QU
Saudi Arabia

Qassim University
جامعة القصيم

COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
M.Sc. PROGRAM HANDBOOK

1447 A.H.

2024/2025 A.D.

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M.Sc. Program Hand Book

Mechanical Engineering

College of Engineering

Prepared by

ME Quality and Development Committee

1447 A.H.

2024 / 2025 A.D.


بسم الله الرحمن الرحيم

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1. Master of Science in Mechanical Engineering program

Welcome to M.Sc. in ME

We extend our heartfelt congratulations to you for making the decision to pursue your educational aspirations. We want to emphasize our unwavering commitment to ensuring that your journey is not only successful but also filled with joy and fulfillment.

We would like to stress our dedication to assisting the students in accomplishing their objectives and aspirations. Please feel free to reach out to your faculty advisor or contact any of our knowledgeable and skilled faculty members for any support you may require.

1.1 An Overview

The Master of Science in Mechanical Engineering program is a general program with thesis track, however it covers different areas within the program such that the student determines his field of study based on the group of elective courses he registers and the research topic of the thesis, and the program consists of 30 study credits (9 credits for compulsory courses (3 courses) + 15 credits for elective courses (5 courses) and 6 credits for the thesis).

This handbook has been prepared with the guidance and review of the College Quality Assurance and Academic Accreditation Unit (QAAA) and the unit of Postgraduate Program in the mechanical engineering department. The contents were made to be extensive with the students need in accordance to the National Center of Academic Accreditation and Evaluation systems (NCAAA) and the Unified Regulation on Postgraduate Studies in the Qassim University.

1.2 Department and Program Mission

Department Mission

The Mechanical Engineering Department seeks to meet the needs of the Saudi society and the region through offering outstanding.

M.Sc. Program Mission

Offering distinguished mechanical engineering master studies, and performing advanced research and valuable community services in an inspiring, energizing and governable environment to promote self-resources, adopt recent technologies and sustainably develop the Saudi society.

1.3 Program Educational Objectives

The program educational goals are broad statement about what the student can attain in few years after graduation are to be set. These should satisfy the employers and alumni. The program educational objectives are set as shown in Table 1:

Table 1: Program Educational Objectives

PEO #1:	Attain a successful research, development and leadership careers in the industry, energy, and academic sectors.
PEO #2:	Properly plan their professional development through self-learning and advanced degrees.
PEO #3:	Efficiently progress to positions of leadership in their profession.
PEO #4:	Effectively contribute to adopting recent technologies, and experience abilities for performing advanced scientific research and offering innovations.
PEO #5:	Skillfully contribute to the sustainable development of the Saudi society.

1.4 Program Strategic Goals

For the NCAAA accreditation system, the QEC MSc programs strategic goals have been set to be as follows:

1. Prepare the graduates to have successful research, development and leadership careers in the industry, energy, and academic sectors.
2. Carry out scientific advanced research and provide engineering consultation services.
3. Strengthen the communication and cooperation with the community, and establish regional and international partnerships.

4. Participate in adopting advanced technologies and offering innovations.
5. Skillfully contribute effectively to the sustainable development of the Saudi society.

1.5 M.Sc. Program Learning Outcomes

According to NCAAA accreditation system, these are the characteristics and qualities gained by the program graduates in the field. The general attributes of the MSc graduates of QEC programs have been set to agree with QU graduate attributes and the employers' needs. The attributes of the ME Program as an example are given Table 2.

Table 2: Program Learning Outcomes (PLOs) for M.Sc. Program

Knowledge and Understanding	
K1	Reveal deep and specialized body of knowledge and understanding covering theories, principles, and concepts in the field of mechanical engineering.
K2	Demonstrate critical knowledge and understanding of processes, materials, techniques, practices, conventions, and/or terminology relevant to mechanical engineering field.
K3	Express advanced knowledge and understanding of recent development in the field of mechanical engineering.
K4	Exhibit excellent knowledge and understanding of a range of established and specialized research and/or inquiry techniques in the field of mechanical engineering.
Skills: Cognitive	
S.1	Apply specialized theories, principles and concepts in advanced frameworks in the field of mechanical engineering.
S.2	Solve problems in complex and advanced perspectives in the field of mechanical engineering.
S.3	Critically assess, review, and reflect on key concepts, principles, and theories; and provide creative solutions to current issues and problems in composite and advanced contexts in the field of mechanical engineering.
S.4	Carry out advanced research or professional projects using specialized research and inquiry methodologies in the fields of mechanical design, manufacturing, dynamic control, thermofluids, and other related fields.
Skills: Practical and Physical	
S.5	Utilize and apply tools, materials, processes and techniques that are advanced and specialized to deal with complex and advanced practical activities in the field of mechanical engineering.

S.6	Carry out multifaceted and advanced practical tasks and procedures in specialized areas related to mechanical design, manufacturing, dynamic control, thermos-fluids, and other related engineering fields.
Skills: Communication and ICT	
S.7	Communicate in various forms to disseminate knowledge, skills, research results, and innovations related to mechanical engineering field to specialist and non-specialist audiences.
S.8	Process data and information quantitatively and/or qualitatively in complex and advanced contexts suitable for mechanical engineering field.
S.9	Select, use, and adapt advanced digital technological and ICT tools and applications to process and analyze a variety of data and information sets to support and advance leading research and/or projects related to mechanical engineering field.
Values, Autonomy and Responsibility	
V.1	Demonstrate integrity and professional and academic values when dealing with various issues.
V.2	Initiate professional planning for learning and/or work, professional development, monitor learning and performance, and participate in academic and/or professional strategic decisions, with high autonomy.
V.3	Effectively manage specialized tasks and activities in Mechanical engineering and related discipline with high autonomy.
V.4	Effectively collaborates and participate in research or professional projects, undertake leadership roles, and take high responsibility of the work.
V.5	Contribute to the development of the quality level of community life.

2. ADMISSION REQUIREMENT

The Deanship of postgraduate studies works in corporate with M.Sc. Program to facilitate the admission and registration procedures at Qassim University. The Deanship has developed procedures for admission in the programs through electronic platforms available to students on the university website (https://guest.qu.edu.sa/login). The Deanship is committed to maintaining the privacy and confidentiality of students' information.

2.1 Admission Conditions

The number of students who can be accepted in the College of Engineering is determined yearly by the M.Sc. program unit in Mechanical engineering department and approved by the postgraduate Council, taking into consideration the department and college capacity. Then, the students who have the desire to join the M.Sc. program compete based on their GPA and other criteria stated below:

2.1.1 Admission Requirements for the M.Sc. Program

The General admission requirements for the M.Sc. program are:

- The applicant must be a Saudi citizen or have a grant for graduate studies if non-Saudi citizen.
- Bachelor of Science degree in mechanical engineering, aerospace engineering, renewable energy engineering, materials engineering, manufacturing engineering, industrial engineering, mechatronic engineering, electrochemical engineering, or production engineering from a Saudi University or recognized International University.
- Two academic recommendation letters from two professors who have taught the applicant.
- For Saudi citizen Must passing the Post-Graduate General Aptitude Test (PGAT) offered by the National Center for Assessment.
- Minimum GPA of 3 out of 5 or equivalent.

- Minimum STEP English language test score of 65 (STEP), or 8 (QUEPT), or 49 (TOEFL iBT), or 460 (TOEFL PBT), or 4.5 (IELTS)
- Passing undergraduate program supplementary courses if necessary.
- Applicant should be of a good behavior and medically fit.
- Application fee: 100 riyals (one hundred Saudi riyals) (non-refundable)
- Fulfilling any additional requirements from Qassim University

2.1.2 Admission requirements International applicants

Admission requirements for non-Saudi applicants residing in the Kingdom of Saudi Arabia (internal and external scholarship students):

- In general, the following requirements are required for admission to postgraduate studies (Master's and PhD):
- He must have obtained a result in the general aptitude test for university graduates during or before the application period, which is held by the National Center for Measurement and Evaluation.
- The result of passing the specified score for programs that require an English language test STEP or QUEPT during or before the application period.
- The applicant must be a Saudi or on a scholarship for postgraduate studies if he is not a Saudi.
- The applicant must have a university degree from a Saudi university or another recognized university.
- For applicants to doctoral programs, a graduation certificate may be accepted provided that:
- The master's defense was successfully passed, and the thesis course's grade was recorded in the academic record (graduate). All that remains is for him to issue the graduation document.
- They are expected to graduate at the bachelor's level from Qassim University or from outside it. The student's cumulative GPA must be no less than (4.50) for theoretical majors, and (4.25) for applied majors.
- Application fee: 100 riyals (one hundred Saudi riyals) (non-refundable)
- Fulfilling any additional requirements from Qassim University

2.1.3 Online Application and Procedures

Documents required to be uploaded to the website when filling out the data on the university website (https://guest.qu.edu.sa/login):

- Bachelor's graduation document for male applicants to master's programs.
- Academic Transcript.
- National Identity for Saudi Citizen or a copy of a valid passport (at least one year for non-Saudis.
- A copy of the residence permit and a valid passport (at least one year) for male and scholarship students (for internal scholarship applicants) (for non-Saudi).

2.1.4 Fees and Payment

- Tuition fees for the master's degree start from **40000** riyals. To know more details about the fees for each program, click on the program name.
- Tuition fees for one supplementary semester are **5000** riyals (five thousand Saudi riyals).
- Tuition fees if the regular duration of study at the master's level exceeds **5000** thousand riyals per semester.

2.1.5 Transferring Students

The M.Sc. program may accept the transfer applications from recognized Saudi Arabia Universities other international university. A transfer depends on the recommendation of the department council and subjected to college council approval. The accepted applicant may transfer his previous achieved courses to the equivalent courses at the ME M.Sc. program at the college of engineering in Qassim University under certain conditions. A student from outside the University may be admitted according to the following rules:

1. The student must have studied at a college or university recognized by the Ministry of Higher Education for at least one semester.
2. A Transferred student must fulfill admission requirements.
3. The student must have studied and passed at least one semester at the organization that he transferred from.
4. The student should not be considered with a failing GPA.

5. The student should not to have been dismissed from the university transferred from for any disciplinary or academic reasons.
6. The transfer shall not be from a scientific degree to a higher degree.

2.1.6 Visiting Student

A student who studies some courses in another university or colleges or in a branch of the university to which he belongs to:

First: A student from the college who wishes to study as a visitor at another university or college:

1. The student must have an academic record (cumulative grade point average) for at least one semester at the university before applying for studying as a visiting student.
2. The college or university the student wants to study in must be recognized by the Ministry of Higher Education.
3. The student should bring a description of the courses to be studied from the other university to be equated by the college and after determining the equivalent materials to be submitted by an official letter to the Deanship of Admission and Registration to address the university where he would like to study as a visiting student.
4. The course to be studied by the student outside the university should be equalized in the vocabulary and the number of units of study.
5. The student must provide the Deanship of Admission and Registration with the results obtained within a week of the start of study in the first semester following the period of study as a visitor.

6. The maximum number of credits that can be calculated from outside the university for a visiting student is (20%) of the total graduation units from QU.

7. Course rates that are equivalent to a visiting student at another university are not counted within their cumulative GPA, and the courses are recorded in their academic record.

8. The maximum number of semesters a student is allowed to study as a visitor is two semesters.

Second: Another university student who wishes to study as a visitor in the college at Qassim University:

1. The student should take a description of the courses that he would like to study from the college within the university to be equated by his university.
2. The course to be visited by the visiting student is equivalent or (equivalent) in his vocabulary and the number of units of study.
3. To obtain the approval of the College to study these subjects.
4. The courses should be registered for the student by the competent authority in the Deanship.
5. At the end of his studies, the student shall be provided with a letter explaining the results of the courses he/she has studied.

3. REGISTRATION

E-register system allows M.Sc. students to register, add courses, request to cancel registrations, request to withdraw, make payments, and credit balance refunds, as well as other options. Students must make the required payment before the announced deadline or they will be placed on hold for non-payments issue.

3.1 Registration Guidelines

1. All students who want to register must log to E-register online.
2. Late registration starts on the first day of the beginning of classes according to the college academic calendar of the semester and finished on the last day for adding courses.
3. A maximum of 12 credit hours can be registered in one semester.
4. Students should follow and respect timetables of registration, add, request drop and request withdrawal according to the college academic calendar.
5. Registering new students must follow compulsory courses before they register for specialization.
6. Registration steps are:
    - Pay your fees (Scholarship students are considered to be waved).
    - Register online.

3.2 Add/Drop Policies

Students may add or drop courses without any penalties during the first two weeks of each term. An Add/Drop Form can be completed by the student through their QU account online, or by a signed request to the department. Students are advised to consult their academic advisors before registering and enrolling in courses.

3.3 Withdraw Policy

A student may withdraw from a course or all courses until the end of the 14th week of the term without academic penalty, provided they meet the eligibility criterion set by the Deanship of graduate studies. It will be shown as a “W”, withdraw, on the

transcript. After week 14 of the term elapsed, all students will be awarded grades for their registered courses based on their assessment.

3.4 The Curriculum

The curriculum for the M.Sc. degree program is based on the following considerations:
Table 3 provides the list of **Compulsory courses** that are bepre-required before taking the courses in the specialization area at the MSc. Program as shown in Table 4 and the thesis in Table 5.

Table 3: Compulsory courses

Course	Course Title	Cr. Hrs.	Pre-req
GE 605	Modeling and Simulation of Engineering Systems	3	----------
GE 608	Experimental Methods and Analysis	3	----------
MATH 621	Engineering Mathematics	3	----------
	Total	**9**	

Table 4: Elective courses

Course	Course Title	Cr. Hrs.	Pre-req
ME 630	Selected Topics in Manufacturing Processes	3	----------
ME 631	Advanced Manufacturing Processes	3	----------
ME 632	Advanced Engineering Materials	3	----------
ME 633	Advanced Mechanics of Materials	3	----------
ME 634	Polymer Processing	3	----------
ME 635	Manufacturing System Design and Simulation	3	----------
ME 636	CAM Applications	3	----------
ME 637	Design for Manufacturability	3	----------
ME 638	Automation in Manufacturing	3	----------
ME 639	Fracture Mechanics	3	----------
ME 640	Applied Finite Elements	3	----------
ME 659	Mechatronic Systems	3	----------
ME 660	Selected Topics in System Dynamics and Control	3	----------
ME 661	Advanced System Dynamics and Control	3	----------
ME 662	Advanced Mechanical Vibrations	3	----------
ME 663	Intelligent Control Systems	3	----------

Course	Course Title	Cr. Hrs.	Pre-req
ME 664	Dynamics of Mechanical Systems	3	----------
ME 665	Advanced Measurement s and Instrumentations	3	----------
ME 666	Robotics	3	----------
ME 667	Design of Digital Control Systems	3	----------
ME 668	Optimal Control	3	----------
ME 669	Flight Dynamics and Control	3	----------
ME 670	Selected Topics in Mechanical Power Engineering	3	----------
ME 671	Advanced Heat Transfer	3	----------
ME 672	Advanced Thermodynamics	3	----------
ME 673	Advanced Fluid Mechanics	3	----------
ME 674	Energy Conversion	3	----------
ME 675	Thermal Power Plants	3	----------
ME 676	Turbo-Machinery	3	----------
ME 677	Engineering Safety and the Environment	3	----------
ME 678	Combustion and Fuel	3	----------
ME 679	Solar System Engineering	3	----------
ME 680	Desalination	3	----------
	Total	**99**	

Table 5: Thesis

Course	Course Title	Cr. Hrs.	Pre-req
ME 699	Thesis	6	----------
	Total	**6**	

3.5 Course Description

A course description provides an overview of what a course covers in the M.Sc. Program.

3.5.1 College Requirements

The college of engineering requires that student must complete 9 credit hours before the elective courses and thesis in the department.

GE 608- Experimental Methods and Analysis: 3 (3, 0)

Design of Experiments, the application of statistical techniques and concepts to maximize the amount and quality of information resulting from experiments. and Use of Commercial Software for Analysis of Experiments (LabView, MiniTab).

GE 605- Modeling and Simulation of Engineering Systems: 3 (3, 0)

Apply modern software packages to conduct analysis of real world data, General concepts of modeling, discrete simulation, Continuous simulation, Signal flow module of PSM++ - link types, Bond graphs, System Dynamics (SD), and Advanced case study: Stock market simulation using DIs.

MATH 621- Advanced Mathematics: 3 (3, 0)

Fourier Analysis and Partial Differential Equations (PDE), Complex Numbers and Functions, Complex Integration, Power Series, Taylor Series, Laurant Series and Residue Integration, Complex Analysis to Potential Theory.

3.5.2 Departmental Requirements

The program and/or departmental requirements requires that the student must complete five courses (15 hours) and 6 hours considered for thesis in the department

ME 630- Selected Topics in Manufacturing Processes: 3 (3, 0)

Role of manufacturing processes, Advancement in Manufacturing Processes, Techniques in Rapid Prototyping, Reading and Interpreting STL files, Modeling in Solid modelling, Preform in Forging process, Porosity issues and way to reduce in Casting, Plastic extrusion process, advancements Pl, Ultrasonic and waterjet machining benefits, Life cycle analysis of Polymers, Advanced Manufacturing Systems, Economics of Advanced Manufacturing Processes, Research Methodology in manufacturing. 5. Pre-requirements for this course

ME 631- Advanced Manufacturing Processes: 3 (3, 0)

Introduction, Jig & Fixture Design, Rapid Prototyping, Materials Review, Polymer processing / processing of composites, Mechanics of Materials Review, Metal forming, Sheet metal working, Material removal processes, Non-traditional machining, and SPC/Lean Manufacturing.

ME 632- Advanced Engineering Materials: 3 (3, 0)

Theories of stress & Strain, Stress-Strain-Temperature Relations, Energy Methods, Torsion, Shear Center for Thin-Wall Beam Cross-sections, Bending of Curved Beams, Thick-Wall Cylinder, Stress Concentrations.

ME 633- Advanced Mechanics of Materials: 3 (3, 0)

Introduction and basic refreshing smart/functional materials, smart/functional materials, high-strength ferrous alloy, high-strength non-ferrous alloys, super alloys, high performance polymers eco-materials, thin film science and technology, advanced joining methods, processing-structure-property relationship, damage tolerance, toughening mechanisms, structure integrity and reliability Mini project submission.

ME 634- Polymer Processing: 3 (3, 0)

Introduction to Polymer Material Science, Dimensional analysis and scaling, Transport phenomena in polymer processing, Analysis based on analytical solutions, introduction to numerical analysis, Finite Difference Method, Boundary Element methods, Radial function method.

ME 635- Manufacturing System Design and Simulation: 3 (3, 0)

Fundamentals of simulation, Simulation with hand, modelling basic operations & inputs, Output analyzers, Modelling detailed operations, Statistical analysis for terminating simulations, Statistical analysis for Non-terminating simulations, intermediate modelling , Steady state statistical analysis, Parts transfer, Case Studies, Project Group Discussions, Project Group Discussions/Presentation.

ME 636- CAM Applications 3 (3, 0)

Introduction to Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM), Methodologies and Components of CAD and CAM Systems, Product life cycle through Computer Integrated Manufacturing systems, Introduction to Computer Numerical Control Machine Tools, Programming of CNC machine tools, Planning of resources for manufacturing through Information Systems, Computer Aided Process Planning, Computer Aided Quality Control, Computer Integrated Manufacturing systems (CIM).

ME 637- Design for Manufacturability: 3 (3, 0)

Introduction, Selection of Materials and Processes, Product Design for Manual Assembly, Electrical Connections and Wire Harness Assembly, Design for High-Speed Automatic Assembly and Robot Assembly, Design for Machining, Design for Injection Molding, Design for Sheet Metalworking, Design for Die Casting,

Design for Powder Metal Processing, Design for Sand Casting, Design for Investment Casting, Design for Hot Forging, and usage of advanced CAD/CAM software's for applying product design and assembly.

ME 638- Automation in Manufacturing: 3 (3, 0)

Introduction to Automation, Industrial Control Systems, Sensors, actuators, and other control system components, Discrete control using programmable logic controllers and personal computers, Automatic data capture, Material transport systems, Automated assembly systems, Storage Systems, Automated Guided Vehicle Systems.

ME 639- Fracture Mechanics: 3 (3, 0)

Crack tip solutions, displacements of fracture surfaces, Stress and strain fields and path-independent integrals, Basic tensor algebra, Concepts of dissipated energy, stiffness reduction and compliance methods, , Materials testing test specimens for fracture mechanical testing, Limits of linear fracture mechanics, stress intensity factors and fracture toughness, Fatigue, Paris' law and stress corrosion laws, Non-linear fracture mechanical concepts and fracture resistance curves, Special Topics in Fracture Mechanics, Mini Project Presentations.

ME 640- Applied Finite Elements: 3 (3, 0)

Basics of Finite Element Method, Stiffness (Displacement) Method, Truss Equations, Beam Equations, Plane Stress and Plane Strain Stiffness Equations, Iso-parametric Formulation, Heat Transfer, Fluid Flow.

ME 659- Mechatronic Systems: 3 (3, 0)

Overview of mechatronics, Mechatronics sensors, Signal Conditioning , Mechatronics Actuators, Modeling of mechatronics systems, Mechatronics Controllers.

ME 660- Selected Topics in System Dynamics and Control: 3 (3, 0)

Selected and contemporary topics in the general area of system dynamics and control. Modeling of mechanical system using newton and LaGrange's and Hamilton's principles. Intelligent Control Systems design, Robotics, Design of Digital Control Systems, Optimal Control, Flight Dynamics and Control.

ME 661- Advanced System Dynamics and Control: 3 (3, 0)

Modeling and Simulation, Linearization, Review of the classical Control Theory, State space representation, Controllability and observability, State feedback and linear quadratic regulator, State observers, Kalman filters, Modeling/performance trade-offs in control system design, Real Application.

ME 662- Advanced Mechanical Vibrations: 3 (3, 0)

Formulation of vibration problems, Free vibrations of Single-Degree-of-Freedom (SDOF) systems, Harmonic forced vibrations of SDOF systems, General periodic and non-periodic response, Multi-degree-of-freedom systems, Vibration control techniques, Continuous systems, Vibration measurement.

ME 663- Intelligent Control Systems: 3 (3, 0)

Fundamental of control theory (e.g. Robustness, nonlinearity, stability), Introduction to intelligent control techniques and their bio-foundations, Fuzzy logic control, Fuzzy and expert control , Artificial neural network, Neuro-fuzzy systems, Using genetic algorithms in optimizing intelligent control system, Applications on mechanical and electromechanical systems.

ME 664- Dynamics of Mechanical Systems: 3 (3, 0)

Introduction. Fundamental principles, Equations of motion using Newton's laws, Work-energy principle, Simulation of dynamical systems, Kineto-static and time response analysis, Principle of virtual work, Potential energy principle, Lagrange's equations, Hamilton's principle.

ME 665- Advanced Measurement s and Instrumentations: 3 (3, 0)

Advanced instrumentation and measurement techniques, System level design, fabrication and evaluation, Use of a wide range of instruments/techniques, fabrication/machining methods, Theory and practice of both linear and nonlinear system identification techniques.

ME 666- Robotics: 3 (3, 0)

Introduction. Automation and Robotics. Robot Classification, D-H representation and forward kinematics, Inverse kinematics, Manipulator dynamics, Robot control, Task planning, Miscellaneous topics.

ME 667- Design of Digital Control Systems: 3 (3, 0)

Review of the continuous control, Introductory digital control, Discrete time systems analysis, Sampled-Data Systems, Discrete Equivalents, Design Using Transform Techniques, Design Using State-Space Methods, Design of a Disk Drive Servo: A Case Study.

ME 668- Optimal Control: 3 (3, 0)

Introduction to the principles and methods of the optimal control approach, Performance measures, Dynamic programming, Calculus of variations, Pontryagin's principle, optimal linear regulators; minimum-time and minimum-fuel problems, steepest descent and quasi-linearization methods for determining optimal trajectories, Numerical optimization using to evolutionary optimization techniques.

ME 669- Flight Dynamics and Control: 3 (3, 0)

Introduction to atmospheric flight, Static and dynamic stability, Aircraft equations of motion, Response to control or inputs,, Flying qualities, Applications of classic and modern control theories to autopilot design.

ME 670- Selected Topics in Mechanical Power Engineering: 3 (3, 0)

Current developments in Mechanical Engineering, Refrigeration principle and design, Wind energy engineering, HVAC, Solar power system, Combustion engine design, Turbomachinery components design, Thermal system design

ME 671- Advanced Heat Transfer: 3 (3, 0)

1D and 2D conduction and applications, Transient conduction, Thermal boundary layers-free and forced convection, Boiling and condensation, pool boiling, two phase flow. Laminar and turbulent film condensation, Heat exchangers: types, analysis and design procedure, Thermal radiation Processes and properties, blackbody radiation, Gray surfaces, Radiation exchange between surfaces, view factor, and Radiation between gases.

ME 672- Advanced Thermodynamics: 3 (3, 0)

Thermodynamic laws, enthalpy, entropy, temperature vs entropy diagrams. Equations of state, property relations, properties of homogeneous mixtures. Exergy analysis. Thermodynamics of irreversible processes. Optimization

applied to power generation, refrigeration cycles, and thermodynamic design of system components. Fundamentals of statistical thermodynamics. Thermal design of equipment and systems. Numerical solutions techniques to thermodynamic problems.

ME 673- Advanced Fluid Mechanics: 3 (3, 0)

Basics of fluid mechanics. Fluid properties and analytical solutions of basic fluid flows. Fluid dynamics, conservation of mass, momentum, and energy. Boundary layer theory and its applications. Turbulent flow and its modeling.

ME 674- Energy Conversion: 3 (, 0)

Energy sources and their classification, Conventional energy conservation, Power plant and vapor cycles, Renewable energy, Solar energy with emphasis on solar cells, and wind energy, Ocean thermal energy conversion "OTEC" systems, Geothermal energy, Nuclear fission and types of fission reactors, Fuel cells.

ME 675- Thermal Power Plants: 3 (3, 0)

Thermodynamics review, forms of energy, oil, gas and coal, combustion processes, gas power plants, steam power plants, combined power plants, nuclear power plants, steam generators and their component design, turbines, load curves, power plant economy and steam condensers and cooling towers.

ME 676- Turbo-Machinery: 3 (3, 0)

Radial flow turbines, axial flow turbines, flow through axial stages, theory of twisted blades, multi-stage turbines, design of the turbine blades, governing of steam and gas turbines, vibration aspects, coefficients of performance and design considerations for axial flow compressors and ducted fans, coefficients of performance and design considerations for centrifugal compressors. Centrifugal pumps: performance, losses, cavitation, water hammer and impeller design, water turbines: characteristics, design considerations, performance.

ME 677- Engineering Safety and the Environment: 3 (3, 0)

Introduction to engineering safety, administrative functions in the control of environmental factors, Factors affecting human health and survival, Introduction to challenges of managing engineering approaches, Environment assessment, Environmental impact statements, Legal requirements, Applications.

ME 678- Combustion and Fuel: 3 (3, 0)

Introduction to Combustion Processes, Combustion and Entropy, Solid Fuels, Liquid Fuels, Gaseous Fuels, Spark-Ignition Engine Combustion, Compression-Ignition Engine Combustion, Gas Turbine Engine Combustion, Thermal Destruction, Semester Project Design.

ME 679- Solar System Engineering: 3 (3, 0)

Thermal network modelling, Solar thermal system design, Photovoltaic (PV) system design, solar energy storage systems, hybrid solar systems, Applications of solar thermal, Applications of PV. Thermal network modelling, Solar thermal system design, Photovoltaic (PV) system design, solar energy storage systems, hybrid solar systems, Applications of solar thermal, Applications of PV.

ME 680- Desalination: 3 (3, 0)

Concepts in thermodynamics; Water treatments; Fouling and scaling on tubes; fouling removal, Thermal desalination: Multistage evaporation systems (MES); Multistage Flash systems (MSF); Vapor compression desalination systems(VCD); Solar desalination systems; co-generation power systems, Reverse osmosis systems: Types of membranes; membrane arrangements; Energy recovery; back washing; membrane fouling; Ultra and nanofiltration, Project: Analysis of Desalination Plant.

ME 699- Thesis: 6 (6, 0)

MSc Thesis in ME M.Sc. program is at least a two-semester research-oriented course. This course is designed to provide students with the opportunity to conduct independent, original research in a specialized area of mechanical engineering. Further, this course emphasizes the development of a deep understanding of advanced engineering concepts, research methodologies, and the ability to apply these to real-world problems. A supervisor is assigned to each MSc student who will guide the student's research tasks including research paper, progress report, thesis editing/reviewing, and thesis defense.

4. COURSE PLAN PER SEMESTER

The M.Sc. Program plan the courses in four (4) semesters as per detailed below

Year 1 – Level 1 (Semester 1)			
Course	**Course Title**	**Cr. Hrs.**	**Prereq**
GE 605	Modeling and Simulation of Engineering Systems	3	---
GE 608	Experimental Methods and Analysis	3	---
MATH 621	Engineering Mathematics	3	---
	Total	**9**	

Year 1 – Level 2 (Semester 2)			
Course	**Course Title**	**Cr. Hrs.**	**Prereq**
ME 6--	Elective 1	3	---
ME 6--	Elective 2	3	---
ME 6--	Elective 3	3	---
	Total	**9**	

Year 2 – Level 3			
Course	**Course Title**	**Cr. Hrs.**	**Prereq**
ME 6--	Elective 4	3	---
ME 6--	Elective 5	3	---
	Total	**6**	

Year 2 – Level 4			
Course	**Course Title**	**Cr. Hrs.**	**Prereq**
ME 699	Thesis	6	---
	Total	**6**	

Total Hours in M.Sc.- Mechanical Engineering Program	**30 H**

Note: Elective courses are selected by the student from an approved list of ME MSc program courses, based on their thesis topic and research interests, under the supervision of their thesis supervisor.

5. GRADES & GRADUATION REGULATIONS

5.1 Grade Point Average (GPA) Semester/Level

It is the average of the total points of all academic units divided by the number of credit hours for the specific semester. Points are calculated by multiplying each academic unit by its corresponding weight of points.

5.2 Grade Point Average, Cumulative

It is the average of total points divided by the number of credit hours for all completed credit hours by a student for all semesters.

5.3 Grade Reports

Semester grade reports are not mailed to students. Semester final grades are typically available online. Students may view their grades by logging onto E-register.

5.4 Grades Breakdown

The following grades have been adopted:

Marks	Grade	Points	GPA	Description
95 – 100	A+	5.00	4.75 - 5.00	Exceptional
90 – 94	A	4.75	4.50 - < 4.75	Excellent
85 – 89	B+	4.50	4.25 - < 4.50	Superior
80 – 84	B	4.00	3.75 - < 4.25	Very Good
75 – 79	C+	3.50	3.25 - < 3.75	Good
Below 75	F			Fail

6. ACADEMIC PROGRESSION, DISRUPTION AND DISMISSAL

6.1 Academic Progression

M.Sc. students must maintain a grade point average (GPA) of least 3.75. Moreover, each graduate student should, at start of enrolment in a program, have an academic guide to direct the study, assist in selecting a thesis topic and preparing a research plan according to M.Sc. program requirements initiated by the Deanship of postgraduate Graduate Studies. The student should follow the process and procedures regarding all the required credit hour for graduation condition (where applicable).

6.2 Attendance

Students are expected to attend all classes and to participate actively in class discussions. Absence should not exceed 25%, which is equivalent to 4 classes, of any course attendance requirements.

6.3 Disruption

Qassim University recognizes that freedom requires order, discipline, and responsibility, and stands for the right of all students to pursue their legitimate goals without interference. Therefore, will not tolerate any attempt by any individual or group to disrupt the regularly scheduled activities of the University. Any such effort to impede the holding of classes, the carrying forward of the University's education objective, or the arrangements for properly authorized and scheduled events would constitute an invasion of the rights of faculty and students and cannot be permitted. If any such attempt is made to interfere with any University education objective, the leaders and participants engaged in disruptive tactics will be held responsible and will be subject to appropriate legal and disciplinary action, including expulsion.

Students who disrupt or attempt to disrupt education shall be subject to University disciplinary procedures, which may include probation, suspension, or exclusion from the University. Disruption is any action that interferes with, interrupts, or impedes the holding of classes, the carrying out of University business, or the arrangements for properly authorized and scheduled University events. A person attempts to disrupt when, with intent to disrupt, that person

does any act that constitutes a substantial step toward disruption.

6.4 Dismissal from the University

The student shall be dismissed from the university in the following cases:

1. If he receives two consecutive warnings for his cumulative GPA being below (3.75 out of 5).
2. If he does not complete the graduation requirements within a maximum period of half of the period prescribed for graduation in addition to the duration of the program.
3. If he does not complete the graduation requirements within a maximum of 3 years. The College Board may give an exceptional opportunity if the student has an approved proposal.
4. If it becomes apparent that the student is not serious about his failure to do so, the College Council may terminate his registration

7. CODE OF CONDUCT

The rules and regulations governing the actions and interactions of administrative personnel, faculty, and students are intended to ensure that the aims and objectives of the M.Sc. Program are accomplished according to the highest standards of academic rigor and ethical behavior.

7.1 Academic Misconduct

The M.Sc. student is expected to act in a responsible manner, as expected in a department and college setting, in all activities connected with his studies. Incidents of cheating, plagiarism, lying, violating courses rules, copyright infringement, or damaging/destroying the department/College facilities or equipment, violate the Code of Student Ethics. If it is determined, by a faculty or other university official, that a student has acted unprofessionally, he will be subject to a disciplinary action. Such action shall include but not to be limited to: a failing grade on the work submitted, a failing grade in the course, or expulsion from the program. The M.Sc. program and the Postgraduate Graduate Studies shall jointly determine the severity of the action. However, the student has the right to appeal to the department, in writing, stating the reason for the appeal.

7.2 Cheating

Using or attempting to use or provide unauthorized assistance, materials, information, study aids or mobile devices in any form in any academic exercise or setting. The term academic exercise includes all forms of work submitted for credit or hours.

1. Using or attempting to use books, notes, study aids mobile devices, calculators, or any other documents, devices, or information in any academic exercise or environment without prior consent by the instructor.

2. Copying or attempting to copy from another person's paper, report, computer labs, computer program, or other work material in any academic exercise.

3. Sending a substitute or acting as a substitute for another student to take one's examination, test, quiz, or to perform one's field or lab work.

4. Conducting a research, preparing a project, or any assignment for another student without prior consent by the faculty.

5. Changing a grade, score, answers on a returned exam, or assignment for credit.

7.3 Plagiarism

Plagiarism is defined as copying another student's work, lending work to another student, or representing extracts or whole articles and texts from books or handouts as one's own work. Presenting the words or ideas of someone else as one's own in any academic exercise, such as:

1. Submitting any course related articles, assignments, projects by another person or by a commercial writing service.

2. Exact reproduction of someone else's words without identifying the words with quotation marks, and without properly citing the quotation in a footnote or reference.

3. Paraphrasing or summarizing someone else's work without acknowledgment in the footnotes or references.

Policy for Plagiarism:

i. For Post-graduate (MSc) Students, the initial draft of the thesis/article/proposal is to be checked by the concerned Supervisor.

ii. The revised soft copy will be sent to the program committee through the respective program director.

iii. Final draft will be sent to program committee who will generate an originality report using "iThenticate/ or Turnitin". There is a provision at Three attempts (First Submission + Two Attempts) for bringing the work

within program committee's prescribed limit (Similarity Index less than 25%). Failing to do so will result in the case being forwarded to the program director to be presented to the Department Council to take the appropriate decision in accordance with the applicable rules issued by the Deanship of Graduate Studies

iv. In case of re-defense, thesis will be processed through "iThenticate/ or Turnitin" again at the time of resubmission.

v. Final/Formal Clearance report will be issued by the program committee to the Head of Department.

7.4 Intellectual Property

Qassim University has Center for Innovation and Intellectual Property (CIIP) to protect and commercialize intellectual properties (IP). The CIIP manages the entire IP lifecycle management from the discovery process and IP protection such as copyright, trademark, trade secret or patent to the deployment of the technology to industry partners or inventor-led startups as well as raising the technology readiness level.

8. STUDENT RIGHTS

8.1 Appeals

The M.Sc. program committee convene to monitor the academic progress of all students at least once result/report in each semester, this result/report may case academic honors, places poorly performing students on probation, and issues suspensions and dismissal according to the postgraduate policies. Also considers and adjudicates on matters of disciplinary action. A faculty member (Instructor/Supervisor) normally brings cases forward to the Postgraduate Studies through online monitoring. The student who has been accused of academic misconduct also will be reported. Decisions of the Mechanical Engineering department meeting council will be conveyed to the Dean of postgraduate for final decision.

8.2 Academic Rights of Postgraduates Students

1. To be provided with an appropriate academic environment that enables them to accomplish their studies and research effectively.
2. Obtain the necessary orientation to clarify rules and regulations of the postgraduate studies.
3. Have an academic advisor to help plan the schedule and provide guidance and direction for the best ways to advance in the academic and scientific research process to achieve the goal of joining the program.
4. Have the academic calendar with important dates and deadlines.
5. Have a study plan for compulsory and elective courses.
6. Have course descriptions (course objectives and educational outcomes - course timetable - course evaluation methods - grade distribution - and references).
7. Have the right to add – drop compulsory or elective courses.
8. Obtain a list of faculty members, specializations and research directions.
9. Get a scientific supervisor for the thesis after approving the research proposal plan.

10. Change the thesis supervisor after submitting a written statement to justify the request.
11. Get one additional opportunity to improve the marks for one semester (after the completion of all courses given that the student's grades are less than very good and have been received a warning letter to improve the GPA).
12. Postpone the admission for one or two semesters.
13. Postpone the study for one or two semesters and submit a written statement to justify the request.
14. Ensure confidentiality of complaints.
15. Solving problems and obstacles that negatively impact the academic progress.
16. Get the graduation certificate upon completion of the graduation requirements.

8.3 Disciplinary Issues

Violations may be academic or non-academic in nature. All individuals who participate in activities outside the University as its representatives whether academic or non-academic are subject to the same disciplinary actions in the event of a violation of the charter.

8.4 Academic Issues

Students may appeal a faculty member's decision regarding a grade. The student can formally appeal or communicate to the faculty member, either orally or in a writing with the reasons; he believes the grade to be unfair or inappropriate. If the disagreement continues, a student may appeal in writing to the head of the department. In this case the decision will be made according to the ME department council meeting.

8.5 Students Complaints

All complaints must be submitted in writing to the head of the department/ Dean of Postgraduate Studies. Students should not discuss any academic issues with any of the M.Sc. administrators due to confidentiality purposes.

9. THESIS SUPERVISION

Each graduate student should, at the start of enrolment in a program (within a period not exceeding four weeks from the beginning of the study), have an academic guide to direct the study and assist in selecting a thesis topic and preparing a research plan according to university council regulations initiated by the Deanship of Graduate Studies and Scientific Research and implemented by the ME M.Sc. Program. To approve the proposal the student must follow the following steps:

1. The student should must pass the first semester.
2. The student must submit his proposal through his university account.
3. The student must present the proposal to the scientific committee.
4. The proposal evaluated by at least three members of the scientific committee.
5. The student must get at least 75 out of 100 to approve his proposal.

9.1 Rules of Supervision of Theses

9.1.1 Rules related Thesis

An academic work introduced by the requirements of obtaining the master's degree, which its title and proposal have been approved by the Department Council and Deanship of Graduate Studies as per the recommendation of both the councils of Scientific Department and College. This has to be done according to the Manual of Theses Preparation approved by the MSc program following the rules of Graduate Studies Deanship.

9.1.2 Rules related Students

A graduate student who registers for attaining the theses after getting his Thesis accredited along with appointing an academic supervisor by the Deanship of Graduate Studies Council as per the recommendation given by the meant two councils of Department and College.

9.1.3 Rules related Advisor

An advisor is a faculty member chosen by the academic section dedicated for each graduate student since joining the program. His duty is to guide and assist the student in the selection of the study subject and preparing the research proposal.

9.1.4 Rules related Supervisor

A supervisor is a faculty member appointed by the Council of Graduate Studies to supervise a graduate student as per the recommendation of the Department and College councils. He is the main supervisor in case more than one supervisor is chosen to supervise the Thesis.

9.1.5 Rules related Co-supervisor

A co-supervisor is a faculty member appointed as an assistant supervisor for the student to help the main supervisor. He can also be selected to supervise a part of the thesis.

10. EDUCATION RESOURCES

The M.Sc. Mechanical Engineering program provides a wide range of resources and expertise to support students in achieving their academic and professional goals. These resources include both traditional and modern tools, some of which may be new to students and their peers. The main educational resources are:

- Textbooks
- Lectures
- The World Wide Web (Internet)
- Seminars
- Conferences
- Training courses

10.1 Student Affairs Office

The Student Affairs Office, headed by the Vice Dean of Student Affairs and staff by two full-time expert members, operates in coordination with the Deanship of Postgraduate Studies for registration purposes. The office is equipped with computers connected to the university's local area network. The main responsibilities of the Student Affairs Office include:

- Assisting in student registration and providing the necessary data regarding enrolment and academic progress, which supports the evaluation process.
- Accessing the registration system to resolve issues encountered by students during the registration process.
- Participating in the committee responsible for assigning students to various departments of the college after the first academic level.
- Monitoring student attendance to ensure that university regulations on exam eligibility are strictly applied.
- Organizing and overseeing all matters related to midterm, final written examinations, and the written outcomes achievement exam, including preparing exam timetables, assigning venues and supervisors, collecting exam questions from faculty members, and arranging answer sheets.
- Disseminating important announcements, dates, news, and regulations to students via the college website and/or SMS notifications.

10.2 Student Activities

The Deanship of Student Affairs supervises most student activities, including cultural, recreational, and social events. These activities not only enhance students' learning abilities but also provide valuable opportunities for entertainment and stress relief. Examples include:

1. Cultural activities – covering various fields of knowledge and arts.
2. Social activities – such as organized trips to major industrial cities and visits to large-scale engineering projects.
3. Recreational activities – including sports competitions in football, tennis, billiards, and other games.

The college also provides facilities such as a mosque, a cafeteria, and a student club. The student club serves as a vital extension of the college's mission, acting as a hub for student engagement through discussions, workshops, competitions, cultural events, training sessions, sports, social gatherings, and other student-related activities. Membership in the club is open to students from all departments, who actively contribute creative ideas and participate in planning future events during regular meetings. Academic staff members who support student activities are also encouraged to participate in the club's programs.

10.3 College Scientific Journal

The College of Engineering publishes the Qassim University Journal of Engineering and Computer Sciences, issued twice annually. Submissions are welcomed from both within and outside the Kingdom of Saudi Arabia and are not limited to faculty members of the college. All papers undergo a rigorous peer-review process by national and international specialists. The journal is recognized as a reputable platform for scholarly publication, and its papers are accepted by scientific councils across all universities in the Kingdom of Saudi Arabia for academic promotion purposes.

10.4 Physical Facilities

In addition to the specialized laboratories in each department, the college provides various facilities that serve all departments, including laboratories, drawing halls, teaching halls, and computer laboratories. The main physical facilities are:

- Workshop
- Computer laboratories
- Drawing halls
- Active learning halls
- Teaching halls

10.5 Workshop

The workshop, located in the Department of Mechanical Engineering, is equipped with a wide range of machinery and tools, including lathes, milling machines, shapers, drill presses, band saws, grinders, welding equipment, and a hydraulic cutter. Junior-level students receive training in the workshop and perform experimental exercises for various industrial applications. Additionally, students may manufacture equipment and experimental models required for their M.Sc. thesis work, if needed. The workshop is also utilized for research projects conducted by the college's faculty members.

10.6 Computer Laboratories

The college has two computer laboratories supervised by faculty members. These laboratories are equipped with licensed engineering and scientific software, up-to-date printers, and scanners. The laboratories are used for graduation projects, teaching computer science courses, and delivering engineering courses that require computer applications. Facilities include email services and internet access. Each laboratory can accommodate approximately 40 students.

10.7 Teaching Halls

The college comprises several teaching halls equipped with modern educational resources such as whiteboards, overhead projectors, internet connectivity, electrical outlets, air conditioning, and other necessary facilities to support an effective learning environment.

11. ME M.Sc. FACULTY MEMBERS

No.	Name	Rank/Position	Specialty
1	Dr. Yasir Mohammed Alfulayyih	Assistant Professor (**Head of Department**)	Thermodynamics - Fluiddynamics
2	Prof. Abdulrahman Ibrahim Alateyah	Professor	Production Engineering
3	Prof. Sulaiman Abdulaziz Alyahya	Professor	Food Engineering - Solar Energy Engineering
4	Prof. Hanafy Mohamed Omar	Professor	Intelligent Automatic Control
5	Prof. Abdulaziz Sulaiman Alaboodi	Professor	Manufacturing and Materials Engineering
6	Prof. Mohammad Sajid	Professor	Mathematics (Chaos Theory)
7	Prof. Fahad Abdulrahman Al-Mufadi	Professor	Design and Manufacturing
8	Prof. Osama Mohamed Irfan	Professor	Industrial Systems Engineering
9	Prof. Shameer Basha Manjula	Professor	Thermal & Fluid Engineering
10	Prof. Sivasankaran Subbarayan	Professor	Material Technology
11	Prof. Abdulrahman Abdullah Alrobaian	Professor	Thermal Sciences
12	Prof. Waleed Hassan El_Garaihy	Professor	Materials Engineering
13	Dr. Abdullah Saleh Alsuwaiyan	Associate Professor	Vibration Engineering
14	Dr. Ali Sulaiman Alsagri	Associate Professor (**Program Director**)	Energy and Thermodynamics
15	Dr. Abdelraheim Emadelddin Abdelraheim	Associate Professor	Dynamics and Mechanical Vibrations
16	Dr. Abdullah Ahmed Alghafis	Associate Professor	Renewable Energy Engineering
17	Dr. Hany Rizk Ammar	Associate Professor	Advanced Materials Technologies
18	Dr. Hussein Zein Korany	Associate Professor	Mechanical Design
19	Dr. Hassan Mohamed Abdelhafez	Associate Professor	Manufacturing and Welding Engineering
20	Dr. Mohammed Saleh Alshitawi	Associate Professor	Ventilation of Buildings and Indoor Air Quality

No.	Name	Rank/Position	Specialty
21	Dr. Saad Mohamed Suleiman Mukras	Associate Professor	Mechanical Engineering Design
22	Dr. Ahmed Mohammed Alshwairekh	Associate Professor	Thermal Fluid Sciences
23	Dr. Mohammed Aqeel Albadrani	Associate Professor	Material Science in Mechanical Engineering
24	Dr. Anas Muhammed Alwatban	Associate Professor	Renewable Energy
25	Dr. Parvez Ali	Associate Professor	Applied Mathematics (Graph Theory)
26	Dr. Mohamed Alobaidi Nejlaoui	Associate Professor	Mechanical Design and Automatic Control
27	Dr. Abdulrahman Amer Alrumayh	Assistant Professor	Production Engineering
28	Dr. Eihab Abdelraouf Mustafa	Assistant Professor	Thermal and Fluids Engineering
29	Dr. Bandar Abdullah Aloyaydi	Assistant Professor	Mechanical Systems
30	Dr. Hussain Sadig Hussain Sadig	Assistant Professor	Energy Engineering
31	Dr. Hesham Abdulghaffar Othman	Assistant Professor	Power Stations
32	Dr. Amer Lafi Allafi	Assistant Professor	System Dynamics Automatic Control
33	Dr. Faisal Saleh Altwijri	Assistant Professor	Renewable Energy
34	Dr. Iqbal Ahmad Akhlaq Ahmad	Assistant Professor	Mathematics (Nonlinear Functional Analysis)
35	Dr. Youssef Hindi Alammari	Assistant Professor	Mechanical Design
36	Dr. Saleh Mohammed Alzughaibi	Assistant Professor	Production Engineering
37	Dr. Nasser Ayidh Alqahtani	Assistant Professor	Dynamic Systems and Control

12. COLLEGE ADMINISTRATION

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