QU
Saudi Arabia

Qassim University
جامعة القصيم

COLLEGE OF ENGINEERIN

MECHANICAL ENGINEERING DEPARTMENT

STUDENT MANUAL

Safar 1444 A.H.

September 2022 A.D.

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College of Engineering
جامعة القصيم
كلية الهندسة

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COLLEGE OF ENGINEERING

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DEAN MESSAGE

College of Engineering at Qassim University seeks to offer a developed and accredited engineering education to satisfy the needs of the job market, and to offer society and research services which support the sustained development in the Kingdom and participate in the knowledge econ. This is the mission of the College of Engineering in Qassim University, for which great efforts are done to be achieved through an ambitious strategic plan for the coming ten years. Through this strategic plan the college hopes by the end of 2020 to achieve its vision as "a locally and regionally recognized college in the engineering education and scientific research, and supporting the sustained development in Qassim and Kingdom."

When designing the study plans for the college's three BSc programs great attention has been paid to them to be comprehensive such that they satisfy the four fundamental aspects of modern engineering education; the mathematics and engineering fundamentals, knowledge and analysis, engineering design, training and practice. The college, also, gives great concern to the soft skills to develop the student communication and character building skills through modern teaching methods which made the college's outcomes compatible with the requirements of the job market. Despite the newness of our college, as it has not completed its first decade yet, the college was able to race against the clock and got the academic accreditation from the ABET organization for the EE, CE, and ME B.Sc programs delivered on the main campus , and has become one of four colleges of Engineering which got the accreditation in Saudi Arabia. Also, the college has sent more than forty postgraduate students to USA, Canada and Australia to achieve the master and PhD degrees. The college prepares, nowadays, for offering four graduate programs in electrical engineering, civil engineering, mechanical engineering and renewable energy engineering. The College will concentrate in the coming years as stated in its strategic plan on scientific research by establishing research chairs and specialized research centers. Moreover, it will activate its role in serving the community through conducting engineering studies, consultation and professional training programs. In the end, I pray to Allah Almighty to grant success to all employees at the Faculty of Engineering and Qassim University, and wish full success to all our students.

College Dean

ABOUT THE COLLEGE

On 17/1/1423 A.H.; the council of King Saudi University (KSU) recommended the transformation of the Department of Agriculture Engineering from the College of Agriculture and Veterinary at its Qassim campus (branch) into an engineering college. The college was to start with three main departments: electrical, mechanical and civil engineering.

The recommendation was then discussed in the meeting of the Saudi Council for Higher Education on 2/11/1423 A.H. and headed by his majesty King Fahd (God bless him) as the Pri-Minister and the Head of Council for Higher Education. The council approved the recommendation on 23/ 11/1423-A.H.

Consequently, a committee of specialists from KSU was selected and assigned the task of developing the curriculums for the three programs. The committee approved the general requirements of the B. Sc. degree in engineering. This included the fulfillment of the university, the college, and the department requirements. Therefore; the schooling process, according to the programs previously set by KSU, started and continued for two full academic years. In "1426-A.H.", Qassim University decided to adopt the Preparatory (foundation) Year Program (PYP) for all its scientific colleges. It was a good chance for the Engineering College to enhance and improve its programs with the objectives of satisfying the new-university-system (PYP) in addition to the job market demands.

Mission

College of Engineering at Qassim University seeks to offer a developed and accredited engineering education to satisfy the needs of the job market, and to offer society and research services which support the sustainable development in the Kingdom and contribute to the knowledge economy.

Vision

A nationally and regionally recognized college in the engineering education and scientific research that supports the sustainable development in Qassim and Kingdom.

Educational Objectives

The educational objectives of Qassim Engineering College (QEC) are stated as follows:

1- Preparation of the graduates to have a successful career as engineers in the governmental and private sectors.
2- Preparation of the graduates to pursue their professional development through self-learning and advanced degrees.
3- Giving the chance for the engineers to develop their skills and scientific abilities through the postgraduate engineering programs.
4- Preparation of the graduates to advance towards leadership positions in their profession.
5- Preparation of the graduates to effectively participate in the sustainable development of Saudi Arabia.

Research Objectives

1- To establish research links with the industry, energy and construction organizations to help develop and promote these organizations.
2- To establish research centers which participate in developing the scientific research and supporting the academic staff and post-graduate students from inside and outside the university.
3- To offer post-graduate programs which focus on research subjects those serve the Saudi society.

Community-Service Objectives

1- To contribute and support the different university committees such as committee of missions and training, demonstrators' committee and the scientific council, etc.
2- To participate, in cooperation with the university community service deanship, in the promotion of the engineering profession through offering training courses and workshops for engineers and technicians in different engineering fields.
3- To conduct engineering studies and field surveys, and to present technical consultations for solving the society problems.
4- To conduct standard tests on constructions, engineering systems, equipment, machines, devices and materials.

Departments

1- Electrical Engineering Department
2- Civil Engineering Department
3- Mechanical Engineering Department

Major Programs

The Engineering College offers three B.Sc. programs:

1- Electrical Engineering Program.
2- Civil Engineering Program
3- Mechanical Engineering Program

Admission Conditions

The admission to College of Engineering requires the completion of the preparatory year program of Qassim University. The number of students who can be accepted in the College of Engineering is determined yearly by the University Council taking into consideration the College capacity. Then, the students who have the desire to join the College of Engineering compete based on their GPA in the preparatory year program.

COLLEGE EDUCATION SYSTEM

The educational system in the college is based on two main semesters per educational year - each semester is fifteen weeks' length. In addition, an optional eight weeks summer semester may be offered.

Course Requirements

According to the educational plans, a student may complete any of the engineering programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the selected program if he completes, after the PYP, a total of 139 credit hours as shown in the table below.

Requirement		CR	%
University Requirements (12 CR)		12	8.63
College Requirements (48 CR)	Compulsory	42	30.22
	Elective	6	4.32
Program/Department Requirements (73 CR)	Compulsory	63	45.32
	Elective	10	7.19
Free Courses (6 CR)		6	4.32
Total		**139**	**100**

University Requirements

Twelve credit-hours are required by the University in order for graduation. A list of these courses comes next.

College Requirements

The college of engineering requires that student must complete 48 credit hours before graduation. Six out of the 48 credit hours are elective courses and the rest are Compulsory courses.

Program and/or Departmental Requirements

Each department requires the completion of 73 credit hours distributed between specialized courses offered by the department itself or offered by other departments of the college.

Free Courses

Six credit hours have to be selected among the set of courses offered by the university.

Academic Supervision

An academic advisor is assigned to each student. In addition, there is full-time staff in the Students Affairs Office to help them in this regard. The student is advised to meet with his academic advisor at least once per semester which should be prior to course registration. The academic advisor may assist the students on:

- Course choices, selections, and degree requirements.
- Selecting the elective and free course that match student's future development and career goals.
- Regulations, policies, and procedures on transfer credits, and academic curricula.
- Getting information about scholarships, coop training opportunities, fellowships, and undergraduate research opportunities within the department.
- Identifying and assessing alternatives and consequences of their decisions related to career goals.

Withdrawal

A student has the right to withdraw from an academic semester -without being considered fail within the withdrawal period announced in the academic calendar for the current semester. The withdrawal must be submitted to the college dean. No withdrawal is allowed during the last five weeks before the final examinations. If the college council accepted the student excuse, the council may search for additional chance of final examinations.

Transfer to the college of engineering

The college of engineering accepts the transfer applications from other colleges whether from Qassim University or from outside Qassim University. A transfer may be approved if the applicant completed his PYP and has achieved a minimum GPA set by the College council. The accepted applicant may transfer his previous achieved courses to the equivalent courses at the college of engineering in Qassim University.

Attendance

Regular engineering courses require full time attendance for academic success. The college requires that students should attend at least 75% of the lectures, practical and laboratorial sessions A student failing to meet this limit in any of his registered courses will be prohibited from attending the final examination of this course. His GPA for this course will be ZERO.

Status of Discontinuity

A student is considered to be in a Status of Discontinuity in one semester if:

1- He did not, or failed to, register in one semester.2-
He withdrew from this semester.

The validity of the causes is not an issue for discussion. It is permissible for a student to be in a discontinuity status for a maximum of two successive semesters, or a total of three non-successive semesters during his enrollment at QEC. Exceeding these limits ends up by terminating the student's enrollment at QEC.

Any student, who loses his QEC- studentship due to any of the discontinuity conditions mentioned above can appeal to be readmitted to the college based on the following conditions:

1- The student discontinuity did not exceed four semesters
2- He has to satisfy all the admission conditions announced at readmission.
3- He should keep the same university personal identification number (PIN) as well as his records he had prior to the discontinuity status.
4- The student's appeal must be approved by the College Dean.
5- The Dean, based on a recommendation from the associated department council, may require the student to retake any course that he has passed before.
6- If the student discontinuity exceeded four semesters, and it was not due misconduct, he can apply for admission as a new student or freshman. In this case all his academic records will be ignored.

Examinations and Grading System

The final grade of a specific course is the summation of the final exam grade and a grade corresponding to the class work during the semester. Each course has a total of 100 points. The grade of the semester work is within 50% to 60% of the total final grade of the course. The rest, however, is assigned for the final exam. A student must have a total of at least 60% of the total marks to pass a specific course. The grading system of QEC is explained in the next table:

Grade Letter	Numerical average %		Points
	From	To less than	
A+	more than or equal to 95		5.00
A	90	95	4.75
B+	85	90	4.50
B	80	85	4.00
C+	75	80	3.50
C	70	75	3.00
D+	65	70	2.50
D	60	65	2.00
F	Less than 60		1.00

A student's semester Grade Point Average (GPA) is calculated by dividing the cumulative point value of all his semester's courses by the total number of semester credit hours he registered for. The following is an example of a hypothetical student's report having six hypothetical courses.

Subject	Credit Hours	Grade Letter	Points	Point product
1	2	B+	4.50	4.5 x 2 = 9
2	3	D	2.00	2 x 3 = 6
3	3	C	3.00	3 x 3 = 9
4	4	D+	2.50	2.5 x 4 = 10
5	1	B	4.00	4 x 1 = 4
6	5	C	3.00	3 x 5 = 15
Total	18			53

This student's semester Grade-Point-Average (GPA) is 53/18 = 2.944

The cumulative GPA of a student is calculated by considering all the achieved courses since he was first admitted to the college till the time his-GPA is required to be calculated at. The graduation grade of a student is considered based on his cumulative GPA according to the following table:

Cumulative GPA	Graduation Grade
From 4.5 and up	Excellent
From 3.75 to less than 4.5	Very good
From 2.75 to less than 3.75	Good
From 2.00 to less than 2.75	Sufficient

Academic Evaluation for Student Standing

It is expected from all QEC-students to be in good academic standing. A student with GPA less than 2 is not eligible for graduation. A student fails to maintain an accumulating GPA less than 2.0 in any semester will be warned. Three warnings will put the student in dismissing conditions from the college and the university rules -on this case- will be applied.

Education Resources

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

Career Opportunities

1- All engineering jobs in the government.
2- The projects operation and maintenance in the government.
3- The ministry of water and electricity.
4- The ministry of municipal and village affairs.
5- The Saudi commission for the engineers.
6- The general institution for the waters refinement.
7- The general institution for ports.
8- Saudi airlines.
9- The military occupations management.
10- The constructions and contracting companies.
11- The electronics and communication companies.
12- The power and electric energy companies.

13- The Ministry of transportations.
14- The Ministry of agriculture and water recourses.
15- The general institution for the electricity.
16- The water and sewage authority.
17- Saudi Arabia Aramco company.
18- Saudi company for the basic industries (SABIC).
19- The unified Saudi company for electricity (SCECO).
20- All factories.

COLLEGE FACILITIES

Students Affairs Office

The college has a students' Affairs Office which is headed by an engineer and has two full-time expert members. The office is supported and linked to the Deanship of Admission and Registration. The office is equipped with computers connected to the university local network. The main tasks of this office are:

- The office helps in the registration of students, and supplies the necessary data concerning the students' enrolment and their progress. These documents help in the evaluation process.
- The office staff has access to the registration program to help solve problems which face the students during the registration.
- The office director participates in the committee which distributes the students after the first level to the different departments of the college.
- The office monitors the attendance of the students so that the rules of exclusion of attending the final exams are firmly applied.
- The Student Affairs Office arranges and controls all matters related to the midterm, final written exams and written outcomes achievement exam. In this regard, the office prepares the exams time table, assigns exams places, assigns exams supervisors, collects the exam questions from the faculty members, and arranges for supplying the answer sheets.
- The office also participates in informing the students about any important activities, dates, news, rules through the college web-site and/or by cellular SMS's.

Students' Activities

The student affairs deanship supervises most of the students' activities. This includes cultural, recreational, and social activities. These activities enhance the students' learning ability as well as it demonstrates good chance for entertainment and stress relief. Samples of these activities are:

1- Cultural activities: in all fields
2- Social activities like traveling and visiting major industrial cities and large scale engineering projects.
3- Recreational activities such as arranging races in football, tennis and billiards.

In addition, the college has a mosque, a cafeteria, and a student club. The club is a complementary part to of the college mission and it is a center for student activities such as discussions, workshops, competitions, culture, training, sports, social and various student related activities. Students from various departments are enrolled as club members. Members usually contribute with their creative ideas, and discuss events for the future planned activities, during meetings held by the club. All teaching staff supporting student activities can participate in this club.

College Scientific Journal

The college of engineering supervises the publication of the bi-annual Qassim University Journal of Engineering and Computer Sciences. Contributions to this journal are not limited to staff members of the college but are open to contributors from inside and outside the Kingdom of Saudi Arabia. Papers are published after being refereed by national and international specialists. This journal is considered a good journal for publication and its papers are considered by the scientific councils in all KSA universities for promotion.

PHYSICAL FACILITIES

In addition to the specialized laboratories in each department -which will be explained in the hereafter- the college contains a number of laboratories, drawing halls, teaching halls and computer laboratories which will serve all the college departments. These physical facilities are:

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

Workshop

A workshop with many equipment and tools is used in conjunction with teaching GE 105: Basics of Eng. Technology. The workshop is located in the Department of Mechanical Engineering and has Lathes, Milling machines, Shaper, Drill Press, Band Saws, Grinder, Welding and Hydraulic Cutter.

Students of the junior levels get trained in the workshop and perform experimental exercises for different industrial programs. Moreover, the students carry out manufacturing of equipment and experimental models for their graduation projects. The workshop is utilized also in research projects performed by the college staff members.

Computer Laboratories

The college has two computer laboratories supervised by teaching staff members. The laboratories are well equipped with extensive licensed software libraries and up• to-date printers and scanners. The laboratories are utilized in graduation projects and in teaching computer sciences as well as these engineering courses which require computer application. The computer facilities include the service of electronic mail, internet. The capacity of each laboratory is about 40 students.

Drawing Halls

The college has two halls for engineering drawing. These halls are utilized in teaching GE 104: Basics of Engineering Drawing. The halls are equipped with thirty drawing tables equipped with all facilities necessary for drawing.

Active Learning Halls

Four new active learning halls are constructed and well prepared for engineering design courses (GE 211 & GE 213). Two halls are assigned for each course. The active learning halls are prepared with the necessary equipment required for creating the appropriate active learning environment. In these courses teams of students (usually five students each) meet to discuss the assignments and to perform active learning procedures.

Teaching Halls

The college contains a number of teaching halls. The halls are equipped with the most recent educational equipment like whiteboards, overhead projectors,internet connections, electric supplies, air conditioners and more.

COLLEGE ADMINISTRATION

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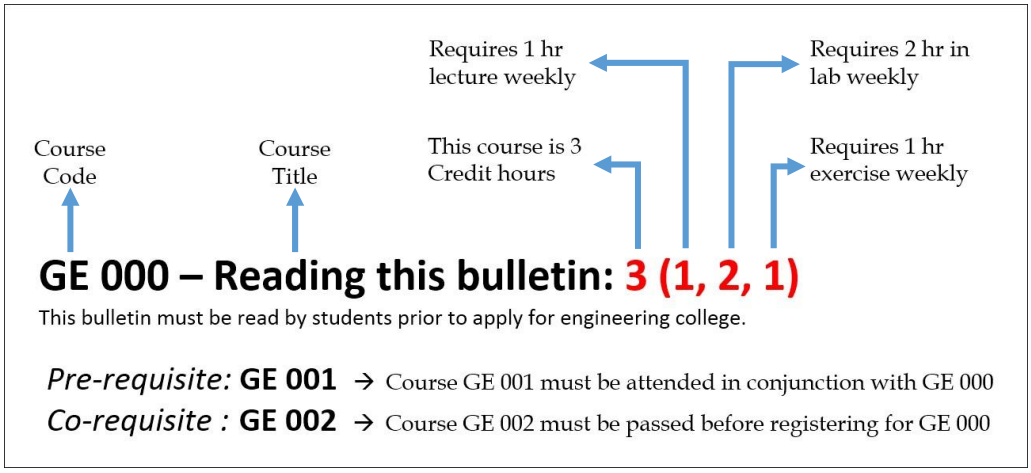
DEGREE REQUIREMENTS

The following are the requirements for the degree of Bachelor of Science in Engineering for different programs offered by QEC. A hypothetical course is given next as an example of how to read codes and terminologies.



The following set of symbols, *arranged in alphabetic order*, is used in this bulletin:

Symbol	Meaning
ARAB	Arabic Language
CE	Civil Engineering
CEN	Computer Engineering
CHEM	Chemistry
CSC	Computer Science
ECON	Economy
EE	Electrical Engineering
GE	General Engineering

Symbol	Meaning
GEO	Geology
IC	Islamic Culture
MATH	Mathematics
ME	Mechanical Engineering
MGMT	Management
PHYS	Physics
STAT	Probability & Statistics

University-Course Requirements

The following courses are required by the University for graduation.

No	Course Code	Course title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	ARB 101	Linguistic skills	2	2	-	-	-	-
2	ARB 103	Arabic Writing	2	2	-	-	-	-
3	IC 101	Introduction to Islamic culture	2	2	-	-	-	-
4	IC 102	Islam and Community Building	2	2	-	-	IC 101	-
5	IC 103	Economic System in Islam	2	2	-	-	IC 101	-
6	IC 104	Political System in Islam	2	2	-	-	IC 101	-
Total credit hours: **12**								

College-Course Requirements

Compulsory Courses

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	CHEM 111	General Chemistry	4	3	2	-	-	-
2	CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
3	ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
4	GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
5	GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
6	GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
7	GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
8	MATH 106	Integral Calculus	3	3	-	1	-	-
9	MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
10	MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
11	MATH 208	Differential equations	3	3	-	1	MATH 203	-
12	MGMT 402	Project Management	3	3	-	1	Pass 90 cr	-
13	PHYS 131	General Physics	4	3	2	-	-	-
14	STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
Total credit hours: **42**								

Elective Courses

Two elective courses may be selected from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
GE 412	Value Engineering	3	3	-	1	GE 213	-
MATH 244	Linear Algebra	3	3	-	1	MATH 107	-
MATH 254	Numerical Methods	3	3	-	1	MATH 106 MATH 107	-
MATH 328	Applied Operations Research	3	3	-	1	MATH 107	-
MGMT 411	Development of Management skills	3	3	-	1	GE 211	-

PREPARATORY YEAR PROGRAM

The Preparatory Year Program (PYP) is taken into consideration as levels 1 and 2 in the graduation program. In these levels, students study the following courses:

1st Level

Course Code	Course Title	Credit Hours
CSC 105	Computer Skills	4
ENG 0011	Preparatory English (1)	8
PHYS 110	Physics (1)	2
PSYCH 101	Thinking Skills and Learning Styles	2
STAT 100	Statistics	2
Total Hours		**18**

2nd Level

Course Code	Course Title	Credit Hours
CSC 111	Computer programming	3
ENG 0012	Preparatory English (2)	5
ESP 102	English for Engineering and Computer Science	2
MATH 105	Calculus	3
PHYS 115	Physics (2)	3
Total Hours		**16**

COURSES DESCRIPTION

The next section shows the degree of Bachelor of Science in Engineering for different programs offered by QEC.

Compulsory Courses

CHEM 111 - General Chemistry: 4 (3, 2, 0)

Stoichiometry: SI Units, chemical formulas, the mole, methods of expressing concentration, Calculations based on chemical equations. Gases: laws, kinetic theory, deviation and van der Waals equation. Thermochemistry: Types of enthalpy changes, Hess Law and its applications, first law of thermodynamics. Solutions: Type of solutions and laws related, colligative properties. Chemical kinetics: Law of reaction rate, reaction order, factors affecting the rates. Chemical Equilibrium: Relation between Kc & Kp, Le Chatelier's principle and factor affecting equilibrium. Ionic equilibrium: Acid and base concepts, pH calculations of acid, base and buffer solutions. Atomic Structure: emission spectrum, Bohr's theory de Broglre's hypothesis, quantum numbers, electronic configuration of elements, consequences of the periodic table.

CSC 209 - Computer Programming: 3 (2, 2, 0)

Introduction to computers and computing fundamentals in JAVA, Data Types, Variables, Operators, Control Structures, Simple input/output statement, Classes & Objects, Methods, Relational and logical expressions, IF-ELSE control structure, The WHILE statement, The FOR statement and looping structure, Introduction to Swing & graphical user interfaces, Arrays Matrix Methods, Vectors, String, Engineering Applications.

ECON 401- Engineering Economy: 3 (3, 0, 1)

Introduction to engineering economy. Interest formulas and equivalence. Bases for comparison of alternatives. Decision making among alternatives. Evaluating replacement alternatives. Break-even and minimum cost analysis. Cost accounting. Depreciation. Economic analysis of operations. Economic analysis of public projects.

GE 104 - Basics of Engineering Drawing: 3 (2, 2, 0)

Geometrical construction and basics of lettering, Sketching, Orthographic projection, Sectional and auxiliary views, Dimensioning, Introduction to computer graphics.

GE 105 - Basics of Engineering Technology: 2 (1, 2 , 0)

Introduction; Function and planning of workshop; Properties of materials and their applications; Non-ferrous Metals - Ferrous Alloys Production of Iron and Steel, Plain Carbon and Alloy Steels - Tool Steels and the Iron-Carbon Diagram - Heat Treatments of Steels: Heating, Quenching, Tempering, Annealing, Aging, and Surface Hardening, Destructive and Nondestructive Testing of Metals. Workshop metrology; Basic bench work operations; Machining operations; Tools, equipment and machinery used in basic workshop processes: turning, milling, grinding, forging, sheet metal-work; Welding processes: gas welding, arc welding, spot welding. Casting processes: sand casting, die casting; Industrial safety.

GE 211- Introduction to Engineering Design-I: 3 (2, 4, 0)

Engineering design or how engineers approach and solve problems; process and product design; quality principles; working in teams; presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc

GE 213 - Introduction to Engineering Design-II: 2 (2, 2, 0)

Computer or mathematical modeling of process and product, continuation of quality principles, working in teams, presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self-regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc.

Pre-requisite: GE 211

MATH 106 - Integral Calculus: 3 (3, 0, 1)

Fundamental theorem of calculus, the definite and indefinite integral, numerical integration. Area, volume of revolution, work, arc length. Differentiation and integration of inverse trigonometric functions. The logarithmic, exponential, hyperbolic and inverse hyperbolic functions. Techniques of integration:

substitution, by parts, trigonometric substitutions, partial fractions, miscellaneous substitutions. Indeterminate forms, improper integrals. Polar coordinates.

Pre-requisite: MATH 105

MATH 107 - Linear Algebra & Analytic Geometry: 3 (3, 0, 1)

Introduction to the conic sections, The parabola; translation of coordinate axes, The ellipse, The Hyperbola, Rotation of axes; second degree equation. Systems of linear equations and matrices: Introduction, Gaussian elimination, Matrices and matrix operations, Inverses; Rules of matrix arithmetic, Elementary matrices and a method for finding A-1, Further results on systems of equations and inevitability, Diagonal, Triangular and symmetric Matrices. Determinants: Determinants by cofactor expansion, Evaluating determinants by row reduction, Properties of the determinant function, A combinatorial approach to determinants Vectors in 2-space and 3-space: Introduction to vectors, Norms of a vector; vector arithmetic, Dot product, Lines and planes in 3-space.

MATH 203 - Differential and Integral Calculus: 3 (3, 0, 1)

Infinite series, convergence and divergence of infinite series, integral test, ratio test, root test and comparison test. Conditional convergence and absolute convergence, alternating series test. Power series. Taylor and Maclaurin series. Functions in two or three variables, their limits, continuity and differentiability, The chain rule, Directional derivatives; gradient, Tangent planes, Maxima and Minima for function in two or three variables, Lagrange multipliers, Double integral and its applications to area, volume, moments and center of mass. Double integrals in polar coordinates. Triple integral in rectangular, cylindrical and spherical coordinates and applications to volume, moment and center of mass. Vector fields, line integrals, surface integrals, Green's theorem, the divergence theorem. Stoke's theorem.

Pre-requisite: MATH 106

MATH 208 - Differential equations: 3 (3, 0, 1)

Different types of first order differential equations and its applications. Linear differential equations of higher order. Linear differential equations with constant coefficients. Reduction of the order. Series solution of ordinary differential equations. Frobenius's method. Fourier series of odd and even functions. Integration of Fourier series.

Pre-requisite: MATH 203

MGMT 402 - Project Management: 3 (3, 0, 1)

Basic Management Process approach, Defining Project, Project life cycle, Balancing competing demands with triple constraints, Strategies and planning, methods, Project planning and scheduling, integrated project planning, Quality management, Bar• charts and Gantt Chart, critical path methods, PERT method, resource leveling and allocation, time-cost trade off. Construction and organizational approaches, leadership elements, and decision making. Time and cost control, Project Closing. computer applications.

PHYS 131 - General Physics: 4 (3, 2, 0)

Electromagnetism: Coulomb's law in the electric fields, Gauss law, Electric potential, Energy stored, Capacitance and dielectrics, Current and resistance, Electric energy and power, Direct current circuits, Kirchhoff "s Rules, Magnetic fields, Motion of a charged particle in a magnetic field, Sources of the Magnetic fields, Ampere's law, Faraday 's law, in the inductance, Mutual inductance, Alternative current circuits, RMS values, Impedance, Resonance, Power in RLC circuits. Nuclear Physics: Photoelectric effect, Atomic spectrum, Bohr model, Nuclear structure, Radioactivity Decay, Half life, Radioactive Decay.

STAT 328 - Probability and Statistics: 3 (3, 0, 1)

Some discrete probability distributions (Uniform, binomial, multinomial, hyper-geometric, negative binomial, geometric and Poisson distributions, Mean and variance for these distributions, relationship between Poisson and hyper-geometric with binomial distributions) Some continuous probability distributions (Uniform, standard Normal, Normal, Area under the normal curve, Application of the normal distribution, mean and variance, Normal approximation to the binomial) Fundamental sampling distributions and data descriptions (Random sampling, some important statistics, Sampling distribution (central limit theorem), Sampling distribution of mean and difference between two means for large samples (and for small samples taken from normal distribution), t-distribution (its applications) One- and Two-sample estimation Problems (Statistical Inferences, Classical method of estimation, Estimating the mean, Standard error of a point estimate, Prediction Interval, Estimating the difference between two means (for known and unknown (equal) variances), Estimating a Proportion, determination of the sample size at a specified error) One-and two-sample tests of hypotheses (Null and Alternative hypotheses, type I error, type II error, one and two tailed tests, P value, tests concerning a single mean, tests on two means (for variance

known and unknown), test on a single proportion) Simple Linear Regression (Least squares and the fitted model, Properties of the least square estimators, Inferences concerning the regression coefficients, prediction).

Elective Courses

GE 412 - Value Engineering: 3 (3, 0, 1)

Introduction, Defining value; overview of value engineering, Project budget; capitalized value. Determining value through cost, market, and income approaches. Models for value engineering. Function identification analysis and FAST diagrams. Weighted evaluation and decision analysis techniques. Bidding and Procurement. Developing a detailed implementation plan. Life cycle costs including maintenance and operating costs. Value engineering workflow.

Pre-requisite: GE 213

MATH 244 - Linear Algebra: 3 (3, 0, 1)

General review of vectors in space and its engineering applications, Euclidean n–space, linear transformation from n-space to m-space and its properties. General vector in space, subspaces, linear independence, row space, column space, and null space. Inner products in space, angle and orthogonality in inner product spaces, best approximation: least squares, orthogonal matrices. Eigenvalues and eigenvectors.

Pre-requisite: MATH 107

MATH 254 - Numerical Methods: 3 (3, 0, 1)

Numerical Solution of non-linear equations and associated errors, convergence rate, solution of system of equations by direct and repeated methods and associated errors, Interpolation and polynomial approximation and associated errors, Numerical differentiation and integration and associated errors, Introduction to numerical solutions for ordinary differential equations.

Pre-requisite: MATH 106, MATH 107

MATH 328 - Applied Operations Researches: 3 (3, 0, 1)

Introduction to operation research methodology and applications, Building of mathematical models, Linear programming models, The simplex algorithm, Duality

and sensitivity analysis, Transportation and assignment models, Network models, Integer programming, Using Optimization Software.

Pre-requisite: MATH 107

MGMT 411 - Development of Management Skills: 3 (3, 0, 1)

Course definition and introduction to management and quality, Basics and definitions of management, Basics and definitions of quality, Qualities top issues. Kaizen Systems: Total Quality Management TQM, Totally Productive Maintenance, Suggestion System, Just in Time: Production System, Activities in small Groups QC. Leadership.

Pre-requisite: MATH 107

MECHANICAL ENGINEERING DEPARTMENT

Contact Information:

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P.O.B: 6677 - Buraydah 51452 - Saudi Arabia

ABOUT THE ME DEPARTMENT

Mechanical engineers are essential to almost every industry. It is in fact difficult to imagine a modern industry without the services of Mechanical engineers. Mechanical engineering has been and continues to be a corner stone in every new technical development.

The job of Mechanical engineer usually involves design, feasibility studies, cost analysis studies, installation, operation, and maintenance of plants, processes, or equipment. The focusing of the Mechanical engineering department is on teaching, community service, and research. The department faculty recognizes the need to provide the graduating engineer with the appropriate background in order to meet the challenges and large demands of a fast growing country such as the Kingdom. The department of Mechanical engineering mission is to provide education of quality, research, and community services that cover a broad spectrum of mechanical engineering areas. These areas include evaluation, design, operation, and maintenance of integrated governmental, industrial, and service systems.

Department Mission

The mechanical engineering department seeks to meet the needs of the Saudi society and the region with outstanding mechanical engineering programs in education, research, and community service.

Bachelor Program Mission

Graduating distinguished mechanical engineers and performing research and community services in an inspiring, energizing and governable environment to promote self-resources, adopt recent technologies and sustainably develop the Saudi society.

Vision

A nationally and regionally recognized department providing high qualityacademic programs, research, and society services in the mechanically engineeringfields.

Program Educational Objectives

1. Preparation of the graduates to have a successful career as mechanical engineers in governmental and private sectors.
2. Preparation of the graduates to pursue their professional development through self-learning and advanced degrees.
3. Preparation of the graduates to progress to positions of leadership in their profession.
4. Preparation of the graduates to effectively participate in the sustainable development of the Saudi Society.

Program Strategic Goals

The Mechanical Engineering Department in cooperation with its constituencies has identified the following list of Program Educational Goals.

1. Prepare the graduates for a successful career as mechanical engineers in governmental and private sectors.
2. Carry out scientific applied research and offer consultation services.
3. Strengthen the communication, cooperation and partnership with the community.
4. Participate in adopting advanced technologies and introducing innovations.
5. Contribute effectively in the sustainable development of the Saudi society.

FACULTY MEMBERS

No	Faculty Name	Rank
1	Abdul-Aziz Alaboodi	Professor
2	Gamal Attia	Professor
3	Hanafy M. Omar	Professor
4	Radwan Almasri	Professor
5	Sulaiman Al-Yahya	Professor
6	Mohammad Sajid	Professor
7	Abdelrahiem Emad	Associate Professor
8	Fahd Almufadi	Professor
9	Osama Mohamed Irfan	Professor
10	Hesham A. Othman	Assistant Professor
11	Saad M. S. Mukras	Associate Professor
12	Hany Ammar	Associate Professor
13	Sivasankaran Subbarayan	Associate Professor
14	Mohammed Saleh AlShitawi	Associate Professor
15	Hussein Zein Korany	Associate Professor
16	Iqbal Ahmad	Assistant Professor
17	Abdulrahman Alrobaian	Associate Professor
18	Bandar Aloyaydi	Assistant Professor
19	Ahmed Alshwairekh	Assistant Professor
20	Anas Alwatban	Assistant Professor
21	Amer Allafi	Assistant Professor

CAREER OPPORTUNITIES

1- All engineering administrations in the governmental authorities.
2- The projects operation and maintenance administrations in the governmental authorities.
3- The ministry of water and electricity.
4- The ministry of municipal and village affairs.
5- The Saudi commission for the engineers.
6- The general institution for the waters refinement.
7- The general institution for ports.
8- The Saudi airlines.
9- The military occupations management.
10- The constructions and contracting companies.
11- The electronics and communication companies.
12- The power and electric energy companies.
13- The Ministry of transportations.
14- The Ministry of agriculture and water recourses.
15- The general institution for the electricity.
16- The water and sewage authority.
17- The Saudi Arabia Aramco company.
18- The Saudi company for the basic industries (SABIC)
19- The unified Saudi company for electricity (SCECO).
20- All factories.

Graduate Attributes

The graduates of mechanical engineering program should be able to:

1. Possession of facts, information, ideas, issues, trends, theories and knowledge relevant to Mechanical Engineering.
2. The ability to analyze and critically evaluate information, concepts, methods and theories related to Mechanical Engineering.
3. The ability to develop new knowledge gained through innovative scientific research that generally contributes to Mechanical Engineering.
4. Possess the cognitive and technical skills to analyze and process data and information.
5. Possess effective communication, numerical and information technology skills.

6. The ability to independently create, design and implement research operations.
7. The ability to take appropriate decisions and assume the role of leadership, and address Engineering problems.
8. The ability to work in a team and solve real problems in the field by linking knowledge and its applications.
9. Awareness of professional ethics, ethics of scientific research, and ethics of dealing with technology and its tools.

PROGRAM LEARNING OUTCOMES

Knowledge and Understanding	
K1	Acquire knowledge of Basic sciences (math, physics, management, economy, etc.) and Basic Engineering sciences.
K2	Identify complex mechanical engineering problems by recognizing the principles of mechanical engineering subjects, basic sciences, and mathematics.
K3	Relate knowledge of Math, Statistics, basic sciences to their engineering specialization (Design, Manufacturing, and Thermo-fluids), together with in-depth knowledge of that specialization.
K4	Comprehensively Identify research and inquiry methodologies.
Skills	
S1	Formulate, and solve complex mechanical engineering problems by applying principles of engineering, science, and mathematics.
S2	Be able to use the engineering techniques, and modern IT tools for modelling, predicting and assessing the performance of mechanical systems.
S3	Apply design concepts to produce solutions that meet specified needs in the mechanical engineering fields with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
S4	Communicate effectively with a range of audiences through engineering drawings, computer graphics, technical reports, and perform presentations.
S5	Conduct inquiries, investigations, and research for complex issues and problems.

S6	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
Values	
V1	Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
V2	Be able to acquire and apply new knowledge as needed, using appropriate learning strategies.
V3	Be able to function effectively on a team whose members together can provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

ADMISSION TO THE ME PROGRAM

The admission in the department depends on:

- The student desire
- The Student GPA
- The capacity of the department

STUDYING SYSTEM

According to the educational plans; a student may complete the ME programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the ME program if he completed (after the PYP) a total of 139 credit-hours. In details, the 139 credit-hours include:

- University requirements (12 credit-hours),
- College requirements (48 credit-hours) and
- Program and/or Departmental requirements (73 credit-hours). Six or nine credit hours have to be selected among the set of elective courses.
- The Free Courses: 6 credit hours have to be selected among the set of courses available in the university.

MECHANICAL ENGINEERING PLAN

Departmental Courses

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ME 241	Mechanical Drawing	3	2	2	-	GE 104	
ME 251	Materials Engineering	3	3	-	1	PHYS 131 GE 105	
ME 252	Materials Engineering Lab	1	-	2	-		ME 251
ME 335	Manufacturing Processes	3	3	-	1	ME 241 ME 251 ME 350	
ME 336	Manufacturing Processes Lab	1	-	2	-		ME 335
ME 340	Mechanical Design -1	3	3	-	1	ME 335	
ME 344	Measurements and Instrumentation	3	2	2	-	ME 385 STAT 328	
ME 350	Mechanics of Materials	3	3	-	1	GE 201	
ME 352	Mechanics of Materials Laboratory	1	-	2	-		ME 350
ME 360	Mechanics of Machinery	3	3	-	1	GE 202 CSC 209	
ME 363	Mechanics of Machinery Lab	1	-	2	-		ME 360
ME 371	Thermodynamics -1	3	3	-	1	CHEM 111	
ME 372	Thermodynamics - 2	3	3	-	1	ME 371	

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ME 383	Thermo-fluid Laboratory -1	1	-	2	-		ME 385 ME 372
ME 384	Thermo-fluid Laboratory - 2	1	-	2	-		ME 395
ME 385	Fluid Mechanics	3	3	-	1	ME 371 GE 202	
ME 395	Heat Transfer	3	3	-	1	ME 385	
ME 441	Mechanical Design -2	3	3	-	1	ME 340	
ME 465	System Dynamics and Automatic Control	3	3	-	1	MATH 208 CSC 209	
ME 468	System Dynamics and Automatic Control Laboratory	1	-	2	-	-	ME 465
ME 495	Thermal Fluid Systems	3	3	-	1	ME 372	-
GE 406	Summer Training	2	1	-	2	Pass 100 cr	
ME 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
ME 492	Senior Design Project - 2	3	1	4	-	ME 491	-
Total		56					

Courses from Outside the Department

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
EE 318	Fundamentals of Electric circuits	3	3	-	1	PHYS 131	-
EE 339	Electrical Machines	2	2	-	1	EE 318	-
GE 201	Statics	3	3	-	1		
GE 202	Dynamics	3	3	-	1	GE 201	
Total		11					

Elective Courses

Students should complete 6 credit hours from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ME 423	Renewable Energy	3	3	-	1	ME 395 ME 372	-
ME 425	Solar Energy	3	3	-	1	ME 395	-
ME 431	Tool Manufacturing	3	3	-	1	ME 335	-
ME 453	Modern Engineering materials	3	3	-	1	ME 350	-
ME 455	Corrosion Engineering	3	3	-	1	ME 350	-
ME 462	Mechatronics	3	3	-	1	ME 465	-
ME 463	Mechanical vibrations	3	3	-	1	ME 360	-
ME 466	Robotics	3	3	-	1	ME 465	-
ME 470	Thermal Power Plants	3	3	-	1	ME 395 ME 372	-
ME 474	Refrigeration Engineering	3	3	-	1	ME 395 ME 372	-
ME 475	Air Conditioning	3	3	-	1	ME 395 ME 372	-
ME 480	Turbo Machinery	3	3	-	1	ME 385 ME 372	-
ME 482	Compressible Fluids	3	3	-	1	ME 385	-
ME 483	Pumping Machinery	3	3	-	1	ME 385	-
ME 490	Selected Topics in Mechanical Engineering	3	3	-	1	ME 385	-

BSC PROGRAM CURRICULUM

The Pre-Req. for acceptance in the program is the completion of the preparatory year program with grade not less than 3.5 from 5.

3rd Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 101	Introduction to Islamic culture	2	2	-	-	-	-
ARAB 101	Linguistic skills	2	2	-	-	-	-
PHYS 131	General Physics	4	3	2	-	-	-
GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
MATH 106	Integral Calculus	3	3	-	1	-	-
CHEM 111	General Chemistry	4	3	2	-	-	-
		18					

4th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 102	Islam and Community Building	2	2	-	-	IC 101	-
GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
GE 201	Statics	3	3	-	1		
ME 241	Mechanical Drawing	3	2	2	-	GE104	
EE 318	Fundamentals of Electric circuits	3	3	-	1	PHYS 131	
		19					

5th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
MATH 208	Differential equations	3	3	-	1	MATH 203	-
GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	
GE 202	Dynamics	3	3	-	1	GE 201	
ME 251	Materials Engineering	3	3	-	1	PHYS 131 GE 105	
ME 252	Materials Engineering Lab	1	-	2	-		ME 251
EE 339	Electrical Machines	2	2	-	1	EE 318	
		18					

6th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
IC 103	Economic System in Islam	2	2	-	-	IC 101	-
ME 371	Thermodynamics -1	3	3	-	1	CHEM 111	
ME 360	Mechanics of Machinery	3	3	-	1	GE 202 CSC 209	
ME 363	Mechanics of Machinery Lab	1	-	2	-		ME 360
ME 350	Mechanics of Materials	3	3	-	1	GE 201	
ME 352	Mechanics of Materials Laboratory	1	-	2	-		ME 350
		18					

7th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ARAB 103	Arabic Writing	2	2	-	-	-	-
ME 335	Manufacturing Processes	3	3	-	1	ME 241 ME 251 ME 350	
ME 336	Manufacturing Processes Lab	1	-	2	-		ME 335
ME 372	Thermodynamics – 2	3	3	-	1	ME 371	
ME 385	Fluid Mechanics	3	3	-	1	ME 371 GE 202	
ME 383	Thermo-fluid Laboratory -1	1	-	2	-		ME 385 ME 372
+++	College Elective Course-1	3	3	-	-		
		16					

8th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 104	Political System in Islam	2	2	-	-	IC 101	-
+++	Free Course 1	3	3	-	-		
ME 395	Heat Transfer	3	3	-	1	ME 385	
ME 384	Thermo-fluid Laboratory -2	1	-	2	-		ME 395
ME 340	Mechanical Design -1	3	3	-	1	ME 335	
ME 344	Measurements and Instrumentation	3	2	2	-	ME 385 STAT 328	
		15					

9th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ME 465	System Dynamics and Automatic Control	3	3	-	1	Math 208 CSC 209	
ME 468	System Dynamics and Automatic Control Lab	1	-	2	-		ME 465
ME 4xx	Elective Course - 1	3	3	-	-		
ME 441	Mechanical Design -2	3	3	-	1	ME 340	
MGMT 402	Project Management	3	3	-	1	Pass 90 cr	
ME 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
		16					

10th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
ME 495	Thermal Fluid Systems	3	3	-	1	ME 372	-
+++	Free Course 2	3	3	-	-		
ME 4xx	Elective Course - 2	3	3	-	1		
+++	College Elective Course-2	3	3	-	-		
ME 492	Senior Design Project - 2	2	1	2	-	ME 491	-
GE 406	Summer Training	2	2	-	-	Pass 100 cr	-
		19					

Elective Courses

In the 8th semester the student should select some elective courses not less than 6 credit hours.

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ME 423	Renewable Energy	3	3	-	1	ME 395 ME 372	-
ME 425	Solar Energy	3	3	-	1	ME 395	-
ME 431	Tool Manufacturing	3	3	-	1	ME 335	-
ME 453	Modern Engineering materials	3	3	-	1	ME 350	-
ME 455	Corrosion Engineering	3	3	-	1	ME 350	-
ME 462	Mechatronics	3	3	-	1	ME 465	-
ME 463	Mechanical vibrations	3	3	-	1	ME 360	-
ME 466	Robotics	3	3	-	1	ME 465	-
ME 470	Thermal Power Plants	3	3	-	1	ME 395 ME 372	-
ME 474	Refrigeration Engineering	3	3	-	1	ME 395 ME 372	-
ME 475	Air Conditioning	3	3	-	1	ME 395 ME 372	-
ME 480	Turbo Machinery	3	3	-	1	ME 385 ME 372	-
ME 482	Compressible Fluids	3	3	-	1	ME 385	-
ME 483	Pumping Machinery	3	3	-	1	ME 385	-
ME 490	Selected Topics in Mechanical Engineering	3	3	-	1	ME 385	-

COURSE DESCRIPTION

Departmental Courses

ME 241 - Mechanical Drawing: 3 (3, 0, 1)

Introduction to 3D modeling. Using SolidWorks to create 3D part models: Creating 2D sketches, using reference geometries, using sketched and applied features to

create 3D models. Creating mechanical assemblies: using mates to combine mechanical parts, assemble and disassemble mechanical parts. Adding standard mechanical parts to assemblies: screw threads, fasteners, bearings and springs. Detailed drawings: orthographic views, auxiliary views, sectional views, detailed views and dimensioning.

ME 251 - Materials Engineering: 3 (3, 0, 1)

Introduction to materials engineering; Structure and characteristics of metals; polymers and ceramics; Equilibrium-phase diagrams; Microstructures of alloys; Imperfections; Diffusion; Mechanical properties of metals, polymers, ceramics; Heat treatment of plain-carbon steels, cast irons and precipitation hardening.

ME 252 - Materials Engineering Laboratory: 1 (0, 2, 0)

Introducing the basic techniques of metallographic, sectioning, polishing, etching, light metallographic and microstructure analysis. Determining mechanical properties (hardness, tensile, fatigue and creep properties) of steels, cast irons and non ferrous as well as some polymeric materials and their structure properties relationship. Emphasizing and illustrating importance of these properties in manufacturing and design. Simple spread sheet based data analysis using the hardness, tensile, fatigue and creep tests results.

ME 335 - Manufacturing Processes: 3 (3, 0, 1)

Basic structure of materials processes, Classification of manufacturing processes, Basic material processes, Manufacturing properties of materials, Liquid state forming processes, casting processes of metals and non metals, Mass-conserving processes of solid state materials, forming of metals. Basics of materials processes, Mass-conserving processes of solid state materials, forming of polymers, and powders, Mass-reducing processes of solid state materials, machining processes, Joining and fabrication processes, welding, brazing, riveting, bonding, etc., Modern manufacturing processes.

ME 336 - Manufacturing Processes Lab: 1 (0, 2, 0)

Introduction to manufacturing Lab Safety, Metrology (part dimensions, surface roughness, and material hardness), Metal casting (sand casting and permanent-mold casting), Metal forming (forging, extrusion), Sheet metal forming, Welding & Joining technology, Material removal (turning, milling, or drilling), CAM systems and CNC machines (turning or milling), Industrial trips (if possible).

ME 340 - Mechanical Design -1: 3 (3, 0, 1)

Design process; Origin and identification of engineering design problems; Creativity in engineering design; Technical analysis; Human and legal factors; Problem solving and decision making; Design communication; Failures resulting from static loading; Variable loading and fatigue failure; Material selection for strength and rigidity; Design of mechanical elements: screws, power screws, fasteners and connections, welded, brazed and bonded joints; Rolling contact bearings; Term design project.

ME 344 - Measurements and Instrumentation: 3 (3, 0, 1)

Measuring concepts; Experimental procedures; Standards and dimensional units of measurement, analyzing, assessing and presenting experimental data, analog measured: time-dependent characteristics, Response of measuring systems, Signal conditioning, digital techniques in mechanical measurements, displacement measurements, measurement of motion, measurement of force and torque, measurement of strain and stress, measurement of pressure, measurement of temperature, measurement of flow, Industrial sensors.

ME 350 - Mechanics of Materials: 3 (3, 0, 1)

Study of the mechanical behavior of solid bodies (Rods, shafts, beams, etc.) under various types of loading. Mechanical and thermal stresses and strains; Stress-strain relations; Axial deformation; Shear and bending moments in beams; Stresses in beams; Torsion of shafts and thin wall tubes; Combined loadings; Analysis of plane stress and plane strain; Thick – and thin-wall cylinders; Energy methods; Stability of axially loaded beams (columns).

ME 352 - Mechanics of Materials Laboratory: 1 (0, 2, 0)

Strain gauge applications: tension test, torsion test, cantilever beam, pressurized cylindrical vessel; Deflection of beams; Buckling of columns.

ME 360 - Mechanics of Machinery: 3 (3, 0, 1)

Topological characteristics of planar mechanisms; Degree-of-freedom; Position, velocity and acceleration analysis of linkages: graphical and analytical methods; Static and dynamic force analysis of machinery: graphical and analytical methods; Flywheels; Cam mechanisms; Law of gearing; Simple and planetary gear trains; Term project.

ME 363 - Mechanics of Machinery Lab: 1 (0, 2, 0)

Introduction to the mechanics of machinery, study of various type of mechanisms like slider crank, four – bar, quick return mechanism, Hooke's coupling and different kinds of gear trains through working models. Drawing the displacement profiles for various combinations of cam and follower. Balancing of rotating and reciprocating masses. Verification of gyroscopic torque equation etc.

ME 371 - Thermodynamics -1: 3 (3, 0, 1)

Basics and definitions of thermodynamics; properties of pure substances First law of thermodynamics; Second law of thermodynamics; Entropy; Carnot and reversed Carnot cycles; simple and modified Rankine cycle; Gas power cycles; Refrigeration and heat pump cycles, ideal gas mixtures.

ME 372 - Thermodynamics – 2: 3 (3, 0, 1)

Availability, Ideal gas mixtures, Gas- vapor mixtures, Thermodynamics of gas reciprocating compressors, Internal combustion engines, combustion.

ME 383 - Thermo-Fluid Laboratory -1: 1 (0, 2, 0)

Temperature and humilities various measurements, Dead weight, Impact of a jet, hammer in pipes, Measuring the hydrostatic forces on the submerged surfaces, Performance test for a multi-stage reciprocating air compressor; Measurement of heating value of a gaseous fuel; Exhaust-gas analysis; Performance of spark ignition engine; Performance of compression ignition engine; Demonstration of fluid flow (flow visualization).

ME 384 - Thermo-Fluid Laboratory-2: 1 (0, 2, 0)

Visualization of potential flow fields; Visualization of real flow around streamlined and bluff bodies; Pipe flow, velocity distribution, pressure drop and friction factor; Flow measurements: orifice, venturi and nozzle calibrations; Calibration of thermocouples; Free convection for a lumped capacitance thermal system; determination of thermal conductivities of a new metals; thermal performance of fins (free and forced convection).

ME 385 - Fluid Mechanics: 3 (3, 0, 1)

Definitions, Fluid properties, Fluid statics, Fluid kinematics, Finite control volume analysis, Euler`s Equation, Bernoulli `s equation, Fluid dynamics, Navier Stokes

equations, Couette flow, Poiseuille flow, Similitude Dimensional analysis and modeling, Viscous flow in pipes, Pressure losses, Boundary layer theory, Introduction to one dimensional compressible flow.

ME 395 - Heat Transfer: 3 (3, 0, 1)

Introduction to heat transfer; Modes of heat transfer; One dimensional steady state heat conduction with and without heat generation; Extended surfaces (fins), transient conduction, Free and forced convection for external and internal flows; Heat Exchangers, Properties and process of radiation, Radiation exchange between surfaces.

ME 441 - Mechanical Design -2: 3 (3, 0, 1)

Design of mechanical elements: springs, lubrication and journal bearings, spur, helical, bevel, and worm gears, clutches and brakes, miscellaneous power transmission components; Term design projects.

ME 465 - System Dynamics and Automatic Control: 3 (3, 0, 1)

Laplace transformation methods; Modeling of mechanical, electrical, hydraulic and thermal systems; Analogies; Mixed systems; Representation of control system components; Transfer functions and block diagrams; Time response of feedback control systems; Routh stability criterion, Root locus technique; Frequency response methods; Compensation; Term project.

ME 468 - System Dynamics and Automatic Control Laboratory: 1 (0, 2, 0)

Experiments in support of control system theory including: servo control of electrical motors, control of linear and torsional vibrations, control of gyroscopic motion, control of pendulum motion, hydro-mechanical liquid level control, pressure control, pneumatic servomechanism, vibration control; digital simulation of linear systems using a software package (MATLAB).

ME 495 - Thermal Fluid Systems: 3 (3, 0, 1)

Pumping systems, compressor systems, steam generation systems, turbines, condensers, water desalination systems.

GE 406 - Summer Training: 2 (-, -, -)

The student starts the Cooperation Training during the summer that precedes his final year of study and continues to the end of the next semester in either the Governmental or Private sectors. At the end of training, student must prepare a detailed report which will be orally examined by a special committee of faculty professors.

ME 491 - Senior Design Project - 1: 3 (2, 2, 0)

The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary field studies, visibility studies, final design drawings, bill of quantities, and the total operating cost of the project. The graduation project shall continue for one semesters. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

Pre-requisite: Pass 100 Cr

ME 492 - Senior Design Project-2: 2 (1, 2, 0)

The course is the second part for the senior design project. It aims to expose the students to the practical experience of real civil engineering projects/projects components in order to gain the necessary experience which relates the design process to the full course work studied during the program. The previously selected team of students shall continue the design process for this part of the project. The students are responsible for and shall utilize all the knowledge and skills gained through the program as well as in order to complete the task. At the end, students will be examined in final project report which is done in the form of an oral presentation as a team.

Courses from Outside the Department

EE 318 - Fundamentals of Electric circuits: 3 (3, 0, 1)

Circuit elements and laws, Network theorem, Nonlinear networks-AC Circuits: Phasors, Circuit analysis, Frequency response, Resonance - Ideal Amplifiers, Ideal diodes, Rectifiers, Waveshaping circuits – Junction diodes – FETs and BJTs transistors- Logic circuits – Small signal models of Diodes, FETs, and BJTs – RC-Coupled Amplifiers.

EE 339 - Electrical Machines: 2 (2, 0, 1)

Transformers (construction, types, operation, equivalent circuit); Synchronous machines (construction, generator performance, motor characteristics, starting); induction machines (construction, three phase motor: types, operation, equivalent circuit, starting speed control); Introduction to DC machines.

GE 201 - Statics: 3 (3, 0, 1)

Introduction to mechanics and vectors – Force system in 2D and 3 D – Moments and couples in 2D and 3D– Equilibrium of force system – Analysis of frames and structures - Distributed forces - Centroid of simple and composite bodies – Moment of inertia – Friction.

GE 202 - Dynamics: 3 (3, 0, 1)

Kinematics of a particle: curvilinear motion, and relative motion; Kinetics of particles: Newton's law, work and energy, impulse and momentum, and impact; Kinematics of a rigid body in plane motion: relative velocity and acceleration, and rotating axes; Kinetics of a rigid body in plane motion: translation, fixed axis rotation, general equation of motion, work and energy, and impulse and momentum.

Elective Courses

ME 423 - Renewable Energy: 3 (3, 0, 1)

Basic and principles of conventional and non-conventional energy, energy conversion, power plant cycles, The distribution, variability and availability of all

categories of renewable energy. Principles of renewable energy systems such as solar, wind, geothermal, and Nuclear energy. Environmental aspects of implementation of renewable energy. Topic also covers some practical applications to utilizing the renewable energy such as sea water desalination and power plants.

ME 425 - Solar Energy: 3 (3, 0, 1)

Basic and principles of conventional and non-conventional energy, energy conversion, power plant cycles, The distribution, variability and availability of all categories of renewable energy. Principles of renewable energy systems such as solar, wind, geothermal, and Nuclear energy. Environmental aspects of implementation of renewable energy. Topic also covers some practical applications to utilizing the renewable energy such as sea water desalination and power plants.

ME 431 - Tool Manufacturing: 3 (3, 0, 1)

Principles of cutting tools, jigs, fixtures, fit and tolerances, tool cutting geometry, tool life, cost analysis, economics, and safety in tooling design applications.

ME 453 - Modern Engineering materials: 3 (3, 0, 1)

Electrical, magnetic, optical and thermal properties of materials. Advanced ceramics, composites. Advanced engineering plastics. High temperature materials. Advanced coatings. Advanced materials processing system. Rapid solidification and powder metallurgy. Selection of modern materials.

ME 455 - Corrosion Engineering: 3 (3, 0, 1)

Technical and economic aspects of corrosion problems. Types of corrosion: pitting, crevice, intergranular, galvanic, and stress-corrosion cracking. Mechanism and prevention of corrosion failures. Cathodic protection of pipelines and submerged structures. Principles of inhibition of corrosion in process industries. Behavior of iron, copper, aluminum and their alloys in corrosive environments. Metallurgical aspects of corrosion. Design consideration in prevention of corrosion failures.

ME 462 - Mechatronics: 3 (3, 0, 1)

Mechanical system interfacing and actuation; Operational and power amplifiers; Analog to Digital and digital to analog converters; Digital data acquisition basics; Position/Orientation control; PWM control of DC motors, Sensors and actuators; Microprocessor-, microcontroller- and PC-based control; PLC basics and their programming; C programming (M-code & G-code) of CNC machine tools.

ME 463 - Mechanical vibrations: 3 (3, 0, 1)

Fundamentals of mechanical vibration, including free and forced vibration of single-, multi-and infinite-degree of freedom systems. Modal analysis and matrix formulation of vibration problems. Approximate solution techniques. Vibration and modal analysis of continuous systems: beams, rods, and strings. Approximate analytical as well as numerical solutions using suitable software such as MATLAB. Numerous examples and applications of vibration measurement and analysis, including vibration isolation and dynamic absorbers and rotating machinery. Laboratory experimentation for justifying the above topics.

ME 466 - Robotics: 3 (3, 0, 1)

Introduction to robotics and their applications, spatial descriptions and transformation, manipulator forward kinematics, manipulator inverse kinematics, trajectory generation Jacobians: velocities and static forces, manipulator dynamics, control of manipulators, robot programming, robot sensors and vision.

ME 470 - Thermal Power Plants: 3 (3, 0, 1)

Forms of energy, oil, gas and coal. Combustion processes, energy cycles. Steam generators and their component design. Turbines. Load curves. Field trips to power plants and other energy installations.

ME 474 - Refrigeration Engineering: 3 (3, 0, 1)

Mechanical vapor compression refrigeration cycles (single-stage and multi-stage); refrigerant compressors; refrigerants; absorption refrigeration systems; thermoelectric cooling; flash cooling; gas cycle refrigeration; ultra-low-temperature refrigeration (cryogenics); food refrigeration; transport refrigeration. Laboratory will be utilized to carry out experiments on refrigeration equipment and in problem solving sessions.

ME 475 - Air Conditioning: 3 (3, 0, 1)

Thermodynamics of moist air; construction of the psychrometric chart; psychrometric processes; psychrometric systems; industrial processes, air conditioning systems; duct design and air distribution methods; cooling towers. Experiments utilizing air conditioning equipment will be conducted for air conditioning systems will be practiced through a practical project in tutorial sessions.

ME 480 - Turbo Machinery: 3 (3, 0, 1)

Thermo-fluid dynamics aspects of fluid flow, efficiencies of turbomachines. Two dimensional cascades: turbine and compressor cascade correlations and performance. Axial turbines (two-dimensional analysis), axial flow compressors and fans (two-dimensional analysis), centrifugal compressors and fans, radial flow turbines.

ME 482 - Compressible Fluids: 3 (3, 0, 1)

Fundamentals of compressible fluid flow (gas dynamics) in relation to effects of area change (nozzles and diffusers), friction and heat interaction (Fanno, Rayleigh line and isothermal flow), combustion waves normal and oblique shock waves and their effects on flow properties (extended diffusers and supersonic airfoils). Applications to flow through pipelines, subsonic, sonic and supersonic flights, turbomachinery and combustion.

ME 483 - Pumping Machinery: 3 (3, 0, 1)

Terminology and description of typical pump machinery. Momentum and energy transfer between fluid and rotor. Performance characteristics of centrifugal and axial flow fans, compressors, and pumps. Various types of losses. Positive displacement pumps. Cavitation and water hammer problems in pump systems. Special problems in pump design and applications. Laboratory experiments will include performance evaluation of various types of pumps and problem-solving sessions.

ME 490 - Selected Topics in Mechanical Engineering: 3 (3, 0, 1)

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student.

LABORATORIES AND EQUIPMENT

1. Dynamics and Control lab

Equipment available includes: applications of mechanical power controls like temperature, pressure, flow and liquid-level controls. This is in addition to two important units for servo-pneumatic controls and servo-hydraulic controls.

Equipments for vibration analysis and controls include rectilinear, torsional, rotor and inverted pendulum pieces of equipments. Another i1nportant unit for machinery fault diagnosis by using vibration spectrum analysis exists. General dynamic motion controls include a magnetic levitation, an industrial emulator and a gyroscopic motion. A training unit on how to control DC, AC, and stepper motors exists. The lab also includes a unit for training on multi-motor digital controllers.

2. Measurements lab

Equipment available includes: Servo control trainer, gyroscope apparatus, Magnetic levitation apparatus, Industrial Emulator, Temperature process station, Pressure process station, Level process station, Pneumatic training system, Electrical control of pneumatic system, Servo proportion al control of pneumatic systems, Hydraulic fundamentals training system, Electrical control of hydraulic system, Servo proportional control of hydraulic systems, Flow process station.

3. Mechanical Vibrations lab.

Equipment available includes: Torsion disk, 'complete tum key' (3rd disk encoder), Rectilinear Apparatus, 'complete tum key' (3rd mass encoder) ECP Inverted Pendulum, Vibration sensor with clamping set, Sensor supply module, PC-aided data recording system, Balance of reciprocating masses, Whirling shaft apparatus, Universal driving unit, Machinery fault trainer.

4. Mechanics of Materials lab.

Equipment available includes: Universal Testing Machine 20 KN, Fatigue testing apparatus, Torsion Testing Machine, Thick Cylinder Apparatus, Thin Cylinder Apparatus, Experimental Set Unsymmetrical Bending, PC-aided Measurement Data Recording System, Universal Test Frame and Stand, Optical microscope, furnace.

5. mechanics of Machinery lab

Equipment available includes: a motorized Gyroscope, Rotating an d Reciprocating Mass balancing, Lathe Gearing Layout, Geared System apparatus along with cutaway-model of different type of gears, clutches and working models of different planar mechanisms.

This laboratory is reasonably equipped for carrying out simple experiments to familiarize the undergraduate students with basic mechanism and working of machinery and include balancing of rotating and reciprocating system and speed and depth of cut in a lathe gear system.

6. Fluid mechanics lab

Equipments available include: Impact of a Jet, Flow over Weirs, Bernoulli's Theorem Demonstration, Orifice Discharge, Energy Losses in Bends, Osborne• Reynolds' Demonstration, Energy Losses in Pipes, Hydrostatic Pressure, Orifice and Free Jet Flow, Flow Visualization in Channels around, solid bodies, Metacentric Height, Free and Forced Vortices, Water Hammer, Pelton Turbine.

This laboratory is reasonably equipped for carrying out simple experiments that related to the fluid mechanics basic& concepts, through this laboratory also many of the basic theories, phenomena and laws that related to the fluid mechanics which the students learns in the lectures are demonstrated and confirmed in the lab through available various experimental equipments.

7. Heat transfer lab

Equipment available includes: Linear Heat Conduction Module, Radial Heat Conduction Module, Radiation Heat Conduction Module, Combined Free and Forced Convection and Radiation Module, Extended Surfaces Heat Transfer Module, Radiation Error in Temperature Measurement, Unsteady State Heat Transfer Module, Plate Heat Exchanger, Shell and Tube Heat Exchanger, Coil Vessel Heat Exchanger, Jacketed Vessel Heat Exchanger, Concentric Tube Heat Exchanger,

Surface Unit Electronic Interface, Heat Exchanger Training System Computer Controlled, Computer Controlled Heat Transfer Series, Disk Top Computers

The heat transfer lab is equipped with the tabulated equipments in order to provide students with experience in engineering analysis of experimental data using relevant theory from heat transfer. Moreover, to develop in students the ability to formulate a research problem, design experiments and analysis tools and to complete a research project in a team setting.

Equipments available include: Dead Weight, Series/Parallel Pumps, Reciprocating compressors characteristics, Temperature and humidity measurements, Internal combustion engine characteristics: Diesel engines two and four strokes, Petrol engines two and four strokes, Petrol engine v.1ith variable compression ratio.

This laboratory is reasonably equipped for carrying out simple experiments that related to the thermodynamics basic& concepts, through this laboratory also many of the basic theories, phenomena and Jaws that related to the thermodynamics which the students learns in the lectures are demonstrated and confirmed in the lab through available various experimental equipments. Students will be able also to evaluate the performance of various thermodynamics open and closed systems.

8. Computer labs

GE 104: Basics of Engineering Drawing
CSC 209: Computer Programming

Equipment available includes: Network transformer (24 output), set Cables cat 6, Printer with network card, PC for students P4, PC for Instructor P4, PC distributing files P4.

In this lab the students apply simulations methods of many theoretical ideas faced in the courses. Also it permits them to try theoretical circuits and enhance their knowledge in programming.

جامعة القصيم
كلية الهندسة
المملكة العربية السعودية
القصيم – بريدة

ص.ب. ٦٦٧٧ بريدة ٥١٤٥٢
تليفون مباشر: ٠٠٩٦٦–١٦–٣٨٠٣٣٧٣
فاكس: ٠٠٩٦٦–١٦–٣٨٠١١٥٢
تحويلة: ٠٠٩٦٦–١٦–٣٨٠٠٥٠–٥٠٠٠
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