**TEMPLATE FOR COURSE SPECIFICATION**

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

 **COURSE SPECIFICATION**

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| 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 program specification. |

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| College of Engineering  University of Baghdad | ***1. Teaching Institution*** |
| Mechanical Engineering Department (MED) | ***2. University Department/Centre*** |
| Mechanical Engineering (ME) Program | ***3. Program title*** |
| B. Sc. Mechanical Engineering program | ***4. Title of final Award*** |
| Annual System; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects. Each graduating student has to successfully complete 163 credits. Each subject credit is one 50- minutes lecture a week.  | ***5. Modes of Attendance offered*** |
| * UNISCO – Iraq Office
* NISA (Network of Iraqi Scientists Abroad
 | ***6. Accreditation***  |
| 2 | ***7. Other External Influences*** |
| April /2018 | ***8. Date of production/revision of this specification***  |

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| ***9. Aims of the Course*** |
| * 1. Graduate mechanical engineers to serve in industry, construction and other sectors of the mechanical engineering labor market.
	2. Improving the teaching and administrative activities to meet international accreditations standards and the mission of the department.
	3. Improving the academic abilities of the faculty and attracting highly skilled personnel.
	4. Improve the abilities of management and technical supporting staff and attract the highly skilled for employment.
	5. Optimum use of resources and potentials of the department.
	6. Cooperation, academic exchange programs, partnerships with other universities and academic centers in developed countries.
	7. Establishing viable applied research that generates knowledge for local and foreign markets.
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| ***10·*** ***Learning Outcomes***  |
| Following a review of the ABET Criteria and the program objectives, it has been decided by the ME Department that the ABET Criteria (a - k) encompass the spirit of our educational vision. Therefore, outcomes (a - k) were adopted as the ME POs. The Department POs are: * 1. An ability to apply knowledge of mathematics, science, and engineering.
	2. An ability to design and conduct experiments, as well as to analyze and interpret data.
	3. An ability to design a system, component, or process to meet desired needs.
	4. An ability to function on multi-disciplinary teams (*Our interpretation of multidisciplinary teams includes teams of individuals with similar educational backgrounds focusing on different aspects of a project as well as teams of individuals with different educational backgrounds*).
	5. An ability to identify, formulates, and solves engineering problems.
	6. An understanding of professional and ethical responsibility.
	7. An ability to communicate effectively.
	8. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	9. A recognition of the need for, and an ability to engage in life-long learning (*Our interpretation of this includes teaching students that the underlying theory is important because the technology changes, coupled with enhancing their self-learning ability*).
	10. Knowledge of contemporary issues (*Our interpretation of this includes presenting students with issues such as the impact of globalization, the outsourcing of both engineering and other support jobs as practiced by modern international companies*).
	11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(ME) program subjects develop the knowledge and skills that will enable students to:* + Apply basic mathematical and scientific concepts for the description and solution of engineering problems,
* Develop initial proficiency in mechanical engineering disciplines,
* Develop the ability to conduct experiments, and critically analyze and interpret data,
* Perform mechanical engineering integrated design of systems,

 components, or processes by means of practical experiences (group projects),* Identify, formulate, and solve mechanical engineering problems using modern engineering tools, techniques, and skills,
* Collaborate in group projects,
* Develop their written and oral communication skills through presentations of project results,
* Acquire an appreciation for some of the ethical problems that arise in the exercise of the profession.
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| ***11.*** ***Teaching and Learning Methods*** |
| 1. Lectures, Tutorials, Homework and Assignment. Lab Experiments, Test and Exams, In- Class Questions and Discussions Connection between Theory and Application, Field Trips, Extracurricular Activities, Seminars, In- and Out Class Oral conservation, Reports, Presentations and Posters
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| ***12. Assessment Methods***  |
| ***Program Outcome Assessment Techniques*** * Survey of Alumni will be implemented every five years starting***.***
* The related committees in the department; such as scientific-, QA-, student affairs-, cooperation mechanism- committee.
* Employment trends of our graduates will be tracked, e.g. place of employment and job title, every year.
* Survey of Employers of Graduates will be given at least every other year to determine if the PEOs are still relevant to the employers of our graduates.
* The POs themselves will be re-evaluated every few years first by the faculty and then with the Council Presidency Department. Informal review of the POs will occur in conversations with alumni.

**Summary of Student Outcomes Assessment Techniques** * Alumni survey as described above but a portion that addresses the student outcomes.
* Co-op Employer evaluation data is obtained at the end of the student co-op experience from co-op employer surveys regarding student performance.
* Student Co-op evaluation data is obtained from students at the end of their co-op experience regarding the students’ perception of their performance.
* Senior Exit Survey are given every year in the senior design capstone class to determine how well students feel they have achieved the student outcomes.
* Summary of student performance is gathered in the form of final grades of the ME courses.
* Evaluation of student data, specifically of transcripts for each graduate, is analyzed for time to graduation and retention rate as well as performance in ME courses.
* Embedded assessment is performed in every class, every year. Not all student outcomes are evaluated in every single class but a representative sample is chosen. This will be accomplished by assess student assignments, quizzes, exams, lab reports, projects and presentations.
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| 1. ***Program Structure***

 The department offers engineering programs leading to the degree of Bachelor of Science (B.Sc.), Master of Science (M.Sc.) and Degree of Philosophy (Ph.D.) in Mechanical Engineering. The B.Sc. degree includes two specialties; the ***"General Mechanics"*** and the ***"Aeronautical Engineering"***, which was established at 1990 for the first time in the department, whereas the M.Sc. and Ph.D. degrees cover four areas of research; ***Thermo-Fluids, Applied Mechanics, Manufacturing of Engineering Materials and Industrial Engineering.*** |

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| 1. ***Personal Development Planning***
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| ***Actions to Improve the Program*** Continuous improvement is a focus of our department and is done every day as a natural part of our profession. We strive always to improve processes that are weak and fix processes that are broken. We have not set “degrees of attainment” goals for each of the outcomes. We attempt to work on every deficit we uncover in our efforts to achieve outcomes. We expect every instructor to continuously improve performance of students in his / her subjects, whether they are currently at low or high level. We practice continuous improvement not because of quality assurance, but because we want our program to be “optimal” given the constraints that we have, analogous to any optimization problem that ME might try to solve. The following specific actions have either been successfully implemented or are in process. 1. Comprehensive changes in curriculum in the academic year 2013-2014. 2. Continuous improvement of faculty through training programs. 3. Promoting a number of faculty members to higher scientific ranks. 4. Purchasing a number of laboratory equipment and measuring instruments. 5. Purchasing a number of books for the library of the department. 6. Purchasing a number of computers. 7. Establishment of network access facilities provided by the Computer Center of Baghdad University in the form of a Wireless LAN network with 10 terminals available now in the department. 8. Employment a number of faculty, engineering and technical staff. 9. Increase in extra-curricular activities for students such as setting up scientific conferences and seminars. 10. Reconstruction and rehabilitation of classrooms and rooms in the department, as well as services and infrastructure.  |
| ***15. Admissions Criteria***  An applicant for admission to an undergraduate program of (ME) at the Mech. Engr. Dept. / University of Baghdad must satisfy the following minimum requirements: * + 1. He / She should have an Iraqi secondary school certificate, or its equivalent, and majored in natural or technological sciences. The students must obtain a high rate qualifies for admission to engineering colleges.
		2. Acceptance is centrally controlled by the Ministry of Higher Education and Scientific Research.
		3. Distribution of students to the 12 engineering departments of the college of engineering, including the department of (ME), is made according to the capacity plan of the departments and the rating average of the applicants and their will. The capacity plan of the Department of in the last three years was 90 students. The number of students accepted is limited to the number of seats available as decided by the College Council based on the capacity of resources at the college.
		4. Also included a plan to accept the top students from Technical Institutes Foundation, and the outstanding employees from state institutions and ministries.
		5. The applicant must submit the required documents within a specified period.
		6. An applicant who has graduated from a secondary school system outside Iraq must have completed twelve years of combined primary and secondary school studies from a recognized school. He is also required to provide an equivalency certificate from the Iraqi Ministry of Education.

Admission to (ME) is highly competitive. As explained above, applicants are granted admission in accordance with an overall evaluation on the basis of their rating record, but only to the extent permitted by the maximum number of new admissions established for that academic year. |
| 1. ***Key sources of programme information***
	* 1. Department page in the website of the college.
		2. Mechanical Engineering Department's Guide
		3. College of Engineering Catalog
		4. Some Committees meetings of ME Department
		5. Portfolios for ME Subjects
		6. Documentation Committee in the Department
		7. Staff and students of the department
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***Relationship of Courses in the Curriculum to the Program Outcomes***

To ensure that the outcomes of the ME Program will be achieved by students by the end of their program of study, it is necessary that such outcomes are injected and adequately covered throughout the program curriculum. The POs should be covered by the subjects in the program. The learning outcomes of the subjects are mapped to the POs with a level of emphasis being Low (L), Medium (M), or High (H). The level of emphasis of a program outcome is determined by the weight used for assessing the outcome in each subject. The level of emphasis for an outcome is determined by the weight as follows:

* When the subject outcome weight is < 10%, it will be given a Low rank (L).
* When the subject outcome weight is between 10% and 20% it will be given a Medium rank (M).
* When the subject outcome weight is > 20% it will be given a High rank (H).

Table (1) below shows the mapping between the Course Outcomes of ME Program subjects and POs. The POs are covered in an overlapping manner over the subjects of the program curriculum. Design capabilities are adequately covered by several subjects.

The ability to apply knowledge of math, science and engineering to solve engineering problems are also well addressed in several subjects. Teamwork is encouraged in all subjects with lab work or project. The ability to design and conduct experiments is covered in subjects involving lab work. The use of engineering tools is also emphasized in all subjects with lab work or course projects.

Students are also trained on self-learning abilities in several subjects. Communication skills are emphasized in all subjects with a project in addition to the summer training. Some subjects help in enhancing the student’s oral presentation skills. The impact of engineering solutions on global and societal context is addressed in the senior design project.

**Table (1) Required Subjects and Their Emphasis on POs**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  **Outcome** | **a** | **b** | **c** | **d** | **e** | **f** | **G** | **h** | **i** | **j** | **k** |
| **Subject No.** | **Subject Name** |
| **ME101** | **Mathematics / I** | **H** |  |  |  |  |  |  |  |  |  |  |
| **ME102** | **Engineering Mechanics**  | **H** |  | **M** |  | **H** |  |  | **H** | **M** |  |  |
| **ME103** | **Engineering Drawing and Descriptive Geometry** |  |  |  |  |  |  |  | **H** | **M** |  |  |
| **ME104** | **Principles of Production Engineering** | **H** | **H** | **H** | **H** | **M** |  |  |  | **M** |  | **M** |
| **ME105** | **Electrical Engineering / I**  | **H** | **H** |  |  | **H** |  |  |  | **M** |  | **M** |
| **ME106** | **Programming / I**  |  |  |  | **H** |  |  | **M** | **H** | **M** |  |  |
| **ME107** | **Human Rights** |  |  |  |  |  |  |  |  |  | **M** |  |
| **ME201** | **Mathematics / II** | **H** |  |  |  |  |  |  |  |  |  |  |
| **ME202** | **Fluid Mechanics / I**  | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME203** | **Thermodynamics** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME204** | **Mechanics of Materials and Machines** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME205** | **Engineering of Metallurgy** | **M** | **M** |  | **M** |  | **M** | **L** | **M** | **M** |  |  |
| **ME206** | **Mechanical Drawing** |  |  | **M** | **M** | **L** |  | **H** | **M** | **M** |  |  |
| **ME207** | **Programming / II**  |  |  |  | **M** |  |  | **M** |  | **M** |  | **M** |
| **ME208** | **Freedom and Democracy** |  |  |  |  |  |  |  |  |  | **M** |  |
| **ME209** | **Mechanical Engineering Laboratories / II**  | **H** | **H** | **H** | **H** |  |  | **M** |  |  |  | **H** |
| **ME301** | **Engineering and Numerical Analysis** | **H** |  |  | **M** |  |  | **M** |  | **M** |  | **M** |
| **ME302** | **Fluid Mechanics / II**  | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME303** | **Heat Transfer** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME304** | **Strength of Materials** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME305** | **Mechanics of Machines and Vibrations** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME306** | **Principles of Manufacturing Processes** | **H** | **H** | **H** | **H** | **M** |  |  |  | **M** |  | **M** |
| **ME307** | **Electrical Engineering / II**  | **H** | **H** |  |  | **H** |  |  |  | **M** |  | **M** |
| **ME308** | **Mechanical Engineering Laboratories / III**  | **H** | **H** | **H** | **H** |  |  | **M** |  |  |  | **H** |
| **ME401** | **Design of Machine Elements** | **H** | **M** | **H** | **H** | **H** | **M** | **M** | **H** | **M** |  |  |
| **ME402** | **Control and Measurements** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME403** | **Air-Conditioning and Refrigeration** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME404** | **Power Engineering** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME405** | **Industrial Engineering** | **M** | **M** |  | **M** | **M** | **M** | **L** | **H** | **M** |  |  |
| **ME406** | **Engineering Materials** | **M** | **M** |  | **M** |  | **M** | **L** | **M** | **M** |  |  |
| **ME407** | **Engineering Project** | **H** | **H** | **H** | **H** | **H** | **H** | **H** | **H** | **H** | **H** | **H** |
| **ME408** | **Mechanical Engineering Laboratories / IV**  | **H** | **H** | **H** | **H** |  |  | **M** |  |  |  | **H** |
| **ME409** | **Aerodynamics** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME410** | **Jet Engines** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |
| **ME411** | **Aircrafts Performance and Systems** | **H** | **M** | **H** | **M** | **H** | **M** | **L** | **H** | **M** |  |  |

**Learning Outcomes:** Skills acquired by students and methods of measurement are Shown in Table (2).

**Table (2) Skills Acquired by the Students and Methods of Measurement**

|  |  |  |
| --- | --- | --- |
| **Acquired Skills** | **Lessons through which****Skills Acquired** | **Method of Assessing** **the Skills**  |
| * 1. **An ability to apply knowledge of mathematics, science, and engineering.**
 |
| * Use mathematics to solve engineering problems
* Applied mathematics and engineering science in engineering matters, evaluation, planning, engineering design
 | ME202, ME203, ME204, ME302, ME303, ME304, ME305, ME306, ME401, ME402, ME403, ME404 | Homework & AssignmentsQuizzesLab. ExperimentsExaminations |
| * 1. **An ability to design and conduct experiments, as well as to analyze**

**and interpret data.** |
| * Design and conduct experiments to verify the presence of engineering problem
* Conduct experiments with different scales to obtain data Simulated reality
* Use of appropriate methods of analysis of the data collected and provide an explanation of the results
 | ME103, ME105, ME206, ME209, ME301, ME405, ME408 | Lab. ExperimentsProjects Writing Reports Examinations & Quizzes |
| **c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.** |
| * Determine the design requirements
* Explain the selection of design parameters
* Determine the possibility of multiple solutions for one design and demonstrate best choice for design
* Clarify the functions of the final design to meet the requirements
 | ME206, ME304, ME305, ME307, ME401, ME402, ME404, ME407,ME411 | HomeworkReportsGraduation ProjectsExaminationsQuizzes |
| 1. **An ability to function on multidisciplinary teams.**
 |
| * Learn basic concepts related to collective action,

 such as leadership, cooperation, objectives,  and results* Knowledge of basic concepts related to team disputes such as differences in attitudes, personal goals, dependency and lack of participation.
* Learn basic concepts related to the management team such as managing effective meetings, listening skills and positive communication, setting goals, and assess the level of progress
* Clarify the ability to organize and good management of the project team with different specialties
 | ME207, ME308, ME407, ME408 | ReportsGraduation ProjectsExtracurricular activities |
| 1. **An ability to identify, formulates, and solves engineering problems.**
 |
| * The ability to identify issues that can be resolved through engineering concepts and models**.**
 | ME102. ME103, ME105, ME202,ME203, ME204, ME206, ME303, ME304, ME305, ME307, ME311, ME401, ME402, ME403, ME404, ME405, ME409, ME410, ME411 | HomeworkQuizzesExamination |
| * The ability to develop standards and specifications with solutions identify the determinants of issues
 |
| * The successful application of engineering techniques to solve engineering problems
 |
| 1. **An understanding of professional and ethical responsibility.**
 |
| * Understanding engineering profession and responsibility
 | ME103, ME106, ME206, ME207, ME401, ME402, ME403, ME404, ME405, ME410 | Meetings and direct dialogues between students and faculty |
| * Knowledge engineering responsibility in terms of risk assessment and safety, honesty and reliability, loyalty and opposition in the workplace
 |
| 1. **An ability to communicate effectively.**
 |
| * Possess technical writing skills
 | ME107, ME208, ME407 | ReportsdiscussionsGraduation ProjectsExtracurricular activities |
| * Possession oral skills that make it able to effectively communicate his knowledge of technical information about the planning and engineering design
 |
| * The ability to communicate complex ideas or engineering designs for people from outside
 |
| 1. **The broad education necessary to understand the impact of engineering solutions in a global & societal context.**
 |
| * Application of knowledge and engineering skills needed to deal with engineering issues and their impact on the cultural and ethical factors
 | ME104, ME206, ME304, ME305, ME401, ME405 | Meetings and direct dialogues between students and faculty |
| * Understand the positive and negative effects of the engineering and technology on society and how these effects associated with economic reality and political
 |
| 1. **A recognition of the need for, and an ability to engage in life-long learning**
 |
| * Take advantage of the learning opportunities outside the formal classroom activities by attending professional lectures, seminars, and training courses
 | ME103, ME206, ME405 | Meetings and direct dialogues between students and faculty |
| * Approximate limits apply theory to practice site
 |
| 1. **Knowledge of contemporary issues**
 |
| * Identify and describe the challenges faced by engineers today
 | ME407 | Meetings and direct dialogues between students and facultydiscussionsGraduation Projects |
| * Determine the potential applications of knowledge engineering in the design and analysis of contemporary engineering operations
 |
| 1. **An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.**
 |
| * The ability to use modern methods of analysis and design in modern engineering applications
 | ME105, ME106, ME207, ME307 | Lab. ExperimentsHomeworkQuizzesExaminations |
| * The ability to use equipment correctly
 |
| * The ability to use computer programs in engineering applications
 |