح العطلات

29-	Trouble shootings	- اصلاح العطلات
30-	Trouble shootings	- اصلاح العطلات

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes
Mechanical Eng. Dep.	ME\ 774 Internal Combustion Engine Parts Design	R	ME/542, ME/343, ME/243 ME/473	Theoretical 2, Tutorial: 1, Practical: 1	Engineering	ABET: a,b,c,d,g

Course (Catalog Description)

This course provides the material needed for the basic understanding of the operation and design of internal combustion engines. Also, to enrich knowledge of the students in the design of engine major components and other subsystems;
Furthermore to gain knowledge on the principles and procedure for the design of engine components; and to impart the knowledge on materials and other consideration for engine design.

Course Text

A Textbook of Machine Design by R.S.KHURMI & J.K.GUPTA

Course Objectives

To help students to understand demonstrate knowledge of the operating characteristics of common IC engines. Students should be able to provide a good background in design of IC engines.

Topics Covered

No.	Contents	المحتويات
1-	Introduction - Historical development design of the I.C. engines - References	مقدمة التطور التاريخي لتصميم محركات - .الاحتراق الداخلي - الكتب المساعدة
2-	Dynamic Forces activity on I.C. Engines - Various types of forces: - Gas pressure in the cylinder - Inertia and centrifugal forces - Frictional forces	محركات في المؤثرة الديناميكية القوى الأحتراق الداخلي للقوى مختلفة انواع - الاسطوانة داخل الغاز ضغط - المركز عن والطاردة القصور قوى - الاحتكاك قوى -
3-	Tensional moment reaction and weight	والوزن الالتواء عزم مقاومة -

	- Vibrations of the crank shaft - Thermal loads	المرفق عمود اهتزاز - الحرارية الاحمال -
4-	Cylinder Liner -Types - Design: - Liner materials - Total liner stress	الاسطوانة بطانة انواعها - التصميم - البطانة معادن للبطانة الكلي الاجهاد
5-	Cylinder Liner - Materials - Construction: - Wall thickness of cylinder liner - Examples	الاسطوانة بطانة المعادن - التركيب - الاسطوانة بطانة سمك امثلة
6-	Cylinder Block Design: - Camshaft location and support - The cylinder block - In-line cylinders - Horizontal opposed cylinders - V-banked cylinder - Coolant jacket	الاسطوانة كتلة تصميم والتثبيت الكامة عمود موقع - الاسطوانة كتلة - مستقيم خط شكل على اسطوانات - شكل على متضادة اسطوانات - V التبريد غلاف -
7-	Cylinder-block materials - Cylinder-block materials	الاسطوانة كتلة في المستخدمة المعادن الاسطوانة كتلة في المستخدمة المعادن -
8-	Cylinder Head Design - The cylinder head - Cylinder head valve and port layouts - Thermostat housing	الاسطوانة كتلة راس تصميم الاسطوانة كتلة راس - كتلة راس في الصمامات و للفتحات النسق - الاسطوانة
9-	- Thermostat location - Cylinder head materials	.الحرارة منظم مكان - .الاسطوانة كتلة راس معادن -
10-	- Design of Cylinder head - Examples	.الاسطوانة كتلة راس تصميم - امثلة -
11-	Hold-down Studs Calculations: - Design procedure - Examples	التثبيت لوالب حسابات التصميم خطوات - أمثلة -
12-	The piston - Types - Design - Materials - Rings Design considerations for a piston Material for pistons	المكبس الانواع - التصميم - المعادن - الحلقات - المكبس وظيفة للمكبس التصميمية الاعتبارات المعادن
13-	- Piston head or crown - Piston rings	المكبس راس - المكبس حلقات -
14-	- Piston Skirt - Piston pin - Examples	المكبس حاشية - المكبس رسغ مسمار - امثلة -

15-	1st Course Exam	الأول الفصل امتحان
16-	Connecting Rod - Analysis - Design - Materials: Function Materials	التوصيل ذراع التحليل - التصميم - المعادن - الوظيفة المعادن
17-	- Shape of connecting rod - Length	التوصيل ذراع شكل - الطول -
18-	- Stresses in the connecting rod - Design procedure - Examples	التوصيل ذراع في الاجهادات - التصميم خطوات - امثلة -
19-	Valve Calculations: - The function of the valves and their arrangements - Materials	الصمام حسابات وترتيباتها الصمامات وظيفة - المعادن -
20-	- Design of a valve - Examples	التصميم - امثلة -
21-	Crankshaft - Design - Materials: Function Material and Manufacture of Crankshafts	المرفق عمود التصميم - المعادن - الوظيفة المرفق لعمود التصنيع وطريقة المعادن
22-	- Bearing pressures and stresses in Crankshaft	عمود في والاجهادات التحميل ضغوط - المرفق
23-	- Design procedure for crankshaft	المرفق لعمود التصميم خطوات -
24-	- Examples on materials used in crankshaft - Examples on crankshaft manufacturing methods	عمود في المستخدمة المعادن على امثلة - المرفق المرفق عمود تصنيع طرق على امثلة -
25-	- Examples on bearings pressures - Examples on stresses in crankshaft	التحميل ضغوط على امثلة - المرفق عمود في الاجهادات على امثلة -
26-	- Examples on design procedure for Crankshaft	المرفق عمود تصميم خطوات على امثلة -
27-	Combustion Chamber Design: - Types of combustion chambers	الاحتراق غرف تصميم الاحتراق غرف انواع - 27
28-	- Methods of design	التصميم طرق -
29-	- Examples	أمثلة -
30-	2nd coarse exam	الثاني الفصل امتحان

Dept.	Course Number/ title	Req./ Elect	Prerequisite(s)	Class/ Lab. schedule	Contribution to Prof. Component	Relevant Program Outcomes

Mechanical Engineering	ME-924 / Computer Aided Engineering	R	ME\ 823	2 hrs. practice	Engineering	A, C, D, E, F, I

Course (Catalog Description)

The course aims to produce a new generation of product design engineers who combine engineering expertise with the confidence to work with, develop and manage knowledge-based computer aided engineering systems to support engineering design. Students gain a thorough understanding of the methods, techniques and tools used in computer-supported product design and development, enabling them to make significant contributions to wealth generation by developing better products in a shorter time at a lower cost. These skills can be applied to, and practiced in, industry-based design projects offered on the course.

Course Text

Different lectures

Course Objectives

Definition concepts of CAE system used in mechanical engineering.
Helping students understanding basic phases of generic CAE package.
Simulation of mechanical systems (fluid, thermal, structural) including components and assemblies to analyze the robustness and performance of systems.

Topics Covered

No.	Contents	المحتويات
1-	Simulation using CAE package, advantages, and disadvantages	المحاكاة بإستخدام برامج الهندسة المعززة بالحاسبة (الايجابيات والسلبيات)
2-	Simulation using CAE package, advantages, and disadvantages	المحاكاة بإستخدام برامج الهندسة المعززة بالحاسبة (الايجابيات والسلبيات)
3-	Simulation using CAE package, advantages, and disadvantages	المحاكاة بإستخدام برامج الهندسة المعززة بالحاسبة (الايجابيات والسلبيات)
4-	Simulation using CAE package, advantages, and disadvantages	المحاكاة بإستخدام برامج الهندسة المعززة بالحاسبة (الايجابيات والسلبيات)
5-	Simulation using CAE package, advantages, and disadvantages	المحاكاة بإستخدام برامج الهندسة المعززة بالحاسبة (الايجابيات والسلبيات)
6-	Building geometry using SolidWorks or geometry from other external CAD file	بناء النموذج الهندسي بإستخدام اما الشكل الهندسي من برنامج الـ SolidWorks او اي ملف للتصميم الهندسي خارجي.
7-	Building geometry using SolidWorks or geometry from other external CAD file	بناء النموذج الهندسي بإستخدام اما الشكل الهندسي من برنامج الـ SolidWorks او اي ملف للتصميم الهندسي خارجي.
8-	Building geometry using SolidWorks or	بناء النموذج الهندسي بإستخدام اما الشكل

	geometry from other external CAD file	او اي SolidWorks الهندسي من برنامج الـ ملف للتصميم الهندسي خارجي.
9-	Building geometry using SolidWorks or geometry from other external CAD file	بناء النموذج الهندسي بإستخدام اما الشكل او اي SolidWorks الهندسي من برنامج الـ ملف للتصميم الهندسي خارجي.
10-	Building geometry using SolidWorks or geometry from other external CAD file	بناء النموذج الهندسي بإستخدام اما الشكل او اي SolidWorks الهندسي من برنامج الـ ملف للتصميم الهندسي خارجي.
11-	Performing thermal analysis to determine temperature and heat reaction	استخدام التحليل الحراري لحساب درجة الحرارة والتأثير الحراري
12-	Performing CFD analysis to determine flow field	استخدام تحليل ديناميكية الموائع الحاسوبية لحساب مجال الجريان
13-	Performing CFD analysis to determine flow field	استخدام تحليل ديناميكية الموائع الحاسوبية لحساب مجال الجريان
14-	Performing CFD analysis to determine flow field	استخدام تحليل ديناميكية الموائع الحاسوبية لحساب مجال الجريان
15-	Performing free vibration analysis to determine natural frequencies and mode shapes	استخدام تحليل الاهتزازات الحرة لحساب الترددات الطبيعية وشكل موجة
16-	Performing sinusoidal vibration analysis to determine harmonic responses and mode shapes	استخدام تحليل الاهتزازات الجيبية لحساب الاستجابات المتناسقة وشكل الموجة
17-	Performing buckling analysis to determine critical buckling load and buckled system	استخدام تحليل الانبعاج لحساب حمل الانبعاج الحرج والنظام المنبعج
18-	Performing buckling analysis to determine critical buckling load and buckled system	استخدام تحليل الانبعاج لحساب حمل الانبعاج الحرج والنظام المنبعج
19-	Performing buckling analysis to determine critical buckling load and buckled system	استخدام تحليل الانبعاج لحساب حمل الانبعاج الحرج والنظام المنبعج
20-	Performing static structural analysis to determine stress and deformation	استخدام التحليل الهيكلي الاستاتيكي لحساب الاجهاد والتشوه
21-	Performing Dynamic structural analysis to determine stress and deformation	استخدام التحليل الهيكلي الديناميكي لحساب الاجهاد والتشوه
22-	Performing thermal –structure analysis to determine thermal induced stresses' and deformations'	استخدام التحليل الحراري-الهيكلي لحساب تأثير الحرارة على الاجهادات والتشوهات

23-	Performing one way flow-structure interaction analysis to determine flow induced stresses’	استخدام طريقة التأثير المنفرد لتحليل الجريان-الهيكل لحساب تأثير الجريان على الاجهادات
24-	Performing one way flow-structure interaction analysis to determine flow induced stresses’	استخدام طريقة التأثير المنفرد لتحليل الجريان-الهيكل لحساب تأثير الجريان على الاجهادات
25-	Performing one way flow-structure interaction analysis to determine flow induced stresses’	استخدام طريقة التأثير المنفرد لتحليل الجريان-الهيكل لحساب تأثير الجريان على الاجهادات
26-	Performing one way flow-structure interaction analysis to determine flow induced deformations’	استخدام طريقة التأثير المنفرد لتحليل الجريان-الهيكل لحساب تأثير الجريان على التشوهات
27-	Performing two way flow-structure interaction analysis to determine flow induced stresses’	استخدام طريقة التأثير المزدوج لتحليل الجريان-الهيكل لحساب تأثير الجريان على الاجهادات
28-	Performing two way flow-structure interaction analysis to determine flow induced deformations’	استخدام طريقة التأثير المنفرد لتحليل الجريان-الهيكل لحساب تأثير الجريان على التشوهات
29-	Conducting seminar and project	اجراء النقاشات والمشروع
30-	Conducting seminar and project	اجراء النقاشات والمشروع