The Public Authority for Applied Education and Training
College of Technological Studies

College Catalogue 2020/2021

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College History and Overview

The Industrial College was the first educational institution to design and offer curricula related to the technological field. It started in the academic year 1954–1955 at the level of secondary stage. In 1976–1977, the study program in the Industrial College was terminated and its title is changed to 'Kuwait Institute for Applied Technology' (1976), 'Kuwait Institute for Technology' (1983) and finally 'College of Technological Studies' (1986), which admitted secondary school leavers or equivalents. The duration of the study program was five semesters after which the graduate obtains a diploma in his specialization. The College of Technological Studies (CTS), in its early and present forms, has witnessed continuous development processes because of the country's policy of adopting up–to–date technologies. This development was included in programs, plans, curricula, tuition systems, constructions, laboratories, workshops, etc. to keep abreast of the latest technology used in the labor market. CTS is, therefore, one of the Public Authority for Applied Education and Training (PAAET) colleges that is closest to the needs of the development plans and the fastest to meet the escalating needs of the labor market.

Mission Statement

The College of Technological Studies offers support to national programs of social and economic development through technological education and professional programs directed towards the specific needs of workforce market.

Vision Statement

The College of Technological Studies aims towards educating and training highly qualified professionals to join the national workforce required by industrial, governmental, and private sector in many technology streams to meet the following objective:

1. Offering a globally accredited programs in nationally required engineering technology programs.
2. Continuous development of programs to convoy with advancement in technology.
3. Leading technological education in Kuwait.
4. Achieving partnership with industrial and educational sectors in the development of national economy.

The diploma degree holders graduating from this college are qualified for jobs in the labor market as assistant engineers and technicians. The college is keen on maintaining the following student outcomes:

I. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve well–defined engineering problems appropriate to the discipline.
II. an ability to design solutions for well–defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline.
III. an ability to apply written, oral, and graphical communication in well–defined technical and non–technical environments; and an ability to identify and use appropriate technical literature.
IV. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results; and
V. an ability to function effectively as a member of a technical team.

The baccalaureate of engineering degree holders graduating from this college are qualified for jobs in the labor market as engineers. The college is keen on maintaining the following student outcomes:

I. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the discipline.
II. an ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline.
III. an ability to apply written, oral, and graphical communication in broadly defined technical and non–technical environments; and an ability to identify and use appropriate technical literature.
IV. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
V. an ability to function effectively as a member as well as a leader on technical teams.

Students Services

Following is an outline of human development–related units:

Dean of Admissions and Registration's Office

The office is an important link between PAAET and its colleges on the one hand, and students with their needs and aspirations on the other.

The office is in charge of implementing admission, registration policies and procedures with regard to warnings, honors lists, issuing various documents and certificates, following up major sheets, establishing graduation procedures and filing graduates' data. The office's organizational structure consists of the following:

1. Assistant Dean – Admissions

   Responsible for suggesting and implementing set admission policies, laying down admission requirements, rules and numbers and advertising the same in the media, preparing and publishing admission handbooks, preparing aptitude tests, and providing admission forms.

2. Assistant Dean – Advising

   Gives advice and guidance to students on the appropriate type of education or training that best suits their aptitudes and abilities.

3. Registrar – General

   Suggests registration rules and regulations for PAAET colleges and academic departments and lays down systems and procedures for tracking students' progress in accordance with the Regulations of Study at PAAET colleges.

In–Service Training Center

The Center offers job–related training to workers by providing them with knowledge and by helping them to acquire the necessary skills and abilities or develop their present ones with the aim to enhance their level of performance and boost their productivity. Training is given by specialists either from among faculty members or trainers or practitioners of relevant fields. Technical courses are given at PAAET colleges and institutes. In–service training programs are divided into two categories:

1. Annual–plan programs: ready–made programs offered to the public, joint and private sectors.
2. Customized (tailor–made) programs: offered to organizations according to the level of their employees who are receiving training and the objectives of the course.

In–service training programs include programs for top management as well as training, computer and technical and vocational fields.

Learning Resources Department

The Department supervises the work of the libraries and educational technology units at PAAET colleges and institutes to develop them to serve the purpose of education and research.

I. Libraries

1. Number: 17
2. Number books held: 130,000 volumes
3. All library services (lending, reference, etc.) are computerized in addition to Internet search.

II. Educational Technology Units

1. Number: 5
2. Supplies classrooms with teaching aids and equipment.
3. Helps faculty members produce transparencies and other audio–visual aids.
4. Shares in documenting and photocopying the respective college's or institute's activities.

III. Indexing and Classification Section

1. Indexing and classification of all channels of information in various forms (books, journals and other audio–visual aids).
2. Completion, updating and maintenance of a bibliographic database of all Department's acquisitions to bring about a paradigm shift in research.

IV. Acquisition Section

1. Follows up the latest developments in channels of information (books, journals, audio–visual aids and equipment), which serve the purposes of the teaching
2. Learning processes and supplying libraries and educational technology units with necessary resources.
3. Selection and orders are made in coordination with academic departments.
4. All section's procedures are computerized using the HORIZON integrated information system.

V. Liberant

1. A sophisticated electronic center for research resources and scientific database for faculty members and researchers.
2. Its objectives include the following:
    a. Providing readily available sources of information to as many faculty members as possible
    b. Using other databases and resources available at comparable institutions.
    c. Creating a multimedia production unit for media titles.
    d. Producing programs on CDs using multimedia applications for various sectors of PAAET.
    e. Establishing a digital library and electronic archive for the storage of PAAET's collection of pictures, video cassettes and other audio materials on CDs so that it is readily available for all sectors of PAAET.
    f. Designing and producing interactive multimedia educational programs for certain specializations in association with the concerned parties.

Scholarships & Educational Relations Department

Duties and responsibilities include:

1. Implementing the recommendations of the General Scholarships Committee.
2. Identifying needs of PAAET in terms of scholarships and study leaves.
3. Monitoring the progress of PAAET's students on scholarships and solving the problems facing them.
4. Participating with the concerned authorities with regard to the drafting of cultural and academic agreements with Arab and non–Arab counterparts and monitoring their implementation.
5. Taking advantage of the bilateral cultural agreements signed between the State of Kuwait and other countries.
6. Coordinating with the concerned authorities regarding the exchange of visits of official delegations related to cultural and academic affairs.
7. Suggesting amendments to the systems and regulations of scholarships and sabbaticals.

The Department comprises the sections of

- Cultural Relations
- Scholarships
- Follow-up

Academic Programs System

Course

A plan of study on a particular subject with theoretical or practical content during one semester, carrying a given number of credits under the system of study.

Credits

Weekly and annual credits are given weightings in the following manner:

a. Course credit: 1 contact hour for theoretical courses, or 2–3 hours for practical courses.
b. Field Training credit: 3 to 4 hours per credit.

The designated Academic Affairs Committee of the college decides the number of hours of the practical and field training courses.

Study Program (Curricula)

A set of courses and activities in a particular specialization undertaken by students during a specific period in order to qualify for graduation.

Plan of Study

The way in which the program is implemented over the given semesters. It includes subscribed courses, the successful completion of which leads to the award of a degree.

Implementation of the program shall take into consideration the sequence in which courses must be offered, prerequisites and resources available in the colleges.

Classification of Courses

Courses shall be classified as follows:

I. The nature of the course:

a. Theoretical: Academic content dealing with the basic principles and concepts of a particular field of knowledge.

b. Practical: A set of experiments, applications and exercises intended to develop the skills and abilities of students.
c. Field Training: Field experience at one of the job markets and is designed to develop students' skills and enhance their achievement.

Courses may be mixed.

II. According to type:

a. General Studies (General Education Courses):
Courses are designed to raise the standard of good citizenship by giving importance to all aspects: cultural, spiritual, social, health and sports, as well as providing a foundation on other subjects of knowledge that serve the purpose of PAAET's philosophy.
b. Specialist or professional courses:
Course aim to provide knowledge and expertise in the chosen field of study and have a distinct, inter–related nature in theoretical, applied or practical body of knowledge.

c. Minors:
   Courses increase knowledge or experience that support the major courses and help students acquire the required knowledge to complete their professional training and area of specialization.
d. Electives:
   Courses offered by PAAET, be it arts and music or general education courses or courses from the same major or otherwise. Electives may be any of the offered courses with the exception of the following:
e. All general education courses.
f. Minors offered to other majors.

Prerequisite

A course that must be successfully completed prior to registering for an advanced course.

Concurrent Courses

Those in which two courses are done concurrently (at the same time).

Remedial Courses

These are designed to provide students with a body of knowledge to enhance their academic level in certain areas of study and qualify them to enroll in credit courses. Remedial courses are non–credit courses.

The College's Academic Affairs Committee, upon the recommendation of the concerned academic department, shall be authorized to define the prerequisites of the concurrent or remedial courses.

Course Coding

1. Courses shall be coded in the following manner:
   a. 101–199: First–Year level
   b. 201–299: Second–year level
   c. 300–399: Third–year level

2. Each course number is preceded by the code of the respective department.
3. Colleges may organize special courses for certain students to complement their knowledge or raise their academic level in certain subjects. These do not carry any credits and are given codes 011 to 099.

Admissions

Admission requirements

Male and female students shall be enrolled in PAAET colleges on the basis of the following general requirements:

- Admission priority is given to Kuwaiti nationals.
- Nationals of the Gulf Cooperation Council, students on scholarships from Arab and foreign countries and children of residents are enrolled at a rate not exceeding 15% of the total enrolments in accordance with the relevant rules and regulations of PAAET.
- Applicants must be secondary school leavers or holders of an equivalent certificate obtained in the previous two years, which is appropriate to the nature of study in the major applied for.

Applicants must fill in application forms during the specified period with the following documents enclosed:

1. The school–learning certificate authenticated by the proper authorities.
2. The civil identity card (ID) and a copy thereof.
3. Declaration of intention to study on a full–time basis.
4. Any other documents required by PAAET.

Re–enrolment

A student may not re–enroll in any PAAET colleges in any of the following events:

1. If he was expelled due to scoring a lower GPA or major average than the required level.
2. If he was expelled for being caught cheating twice in exams.
3. If he was expelled for disciplinary action.
4. If he failed to complete his study successfully within the maximum time limit.
5. If he has withdrawn his documents.
6. If he was expelled for non–attendance.

Change of Major in the College

A student may change his major on the basis of the following rules and regulations:

1. Change of major shall not be permissible during his/her first semester in college.
2. The number of credits obtained shall not exceed 45 in four–year programs and 30 for other colleges.
3. Joint (core) approved credits upon change of major shall not be counted as obtained credits.
4. Change of major shall be allowed only once during a student's duration of study in college.
5. Following a change of major and for the purpose of calculating a student's GPA, his/her transcript shall remain unchanged and all completed courses will be counted.
6. Students shall be exempted from re–doing previously completed courses approved by the concerned academic departments and forming a component of the new major.
7. Colleges' Academic Affairs Committees shall establish the major changes in rules and regulations in accordance with the approved admission policy and in the light of labor market requirements and vacancies in the desired major.

Transfer to PAAET Colleges and Inter–College Transfers

1. A student may change from one college to another within PAAET from an accredited counterpart based on the available resources and annual admission policy. Transfer applications shall be submitted to Dean of Student and the office of Trainee Affairs and shall be subject to the following requirements:
   a. Consent of the PAAET college, in which the student is enrolled, for the transfer application shall be obtained.
   b. The student shall satisfy the admission requirements of the college he/she is being transferred to.
   c. The student shall not be suspended as a disciplinary measure.
   d. On submission of the transfer application, the student should have completed at least one semester at a college or institute.
   e. For inter–college transfers, the number of credits already obtained shall not exceed 45 for four–year programs and 30 for other colleges.
   f. The student shall not have previously withdrawn his documents from any of PAAET colleges.
   g. The student shall not have been expelled from any PAAET college due to non–attendance.
2. In the case of inter–college transfers, a student's transcript shall remain unchanged and all courses previously taken in the college transferred from shall count for the purpose of calculating his GPA.
3. Students shall be exempted from re–taking previously completed courses approved by the concerned academic departments if the student is transferring from a PAAET college.
4. Approved credits shall not count for the purpose of calculating the grades of students transferred from a non–PAAET college, and they shall be deemed to have obtained the number of credits equivalent to a maximum of 50% of the credits required for graduation in the college he/ she is being transferred to.
5. Academic departments shall specify the courses which a student may be exampled from and which are equivalent to the courses previously completed successfully with at least a C (Good) grade at a non–PAAET college or institute.
6. Once a student is exempted from a course(s) because of the transfer after the withdrawal period, his registration for such courses shall be cancelled.
7. The duration of study of the approved courses at non–PAAET colleges or institutes shall count as part of the maximum time limit for graduation based on normal load per semester.

Auditing (Non–degree courses)

1. The College Dean may allow the following interested parties to register for some of the offered courses as auditors within the limits of the college facilities and capacity:
   a. College employees, according to the nature of their jobs subject to consent of supervisor and approval of the Dean, provided this does not interrupt the performance of their duties.
   b. Kuwaitis and those treated similarly holding a General secondary School Certificate.
2. Registration shall take place during the late registration period. The College Dean may at his discretion accept excuses for registration after expiry of such period and by the end of the second week of classes.
3. Auditors shall not be allowed to sit end–of–term exams in the enrolled courses.
4. Auditors shall pay the prescribed course fees.

Credits Transfer

Kuwaiti students enrolled in foreign universities recognized by the Kuwait Ministry of Higher Education may register for a maximum of seven credits in one or more semesters for the duration of his studies.

Students enrolled in PAAET colleges may enroll in a non–PAAET college and register for up to seven credits in one or more semesters for the duration of his studies. Such courses shall count as graduation requirements subject to the following regulations:

1. The applicant's obtaining the prior consent of the relevant academic department of PAAET.
2. The university or college being recognized by the Kuwait Ministry of Higher Education.
3. The course content being equivalent to a course constituting a part of the student's graduation requirements.
4. The student's completing the course with at least a C (Good) grade.

The Grading Policy

The Evaluation System

The student's performance and effort shall be evaluated on an on–going assessment basis for the duration of the semester in addition to an end–of–term exam.

The total score shall be distributed as follows:

1. Fifty percent for on–going assessment of term work.
2. Fifty percent for end–of–term exams.

Academic departments, subject to approval of the College's Academic Affairs Committee, may change the above distribution to suit the nature of the courses.

Prior to each semester, faculty members shall distribute the work plan approved by the respective department to the students, which contains the following:

a. Course objectives.
b. Course content and weekly distribution
c. Evaluation scheme
d. Tests and quizzes during the semester
e. Textbooks and references
f. Office hours

Duration of End–of–Term Exams

The time allowed for end–of–term exams shall be two hours. The College's Academic Affairs Committee may amend this Article in special cases and on the recommendation of the concerned academic department.

Deferment of End–of–Term Exams

1. A student shall be deemed to have failed the final exam if absent from it.
2. Final exams may be deferred in exceptional cases under the following conditions:
   a. The student under consideration was absent from the final exam for a reason beyond his control.
   b. The student or his authorized representative shall submit an application for exam deferment to the head of department or his deputy within three days of the exam date enclosing the necessary testimonials therewith.
   c. There shall be mutual agreement between the course instructor, the concerned head of the department or his deputy and the college dean for each course.
3. The course instructor shall send a score sheet to the Registration Office putting a note of I (Incomplete) opposite the name of the student under consideration without giving him a grade.
4. After the student attends the exam, the course instructor shall inform the result to the Registration Office within the following time periods:
   a. Within a week of the start of classes in the autumn semester for both previous spring and summer courses.
   b. Within a week of the start of classes in the spring semester for the previous autumn semester courses.
5. If the student fails to attend the exam on the above–mentioned dates, he shall receive an FA (Fail) grade.

The Credit Course System

PAAET colleges shall follow the credit course system, under which a given number of credits must be successfully completed by students in the level specified under these regulations to qualify for graduation. The credits are distributed over certain fields of study in accordance with these regulations.

Following consultation with their advisors, students may select the courses that they wish to enroll in from the offered courses according to their needs and aptitudes as well as graduation requirements and within the allowed student load.

Definition of Some Terms Used During the Academic Year

The academic year shall be divided into two semesters, each with a duration of 14 weeks in addition to two periods for advising and registration and end–of–term examinations.

The summer semester shall be optional and shall run for seven weeks, apart from a period for advising and registration and final examinations.

Grades and Points

Assessment of students' performance at the end of each semester shall be based on the points scored and final grade earned according to the following levels:

i. A student shall be deemed to have completed a course if he earns at least a D (Pass) grade.
ii. The course instructor shall announce the final exam result within three days of the date thereof.
iii. In the event that a student is not satisfied with his final grade in the end–of–term exam, he shall discuss the matter with the course instructor within two days of the date of the result, and if he is still not convinced of the instructor's clarifications, he shall lodge a complaint in writing with the college Dean within a week of the date of the result, and the Dean shall refer the complaint to the concerned head of the department to consider the same in accordance with relevant regulations laid down by the college's Academic Affairs Committee. Settlement of all grievances shall be made, and the Registration Office shall be informed thereof not later than the end of the late registration period of the subsequent semester.
iv. The course instructor shall in person deliver the grades of the students enrolled in the course to the Registration Office within two days of announcement of the result and not later than five days after the final exam date.
v. For the purpose of calculating a student's GPA and average grade, all courses registered for shall be counted and he shall re–take the courses he failed or take alternative courses, subject to regulations, and successfully complete them at the required level. He may not re–take a course he has previously passed with a C (Good) or higher grade. To calculate averages, only the second grades for the first eight and four re–taken courses shall be counted in four–year and two–year programs, respectively; for College of Technological Studies and General Nursing Major at College of Health Sciences, the second grades for five re–taken courses shall be counted. In the event of extra courses, all these shall be considered.
vi. A student shall enroll on the same course if it is a required one or on any other course if it is an elective.
vii. A student may re–take one or more courses he has previously passed with a D (Pass) grade.

The following table shows the grading assessment guide:

Marks	Letter Grade		Grade Points
95–100	A	Excellent	4.00
90–94	A–	Excellent (low)	3.67
86–89	B+	Very good (high)	3.33
83–85	B	Very good	3.00
80–82	B–	Very good (low)	2.67
75–79	C+	Good (high)	2.33
70–74	C	Good	2.00
66–69	C–	Good (low)	1.67
63–65	D+	Satisfactory (high)	1.33
60–62	D	Satisfactory	1.00
< 60	F	Failed	0.00
Final Exam Absent	FA	Failed	0.00
Failed by disciplinary measure	XF	Failed	0.00
Course withdrawal	W		
Term withdrawal	Z		

Averages

Averages are the result of multiplying the number of points in each course by the number of credits assigned for such course. The following averages are calculated by rounding off to the nearest two decimals.

a. Semester Average: The quotient resulting from the division of the total number of points received during the semester by the number of credits allotted to these courses.
b. GPA: The result obtained by dividing the total number of points the student has obtained in all courses since he enrolled in the college by the number of credits allotted to these courses.
c. Major average: The result of the division of the total number of points the student has received in all specialist courses since he enrolled in the college by the number of credits allotted to these courses. Calculation of the major average starts upon the completion of two semesters in the college.

Average Warning

If a student's GPA or major average at the end of any semester is below 2.00, his name shall be listed in the warning list during the subsequent semester, and this shall be recorded on his transcript.

If the student fails to raise his average to the required level during the next two semesters, he shall be expelled from the college.

The Student Affairs Committee shall be authorized to settle grievances from expelled students and allow them to re–enroll as an exception made for one semester only in accordance with these regulations and orders made for implementation thereof. The student shall be deemed expelled from the college if his semester grade is zero at the end of his first semester in the college.

Honors' List

The name of a student shall be listed in the honors' list during a semester if he has successfully completed the courses of the preceding semester under the following conditions:

a. The number of credits registered for shall not be less than the normal student load.
b. His semester average shall not be less than 3.50.
c. He shall not have previously faced any disciplinary action.

Advising and Registration

Graduation Requirements

A student shall graduate from the college if he satisfies the following requirements:

1. Successfully completing all courses required for graduation.
2. Earning at least a 2.00 GPA or major average.

The Dean of Student and Trainee Affairs' Office shall prepare a list of the students who satisfy all graduation requirements in accordance with these regulations and orders issued for implementation thereof, and the office shall submit the same to the Director General for approval by the Board of Directors of PAAET.

The student who meets all graduation requirements shall be awarded a certificate stating his major, date of graduation and GPA in accordance with these regulations and orders made for implementation thereof. The certificate shall be signed by the college Dean and the Director General and approved by Chairman of the Board of Directors according to the list of qualified graduates.

GPAs upon graduation shall be as follows:

Excellent : 3.60–4.00
Very Good : 2.80–3.60
Good : 2.00–280

Honors' Degree

The student who successfully completes his studies during the normal period thereof with a GPA of at least 3.75 shall be awarded an honors' degree provided he has not previously faced any disciplinary action.

Degrees and Diplomas Awarded

PAAET shall award the following diplomas and degrees:

1. A Diploma in Applied Sciences according to the majors offered by PAAET colleges as provided hereunder following a normal period of study ranging from at least four to five semesters for holders of Secondary School Certificate or an equivalent certificate.
2. A Baccalaureate in Applied Sciences according to the majors offered by PAAET colleges as provided hereunder following a normal period of study ranging from at least eight semesters for holders of Secondary School Certificate or an equivalent certificate.

Advising

PAAET colleges shall adopt the advising system under which each student has an advisor, preferably a faculty member. The advisor shall advise students with regard to the selection of courses to be taken and assist them in solving the problems that they may face. He also approves registration, addition and withdrawal forms.

Registration

Registration for courses shall take place during the week preceding the start of classes.

A system for early advising and registration may be applied in the second part of each semester for the following semester, under which courses are selected according to the needs of the students and the schedule of the college.

Late registration

Subject to consent of advisor and approval of office student and Dean of Trainee Affairs, students may register for courses on the first three days of classes every semester.

Regulations of registration for summer semester courses shall be the same as those for other courses. Students may not register for any course unless they have successfully completed its prerequisite (if prerequisite is required).

Students shall pay registration fees as specified by the Director General; students on scholarships shall be exempted from payment.

Study Load

Credits for which students may register in a single semester shall be determined as follows:

a. The normal load shall be the number of credits a student may register for in every semester. This is obtained by dividing the number of units as a graduation requirement by the number of normal semesters under those regulations (18 Credit hours).
b. The minimum load shall be three credits less than the normal load (15 Credit hours). The maximum load shall be three credits more than the normal load (21 Credit hours).
c. A student may register for a number of credits below the minimum load in exceptional cases and in accordance with the rules laid down by the college's academic affairs committee, subject to the consent of Advisor and approval of Dean.
d. A student may register for a number of credits above the maximum load if his/her graduation hinges on that, provided he/she registers for only one course carrying a maximum of the three credits (24 Credit hours).
e. Students on a warning list may not register for courses carrying more than one credit above the minimum load (16 Credit hours), with an exception of senior students who are expected to graduate at the end of the same semester, in which case they may register for courses carrying not more than two credits above the minimum load (17 Credit hours).
f. Students may register for a maximum of seven credits in the summer semester, with the exception of senior students who are expected to graduate at the end of the summer semester or the subsequent semester, in which case they may register for up to 9 credits.

Additions

Following approval of the Advisor and subject to the maximum load rules, a student may add a course(s) within the first week of the start of classes in the autumn or spring semester or in the first three days of the summer course.

Withdrawals

Following approval of the Advisor and subject to the minimum load rules, a student may drop a course(s) within the first seven weeks of the start of classes.

Likewise, subject to approval of the Student Affairs Committee, a student may drop the whole course for a semester. A note of Z is recorded on his transcript for one term without affecting the GPAs.

Attendance and Absence

1. Students shall attend classes regularly and punctually during the semester and field training.
2. In the event of absence from a course equivalent to a week's contact hours, a student shall be given a written warning notice by the course instructor; a second warning notice is given in the event of absence for two weeks.
3. In the event of absence for three weeks or more, the course instructor shall forthwith inform the Registration Office of barring the student under consideration from attending the end–of–term exams for that course.
4. The Registration Office shall give the student, the Advisor and the course instructor a copy of the barring decision. The student shall then be deemed to have failed the course and a note of F (Fail) shall be recorded on the transcript.
5. Subject to approval of the Director General, the allowed period of absence shall be extended for up to four weeks in the case of a student being called up as a reservist or appointed to represent the country abroad.
6. Regarding the summer semester, the first warning notice shall be given in the event of absence for 10% of the contact hours and the second warning notice in the event of absence for 15% of the contact hours. If absence exceeds 20% of the contact hours, the student under consideration shall be deemed to have failed the course and shall be barred from attending the final exam.

Determination of the Student's Year of Study

The student's year of study shall be determined on the basis of the number of credits obtained, as shown in the following table:

Credits obtained	Year
Up to 34	First
35–68	Second
69 +	Third

Time Limit for Graduation

The maximum time allocated for graduation is seven semesters for diploma and thirteen for baccalaureate.

Deferment of enrolment or non–attendance periods shall be included in the maximum allocated graduation time, except for those semesters in which a student is called for compulsory military service or maternity leave for a female student or if a male or female student accompanies their spouse on a scholarship abroad, in which case the maximum duration of studies shall be extended by up to two semesters. If a student is accompanying a person receiving treatment or is on an official assignment, the extension may not exceed one semester. In exceptional cases and in accordance with Student Affairs Committee's rules, a student may be allowed to continue at the college for one extra semester more than the maximum periods shown above.

Things to Know

Deferment

This refers to non–registration for courses for a prior valid excuse accepted by the Student Affairs Committee.

Dropouts

A student shall be deemed a dropout if he fails to register for courses for one or more semesters.

1. A student may not discontinue studies during the first semester he is enrolled in, except if he is in compulsory military service or any good reason accepted by the Student Affairs Committee.
2. A student who fails to attend classes for two weeks, consecutively or otherwise, shall be expelled from the college unless he/she gives reasons accepted by the Student Affairs Committee, in which case he/she shall be allowed to continue his/her studies according to his/her transcript.
3. A student shall be deemed to have failed all courses registered for in the semester he withdraws his documents from the college.

Events of dismissal from the college

A student shall be expelled from the college by order of the Director General in the following events:

1. If he fails to attend classes regularly during his first semester, notwithstanding the provisions of Article 38 hereof.
2. If he fails to attend classes for two semesters consecutively or otherwise, without prejudice to the provisions of Article 35 hereof.
3. If he fails to complete his studies successfully within the specified time limit, notwithstanding the provisions of Article 35 hereof.
4. If he is expelled from the college as a disciplinary measure.
5. If he is caught cheating for the second time in an examination.
6. If he fails to raise his GPA or major average to the required level for two semesters following a warning.
7. If he earns a zero GPA at the end of his first semester in college.
8. If he earns a semester average of less than one point in each of his first two semesters in college.

Cheating in Exams

1. In the event that a student is caught cheating or attempting to cheat, the course instructor or final exam invigilator shall substantiate this in a report stating the name of the student in question, his ID number, exam subject, time and date as well as an account of the incident and shall refer the same to the Dean.
2. The Dean shall take the necessary actions as follows:
    a. The Student shall be deemed to have failed the course in question, a grade of XF would show on his/her transcript.
    b. The student shall be barred from enrolment in the subsequent semester in addition to the summer semester.
    c. In case cheating takes place in the summer semester, the student's registration for such semester's courses shall be cancelled.
    d. A copy of the related decisions shall be sent to the course instructor concerned and the Registration Office.

3. If the same student is caught cheating again in the same or another semester, he shall be expelled from the college and the details of expulsion shall be recorded on his transcript.
4. The above provisions shall apply to any student caught cheating, attempting to cheat or assisting others to cheat.

Academic Departments and Majors

The College of Technological Studies is the home of nine different departments:

1. Department of Automotive and Marine Engineering Technology.
2. Department of Chemical Engineering Technology.
3. Department of Civil Engineering Technology.
4. Department of Electrical Engineering Technology.
5. Department of Electronic Engineering Technology.
6. Department of Laboratory Technology.
7. Department of Manufacturing Technology.
8. Department of Mechanical Power and Refrigeration Technology.
9. Department of Petroleum Engineering Technology.

The nine academic departments in the College of Technological Studies offer 21 educational programs leading to the Diploma in Applied Technology degree (Associate Degree) and one Baccalaureate in Engineering Technology. These programs provide diverse career opportunities.

All educational programs aim at qualifying the graduate to be a technologist with knowledge of basic theory supported by field training.

Degrees Outline

i) Diploma Degree:

Specific degree requirements for the programs are listed below. Each program requires the full–time student to complete five semesters for associate degrees. All diploma programs have unified structure of general elective courses and general core courses. All the general elective courses are offered by the College of Basic education and the College of Business Studies. Moreover, a course on Islamic Culture, among the general complementary courses, is offered by the College of Basic Education.

Type of Courses	Credit Hours
General Core Courses	18
General Elective Courses	3
General Compulsory Courses	6
Major Core Courses	42
Major Elective Courses	6
Total	**75**

1. General Core Courses (18) Credits.

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
30	099	Remedial English	0	5	
30	102	Technical English	3	3	30-099
30	162	Technical Report Writing	3	3	30-102
30	171	Communication Skills	3	3	30-102
56	113	General Physics	3	4	
76	105	Mathematics (1)	3	3	
76	106	Mathematics (2)	3	3	76-105

2. General Elective Courses (3) Credits.

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
3	112	Work Ethics and Loyalty	3	3	
7	141	Art Education (1)	1	2	
7	142	Art Education (2)	1	2	07– 141
8	110	Physical Education	1	2	
13	151	Music Education	1	2	
15	114	Industrial Psychology	2	2	
21	164	Accounting	2	2	
22	104	Small Projects Management	2	2	
25	166	Industrial Economics	2	2	
57	102	Introduction to Contracts and Specifications	3	3	
63	136	Fundamentals of Air Conditioning	3	3	
64	268	Creativity and Design in Tech.	2	2	
65	205	Automotive Mechanics	3	3	
66	135	Energy and Water Conservation	3	3	

ii) Baccalaureate Degree (Engineering Technology):

The baccalaureate in engineering technology degree program has the following structure and outline:

Type of Courses	Credit Hours
Social Science and Humanities	21
Mathematics	12
Natural Science	12
College Requirements	21
Chemical Engineering Technology	66
Total	132

1. Baccalaureate Program College Requirements – (21) Credits

Code	No.	Course Name	Cr.	Hrs.	Pre-requisite
55	221B	Industrial Safety	2	2	30-151B
57	111B	Statics	3	3	56-101C
64	101B	Engineering Drawing	2	4	
60	151B	Introduction to Computing	3	3	76-101B
70	221B	Electrical Circuits	3	3	56-151B
75	151C	Organic Chemistry	3	3	75-101C
75	152B	Organic Chemistry Laboratory	1	2	+75-151B
75	241B	Analytical Chemistry	3	3	75-101C
75	242B	Analytical Chemistry Laboratory	1	2	+75-241B

2. Baccalaureate Program Social Science and Humanities, Core Courses – (15) Credits

Code	No.	Course Name	Cr.	Hrs.	Pre-requisite
01	102B	Islamic Culture	3	3	
03	231B	Loyalty and Work Ethics	3	3	
30	101B	English (1)	3	3	
30	151B	English (2)	3	3	30-101B
30	201B	Technical Report Writing	3	3	30-151B

3. Baccalaureate Program Social Science and Humanities, Elective Courses – (6) Credits

Code	No.	Course Name	Cr.	Hr.s	Pre-requisite
02	101B	Language Drills	3	3	
02	102B	Readings and Styles	3	3	
03	105B	Islamic Arabic Civilization	3	3	
03	115B	Kuwait and Development	3	3	
14	384B	Research Methods	3	3	
15	107B	Introduction to Psychology	3	3	
22	104B	Establishment and Man. of Small Business.	3	3	

4. Baccalaureate Program Mathematics and Natural Sciences – (24) Credits

Code	No.	Course Name	Cr.	Hrs.	Pre-requisite
56	101C	Physics (1)	3	3	
56	105B	Physics Laboratory (1)	1	2	
56	151B	Physics (2)	3	3	56-101C
56	155B	Physics Laboratory (2)	1	2	+56-151B
75	101C	General Chemistry	3	3	
75	105B	General Chemistry Laboratory	1	2	+75-101C
76	101B	Math (1)	3	3	
76	102B	Math (2)	3	3	76-101B
76	201B	Applied Math for Engineers (1)	3	3	76-102B
76	202B	Applied Math for Engineers (2)	3	3	76-201B

Departments and Programs

Department of Automotive Mechanics and Marine Engineering Technology

Overview:

The department aims at preparing the students to occupy positions in the technical departments of automotive and marine industry and to give them a solid technological and scientific basis upon which they can advance toward higher qualifications.

Students studying for major in Automotive Mechanics are educated both practically and theoretically in the technology of various types of power–driven vehicles. The students are acquainted with the operation, maintenance, and repair of all components of the various transportation vehicles.

The students studying for major in Marine Engineering Technology are trained in such a manner that they acquire the skills to operate, maintain and repair various ship systems. The curriculum covers subjects ranging from marine engineering to naval architecture and ship construction. The study is complemented by extensive workshop, laboratory, and field training in the marine field. Students are trained in such a manner that they can work on board ships as technical staff.

Majors:

The department offers two areas of specialization:

- Automotive Engineering Technology
- Marine Engineering Technology

Laboratories

The Automotive Mechanics and Marine Engineering Technology Department is equipped with a series of laboratories and workshops for serving the study curriculum:

- Automotive Electrical Laboratory
- Automotive Simulators Laboratory
- Automotive Testing Laboratory
- Automotive Workshops
- Auxiliary Machinery Workshop
- Diesel Laboratory
- Gasoline Fuel System Laboratory
- Internal Combustion Laboratory
- Marine Power Plant Simulator
- Naval Architecture Laboratory
- Projects and Research Laboratory

Department of Automotive and Marine Engineering Technology

Program: Automotive Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
65	120	Statics	2	3	
65	124	Mechanics skill workshop	1	3	
65	125	Thermodynamics	2	3	76–105
65	126	Fluid Mechanics	2	3	76–105
65	128	Automotive Material Technology	2	3	
65	129	Automotive Engines Technology	3	5	65–124
65	250	Engineering Drawing	2	3	65–129
65	256	Internal Combustion Engines	3	4	65–125
65	257	Automotive Fuel Systems	3	4	65–129
65	258	Automotive Powertrain Technology	3	5	65–120
65	259	Automotive Chassis Technology	3	5	65–258
65	260	Automotive Electrical and Electronic Systems	3	4	65–257
65	261	Automotive Emission and Control	2	3	65–256
65	267	Automotive Safety	1	1	65–258
65	356	Vehicle dynamic	3	4	65–259
65	357	Automotive Drivability and Diagnosis	3	4	65–260
65	399	Field Training	4	16	Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
65	153	Transportation Economics	2	3	76–105
65	154	Heavy Equipment Technology	2	2	65–129
65	155	Alternative Energy Sources	2	2	
65	208	Automotive Accident Analysis	2	2	65–120
65	235	Automotive HVAC Systems	2	3	65–125
65	264	Modern Automotive Systems	2	3	65–258
65	265	Automotive Engine Tribology	2	2	65–129
65	266	Automotive Dynamometer Testing	2	3	65–258
65	350	Projects	2	3	65–260
65	358	High Performance Engines	2	3	65–260

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
01	101	Islamic Culture	2	2	
65	133	Introduction to Automotive Engineering Technology	2	2	
65	134	Occupational Safety	2	2	

Department of Automotive and Marine Engineering Technology

Program: Marine Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
51	101	Fluid Mechanics	2	3	
51	102	Thermodynamics	2	3	56–113
51	103	Engineering Mechanics	2	3	76–105
51	104	Naval Arch. and Ship Construction (1)	2	3	
51	105	Manufacturing Processes	1	3	51–116
51	106	Strength of Materials	2	3	
51	225	Marine Engineering technical Drawing	2	3	51–104
51	230	Marine Heat Engines	2	3	51–102
51	233	Marine Diesel Power Plants (1)	3	6	51–102
51	237	Auxiliary Machinery	3	5	51–101
51	242	Ship Systems	3	4	51–104
51	250	Marine Propulsion Systems	3	3	51–101
51	251	Marine Electro-Technology (1)	2	3	56–103
51	253	Marine Diesel Plant Simulator	3	6	51–233
51	257	Marine Automatic Control	3	3	51–101
51	258	Marine Power Plants Maintenance	3	3	51–233
51	399	Field Training	4	16	51–105, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
51	301	Introduction to Offshore Technology	2	2	
51	302	Corrosion Protections and Monitoring	2	2	
51	303	Marine Pollution and Maritime Law	2	2	
51	304	Naval Arch. and Ship Construction (2)	2	3	51–104
51	314	Shipyard Technology	2	3	51–104
51	315	Ship Operation and Transportation	2	2	
51	333	Marine Diesel Power Plant (2)	2	3	51–233
51	335	Marine Turbines	2	3	51–102
51	341	Refrigeration and Air Conditioning	2	3	51–102
51	352	Marine Electro-Technology (2)	2	3	51–251
51	356	Advanced Pneumatic and Hydraulic System	2	3	51–257
51	367	Project	2	3	

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
01	101	Islamic Culture	2	2	
51	116	Introduction to Engineering Technology	2	2	
51	117	Marine Safety	2	2	

COURSE DESCRIPTION

51– 101 Fluid Mechanics
Credits: 2 Hours: 3
Properties of fluids. Fluid statics: pressure, pressure measurement. Forces on immersed plane surfaces, application to ship tanks and bulkheads. Fluid flow, continuity equation, Bernoulli's equation, velocity and flow measurement. Momentum and forces in fluid flow, fluid impact, jet propulsion. Dimensional analysis, similarity laws, ship model experiments, Froude, and Reynolds numbers.

51– 102 Thermodynamics
Credits: 2 Hours: 3
The state of working substance. Perfect gasses. Gas Laws. Heat and work relationship. Gas processes. The First Law for non–flow processes. The steady flow equation. Conservation of energy. Flow processes. Gasses and vapors. Reversible and non–reversible processes. The Second Law. Entropy. Heat engine cycles: Otto cycle, Diesel cycle, dual combustion cycle, gas turbine cycle. Performance of engine.
Prerequisite: 56–113

51– 103 Engineering Mechanics
Credits: 2 Hours: 3
Concurrent and non–concurrent force systems, position, and force vectors. Equilibrium of force systems for particles and rigid bodies. Application to ship cranes and steering gears. Friction. Work, energy, and power. Impulse and momentum. Newton's Second law. Kinetics of particles and rigid bodies. Gears. Centroid and moment of inertia of area. Application to midship section. Simple beams.
Prerequisite: 76–105

51– 104 Naval Architecture and Ship Construction (1)
Credits: 2 Hours: 3
Terminology of naval architecture. General arrangement of modern ship types. Buoyancy. Hull geometry. Simpson's Rule. Hydrostatic curves. Metacentric height. freshwater allowance. Initial stability. The inclining experiments. Free surface effect. Removal or addition of weights. Hogging and sagging. Racking stresses. Slamming. Framing systems. Classification Societies. Midship section of different ship types.

51– 105 Manufacturing Processes
Credits: 1 Hours: 3
Fundamentals of metal cutting. Measuring systems. Process accuracy and produced surface finish. Hand tools and machine tools with emphasis on basic lathe operations. Thread generation. Electric arc welding. Inspection of welds. Oxy–acetylene welding and flame cutting. Setting up of milling machines (horizontal and vertical), drill presses, hydraulic press, and vertical band saw. Knurls, shoulders, cuts off in lathe using proper procedures. Pipe threading and welding. Cutting methods using oxy fuel torch and associated equipment. The plasma arc cutting process. Gas tungsten arc welding.
Prerequisite: 51–116

51– 106 Material Technology
Credits: 2 Hours: 3
Basic metallurgy, metals and processes, properties of materials (Physical, Chemical, Electrical and Mechanical). Mechanical properties and Strength of materials. Properties of metals and alloys, Selection and Heat Treatment of the Marine Materials (Metallic metals and alloys), Classification, properties, and heat treatment of Non–metallic metals and alloys. Rubber, Plastics, Fiberglass, and Other important materials used in marine.

51– 115 High Performance Boats Tech.
Credits: 2 Hours: 3
General on leisure boats, jet ski propulsion engines: propulsion and jet pumping systems. Boat geometry and hull materials. mechanical and Electrical systems: Tools, Engines disassembly procedure. Engines maintenance check points. Lubrication oil system. Water cooling system. Fuel oil system. Air intake and exhaust systems. Electrical system (DC electric theory and batteries). Auxiliary equipment. Trouble shootings. Deck hardware. Power estimation and sizing outboard engine, boats hull, and propellers.

51– 116 Introduction to Engineering Technology
Credits: 2 Hours: 2
Describe some of the subfields of engineering, what are the differences between engineering and engineering technology, Role of engineering technology in society, being successful in engineering colleges and industry, Project management and Teamwork Skills, Engineering tools overview, Using spreadsheets and computer software, Engineering ethics and professional responsibility, The Human–Machine Interface. Engineers and the real world. Knowledge of fundamental physics and mathematics. Employ engineering measurements, units, and conversions, Engineering methods and problem solving, Job opportunities for engineering technology, learning to speak, write, and make presentations. Field visit and report writing.

51– 117 Marine Safety
Credits: 2 Hours: 2
General safety roles, Safety systems –. Relevant IMO/SOLAS/Class Regulations and conventions concerning safety of life at sea. Types of hazards. Fire protection and firefighting equipment: Fire detection systems, fire–main systems, CO2 and foam extinguishing systems, hand portable and semi–portable fire extinguishers. Lifesaving appliances: Lifeboats, L.S.A.
Boats life rafts, PFDs, exposure suits, ring life buoys, ship's distress signals and emergency equipment. Safe handling dangerous, hazardous, and harmful cargoes.

51– 225 Marine Engineering Technical Drawing
Credits: 2 Hours: 3
This course introduces the students to the use of naval architecture related software, and to solve simple technical problems in marine engineering. Further, it introduces the students to the basic elements of programming.
Prerequisites: 51–104

51– 230 Marine Heat Engines
Credits: 2 Hours: 3
Steam cycles. Main components of marine steam plants: Boilers, turbines, marine condensers, condensate pumps, deaerators, feed pumps, heaters. Economizers. Boiler types, specifications, construction, operation, control. Fuel systems. Draft systems. Superheating and de–superheating. Water treatment. Marine auxiliary boilers. Heat recovery. Marine steam turbines: construction, operation, and control.
Prerequisite: 51–102

51– 233 Marine Diesel Power Plants (1)
Credits: 3 Hours: 6
General discerption of Marine diesel engines. Principles of 2– and 4–stroke diesel engines. Scavenge of marine diesel engines. Requirements for marine diesel engines. Engine structure: Cylinders, cylinder heads and combustion chambers. Valves. Pistons and piston rings. Crankshafts. Flywheels. Vibration dampers. Marine fuel types properties. Injection pumps and injectors for marine diesel engines. Timing diagrams. Indicator diagrams. Power calculations. Slow speed marine diesel engines.
Prerequisite: 51–102

51– 237 Auxiliary Machinery
Credits: 3 Hours: 5
Pumps: Types of marine pumps and their applications and characteristics. Rotor dynamic pumps: Centrifugal pumps, mixed flow pumps and axial flow pumps. Positive displacement pumps: Reciprocating and rotary pumps (screw and gear pumps). Factors affecting pump performance. Ejectors. Piping – various types of piping system fitted in ships, valves, types used in Marine Practice. Marine Heat exchangers. Air compressors. Marine distilling plants. waste heat recovery systems. Marine sanitation systems. Marine oily water separators centrifuges, purifiers, and clarifiers.
Prerequisite: 51–101

51– 242 Ship Systems
Credits: 3 Hours: 4
Steering system: The action of the rudder in steering a ship. Types of rudders. Rudder carrier and pointless. Steering gear. Design requirements. Types of steering gear: Hydraulic, Electric, and Electrohydraulic. Anchoring systems: Anchor handling arrangements from hawse pipe to spill pipe. Windlass and capstan arrangement on the deck. Mooring of ship: arrangement of mooring lines, fairleads and mooring bitts. Cargo handling gear: Masts and Sampson posts. Boom types and deck cranes. Cargo access and automatic hatch covers. Ship piping systems: Bilge, Ballast, Fresh water, etc.
Prerequisite: 51–104

51– 250 Marine Propulsion Systems
Credits: 3 Hours: 3
Ship resistance. Model testing. Propeller as a thrust producing mechanism, Powering. Types of marine power plants. Fuel consumption calculations. Engine room layout. Shafting: Arrangement, loads, bearings, stern tubes, thrust blocks, alignment, reduction gears. Torsional vibrations. Combined marine power plants. Marine propellers. Propeller geometry. Propeller theory. Interaction between Hull and propeller. Cavitation. Propeller strength– Materials and their qualities. Different types of marine propellers.
Prerequisite: 51–101

51– 251 Marine Electro–Technology (1)
Credits: 2 Hours: 3
Basic electrical concepts and relationships. DC electric circuits. Series and parallel circuits. Capacitors and inductors. Electromagnetic induction. Sources of electrical power onboard ships. System configuration. Storage batteries. DC generators. AC generators. Main and emergency generator, shaft generator. Load analysis. Switchboards. Shipboard cabling and installations, Lighting systems on ships.
Prerequisite: 51–103

51– 253 Marine Diesel Plant Simulator
Credits: 3 Hours: 6
Engine room arrangement. Identification of systems and components. Engine cold start. Emergency generators. Compressed air starting system. Shore connections. Engine continuous operation. Engine shutdown. Diesel generators. Turbogenerators. Synchronizing generators. Power distribution. Boiler operation. Engine room blackout and emergency procedures. Engine room troubleshooting.
Prerequisite: 51–233

51– 257 Marine Automatic Control
Credits: 3 Hours: 3
Pressure, temperature, level, flow, and other measuring devices. Automatic control system analysis and performance. Concepts of on/off, proportional, integral, derivative control schemes. Automatic control valves. Pneumatic and electronic control principles and systems. Typical shipboard control systems, e.g. Fuel, Cooling systems. Engine room controls.
Prerequisite: 51–101

51– 258 Marine Power Plants Maintenance
Credits: 3 Hours: 3
Maintenance policies. Duties and responsibilities of workers and supervisors. Use of personal safety equipment. Types of maintenance schemes: Corrective, preventive, and predictive maintenance. Maintenance scheduling. Inspection, maintenance and repair of main engine and auxiliaries. Hull inspection and maintenance. Docking arrangements. Computerization of planned maintenance systems.
Prerequisite: 51–233

51– 301 Introduction to Offshore Technology
Credits: 2 Hours: 2
An introduction to offshore drilling systems. Oil and gas production systems. Types of drilling rigs. Mooring and anchor handling. Subsea equipment. Tanker loading terminals and buoy systems. Support systems and logistics. Pipe laying techniques. Salvage and rescue operations. Diving and submersibles. Role of Classification Societies. Supply and Workboats.

51– 302 Corrosion Protections and Monitoring
Credits: 2 Hours: 2
Definition of corrosion, Corrosion cost, Corrosion monitoring and its performance in corrosion prevention and control. Corrosion fundamentals and characterization techniques. Cathodic and Anodic Protection and comparisons. Electrochemical techniques for corrosion monitoring. Physical and Chemical methods for corrosion monitoring. Corrosion monitoring in particularly environments.

51– 303 Marine Pollution and Maritime Law
Credits: 2 Hours: 2
Sources of marine pollution. Types of marine pollutants. Natural processes acting on spilled oil (weathering). Containment and recovery of oil. Treatment of recovered oil. Shipboard oil pollution contingency plan. Implementation of MARPOL 73/78 Convention. Control of oil from machinery. Discharge criteria. Oil Record Book. Oil and hazardous material transfer operations. Rules for tankers carrying oil in bulk. International Maritime Law, Contracts, Agency, Insurance, Accident tort, Carriage, Towage and Salvage Laws, International conventions.

51– 304 Naval Architecture and Ship Construction (2)
Credits: 2 Hours: 3
Hull form definition of ships and ocean structures; Deadweight, capacity and tonnage measurement Hydrostatic calculations, Bonjean's calculation and curves, sectional area curve, stability at large angles; Intact and damaged stability computations; Damaged stability and its calculation by lost buoyancy and added weight methods; IMO stability criteria; Subdivision and floodable length calculations; Subdivision indices; Launching calculations; Stability of fully submerged body; Stability of multibody systems; Pressure integration technique of computing hydrostatic and stability. Structural components – bottom construction, shell plating, decks, fore and aft peak construction, superstructure and deckhouses, bulkheads.
Prerequisite: 51–104

51– 314 Shipyard Technology
Credits: 2 Hours: 3
Ship design stages. Shipyard layout. Stockyard. Material preparation stage. Lofting operation (conventional, optical, computer aided lofting). Main fabrication processes of component ship parts in shipyards. Sub assembly and assembly stages. Erection of ship's hull. Installation of machinery and shafting. Launching methods. Test trials and delivery. Docking and repair technology.
Prerequisite: 51–104

51–315 Ship Operation and Marine Transportation
Credits: 2 Hours: 2
Introduction to the maritime transport industry. International shipping organizations. Supply and demand in maritime transport. Multi modal transport. Containerization. Container terminal operations. Logistics information systems. Maritime law. Commercial arbitration. Marine insurance. Cargo claims. Liabilities. PandI Clubs. Legal aspects in ports.

51– 333 Marine Diesel Power Plants (2)
Credits: 2 Hours: 3
Engine scavenging. Air intake and supercharging. Turbochargers. Exhaust systems. Engine lubrication oils and systems. Marine engines cooling systems. Saltwater system. Starting and reversing of marine engines. Mixing tanks. Governors. Engine heat balance. Engine performance and heat balance diagrams. Fuel injection components and systems. Troubleshooting. Emergency marine generators, Engine monitoring. Engine shutdown.
Prerequisite: 51–233

51– 335 Steam and Gas Turbines
Credits: 2 Hours: 3
Thermodynamic process in turbines. Impulse, reaction turbines. Blading. Nozzles and diaphragms. Casing and foundation. Sealing. Auxiliary turbines. Lubricating systems, oil purifiers. Bearings. Marine reduction gears. Couplings. Throttles and controls. Governors. Over speed devices. Turbine operation monitoring. Gas turbines. Compressors. Combustion chambers.
Control of gas turbines.
Prerequisite: 51–230

51– 341 Refrigeration and Air Conditioning
Credits: 2 Hours: 3
Refrigeration cycles and components. Refrigerants and lubricants. Operation, maintenance and troubleshooting of refrigerating systems. Air conditioning theory. Properties of air. Air conditioning systems and components. Operation, maintenance and troubleshooting of air conditioning systems. The marine environment and special requirements for marine refrigeration systems.
Prerequisite: 51–102

51– 352 Marine Electro–Technology (2)
Credits: 2 Hours: 3

Electrical Power Systems: (AC circuits, Power Factor, Power Management). Electronic Principles and Systems: (Signal Shaping, Power Supplies, Amplifiers and Oscillators, Digital Devices and Systems, Displays, Measuring Instruments). Electrical Machines: Synchronous motors and induction machines. Advanced Marine Electrics: (DC and AC Circuits, Semiconductor Components and Systems).
Prerequisite: 51–251

51– 356 Pneumatic and Hydraulic Systems
Credits: 2 Hours: 3
Pascal's law, Pressure measurement, Fluid flow, Temperature measurement, Gas laws. Hydraulic pumps and pressure regulation, Air compressors, air treatment and air pressure regulation. Check valves, sequence valves and proportional valves. Linear and rotary actuators. Hydraulic and pneumatic auxiliary equipment. Process control pneumatics. Process control actuators. Sequencing applications. Safety, fault finding and preventative maintenance. Types and principle of operation of pneumatic and hydraulic marine industrial power systems, Design and assemble and test a fluid power and control system, fault findings.
Prerequisite: 51–257

51– 367 Project
Credits: 2 Hours: 4
Teams of several students conceive and complete a marine design project under the supervision of a faculty member, most often in one of the fields they studied, namely, marine power plants, auxiliary machinery, ship systems, naval architecture, propulsion systems or small boat technology. Oral presentation and written report are required.
Prerequisite: 51–237

51– 399 Field Training
Credits: 4 Hours: 16
Students should spend 14 weeks in an industrial field such as: Shipyards, Repair yards, Marine salvage and firefighting centers, Coast Guard centers, Shipping companies, to get acquainted with real life to participate in real life practices and daily work routines. The student is enrolled in small groups under mutual supervision from college and industrial establishment to carry out some assignments under a mutual supervision from college and industrial establishment.
Prerequisite: 51–105, Passing 50 credits

65– 120 Statics
Credits: 2 Hours: 3
General principles: mechanics, fundamental concepts, units of measurement, the international system of units, numerical calculations; Introduction to statics including vectors and scalars, forces, moments of force; equilibrium of a particle and rigid bodies covering free–body diagrams; structural analysis and trusses; internal forces and shear; friction; center of gravity and centroids, and Moments of inertia; Application of mechanics in automotive industry.

65– 124 Mechanics Skill Workshop
Credits: 1 Hours: 3
Automotive workshops safety precautions, procedures, and hazardous materials. The students will be trained on using different tools, devices and equipment that are encountered in automotive workshops. This shall include hand/power/special tools, lifting equipment, measurement tools, diagnostic tools, welding equipment, machining equipment, electrical and electronic testing devices.

65– 125 Thermodynamics
Credits: 2 Hours: 3
Fundamentals of thermodynamics including work and heat; Thermodynamic properties of fluids including ideal gases. Thermodynamic processes. Classical approach to first and second laws of thermodynamics with applications; entropy, reversibility, irreversibility. Applications of thermodynamic principles to air standard cycles, otto cycle, diesel cycle and dual cycle.
Prerequisite: 76–105

65– 126 Fluid Mechanics
Credits: 2 Hours: 3
Fluid mechanics fundamentals and applications. Topics include fluid properties, fluid static, manometer, pressure gauges, classification of fluid flow, conservation of mass, Bernoulli's equation, flow measurements, friction losses in pipes and pipe system connections. Fluid mechanics application in the automotive engineering.
Prerequisite: 76–105

65– 128 Automotive Material Technology
Credits: 2 Hours: 3
General classification of materials including metals, polymers, ceramics, and composites. Emphasis on processing, structure, properties, performance, and selection of these materials for automotive engineering applications. Understand the different heat treatment processes, their applications. Problem–solving skills are developed in the areas of materials selection, evaluation, measurement, and testing.

65– 129 Automotive Engines Technology
Credits:3 Hours: 5
Automotive engines (spark –SI – and compression ignition – CI) cycles, construction, parts, functions, and materials. Engine systems such as cooling, lubrication, intake, exhaust, forced induction, ignition, and fuel. Students are trained to diagnose, repair, disassemble and reassemble engine and related parts.
Prerequisite: 65– 124

65– 132 Vehicle and Traffic Safety
Credits: 3 Hours: 3
General road safety rules. Traffic related injuries, effect on life, and cost for society and means to reduce these injuries and cost. Major causes of car accidents. Human physical and mental factors. Restraint designs and their principal function; for adults, children and vulnerable road users. Infrastructure design to reduce accident risk and impact severity. Vehicle control and traffic procedure. Future vehicle designs.

65– 133 Introduction to Automotive Engineering Technology
Credits: 2 Hours: 2
Introduction to automotive engineering "terminology" and the different disciplines incorporated in automotive engineering technology field as well as the skill set needed to be successful in automotive engineering technology. Focus will be on individual and professional development including teamwork, problem identification, developing analytical skills, time and resource management, project planning, design, implementation and evaluation. Role of automotive engineering technology in society. Job opportunities for automotive engineering technology.

65– 134 Occupational Safety
Credits: 2 Hours:2
This course offers students an introduction to standards and guidelines for safety in automotive field, with special emphasis on automotive workshops and garages. Topics include the need and justification for safety in the workplace, legal aspects of safety related insurance policies, common incidents and accidents, first aid and emergency procedures, and safety investigation procedures. Furthermore, it covers protection against mechanical and non–mechanical (e.g. chemical and electrical) hazards.

65– 153 Transportation Economics
Credits: 2 Hours: 3
Study of factors affecting automotive transportation and how they affect selection of transportation units. Fixed and variable transportation costs. Transportation cost optimization.
Transportation Systems, management, and marketing.
Prerequisites: 76–105

65– 154 Heavy Equipment Technology
Credits: 2 Hours: 2

Heavy equipment types, construction, theory of operation, performance characteristics and productivity rates. General hydraulic and pneumatic control and power transmission systems.
Prerequisite: 65–129

65– 155 Alternative Energy Sources
Credits: 2 Hours:2
Study of alternative fuel and energy systems, fuel delivery systems, alternative propulsion systems, hybrid and alternative propulsion. Study of energy conversion, battery design, fuel cells, renewable and fossil fuel. Also, internal combustion engines burning hydrogen and reformulated fuels. Environmental concerns with current legislative actions will be discussed.

65– 205 Automotive Mechanics
Credits: 3 Hours: 3
Automotive workshop safety rules. Operating principles and working cycles for automotive engines. Function, components and operation of engine parts. Function, components, operation and troubleshooting of different automotive systems. Automotive emissions and their control devices. Automotive maintenance schedule.

65– 208 Automotive Accident Analysis
Credits: 2 Hours: 2
Automotive Accident Analysis guides the student through every step of analyzing vehicular accidents. This course explains the procedures involved in accident investigation and reconstruction and offers a constant source of reference on topics such as occupant kinematics, the history of safety equipment.
Prerequisite: 65–120

65– 235 Automotive HVAC Systems
Credits: 2 Hours: 3
Study of the main components and functions of automotive heating, ventilation, and air conditioning systems. The course includes theory of operation, diagnosis, and repair of HVAC systems. Environmental safety issues are stressed including law and regulations. Computerized automatic temperature–controlled systems are also covered.
Prerequisite: 65–125

65– 250 Engineering Drawing
Credits: 2 Hours: 3
An Introductory course in the fundamentals and practices of engineering drawing. Manual drafting techniques include the use of drawing instruments, geometric construction, orthographic projection, technical sketching, sectional and auxiliary views and proper dimensioning techniques. Manufacturing and assembly specifications in engineering drawing. This course deals with generation of two–dimensional and three–dimensional drawing using Auto CAD. It also deals with the inserting dimensions and text in drawing.
Prerequisite: 65–129

65– 256 Internal Combustion Engines
Credits: 3 Hours:4

Fuel Structure and Properties, SI engine fuels and Diesel Fuels. Alternative fuels: types, uses, advantages and disadvantages. Combustion in SI engines, normal and abnormal combustion. Combustion in CI engines, normal and abnormal combustion. Combustion Chambers design. Scavenging and charging Systems. Engine Performance and related curves/graphs. Brake Power, Indicated Power and Friction power. Torque, Brake and Indicated Mean Effective Pressure (i.m.e.p). Fuel Consumption, mechanical, thermal and volumetric efficiencies. Introduction to HCCI and CAI Engines.
Prerequisite: 65–125

65– 257 Automotive Fuel Systems
Credits: 3 Hours: 4

Study the effect of air fuel mixture on gasoline engines performance (rich, stoichiometric and Lean mixtures). Study gasoline fuel system components and functions with particular emphasis placed on microprocessor control systems. Injection systems types (construction, operation, testing). Different types of diesel fuel systems, construction, theory of operation, advantages and disadvantages, disassembling, reassembling, testing, and service procedures of each type. Electronically controlled systems will be covered.
Prerequisite: 65–129

65– 258 Automotive Powertrain Technology
Credits: 3 Hours.: 5
This course covers manual, automatic transmissions/transaxles, and driveline components. This includes the function, construction, operation, inspection, troubleshooting and servicing of front, rear, and four – wheel drive power transmission devices used in passenger cars and light trucks.
Prerequisite: 65–120

65– 259 Automotive Chassis Technology
Credits: 3 Hours: 5
Understand the construction details of various types of automotive chassis and basic functions of subsystems in the chassis. Function of suspension system, brake system, steering system and wheels and tires in the vehicles.
Prerequisite: 65–258

65– 260 Automotive Electrical and Electronic Systems
Credits: 3 Hours: 4
Study of electric and electronic circuit fundamentals, functions, construction, operation and testing for: storage battery, charging, cranking and ignition systems. Study, diagnose and repair for: lighting, signaling, hazard flashers, windscreen washers and wipers, horns, electric power door locks, power windows, analog dash instruments, computer– controlled instrument panel, driver information center, cruise control and heating, ventilation and air conditioning fundamentals.
Prerequisite: 65–257

65–261 Automotive Emission and Control
Credits: 2 Hours: 3
This course introduces students to the fundamentals of engine exhaust emissions, including their formation mechanisms, their sources, and their effects. The students will be familiarized with the present emission control technologies and future challenges. The topics covered include engine emissions and air pollution, review of emission regulations, emission control systems, catalyst fundamentals, and catalyst–based engine after treatment techniques for gasoline, diesel, and lean burn engines, discussion of cold–start emission control and breakthrough catalytic technologies.
Prerequisite: 65–256

65–264 Modern Automotive Systems
Credits: 2 Hours: 3
Principles, concepts, and components of automotive control systems. Modern control systems of engine, power transmission, suspension, steering, brakes, safety, and stability.
Prerequisite: 65–258

65–265 Automotive Engine Tribology
Credits: 2 Hours: 2
Introduction to Tribology. Engine tribology basics. Friction and wear. Friction components: crankshaft friction, reciprocating friction, valve train, auxiliary components, pumping losses. Types of wear mechanism. Factors affecting wear. Bearing, lubrication and automotive lubricants. Mode of Lubrication.
Prerequisite: 65–129

65– 266 Automotive Dynamometer Testing
Credits: 2 Hours: 3
Dynamometer types, operation, calibration. Methods of designing and preparing laboratories and workshops for engine/vehicle performance testing. Testing engine/vehicle performance under steady and transient operating conditions. Observing the influence of different engine subsystems (fuel injection system, ignition system, intake system and exhaust system) on the performance.
Prerequisite: 65–258

65– 267 Automotive Safety
Credits: 1 Hours: 1
Introduction to vehicle safety. Safety equipment. Safety and comfort systems: antilock braking system, traction control system, electronic stability program, low tire pressure warning system, collision avoidance systems, steering and mirror adjustment, central locking system, tire pressure control system, rain sensor system, and environment information system.
Prerequisite: 65–258

65– 268 Diesel Systems Technology
Credits: 2 Hours: 3
Diesel Performance and Diagnosis. Diesel engines electronic controls. Truck air systems, brakes, and preventative maintenance. Diesel steering and suspensions. Diesel engine diagnosis and repair.
Prerequisite: 65–129

65– 269 Hybrid and Electric Vehicles
Credits: 2 Hours: 3
Comparison between conventional automotive and hybrid and electric cars. Types, characteristics, operation, construction, and performance of hybrid and electric cars and their components. Operating economics of hybrid and electric cars.
Prerequisite: 51–260

65– 350 Projects
Credits: 2 Hours: 3
Teams of several students conceive and complete an automotive design project under the supervision of a faculty member, most often in one of the fields they studied, namely, automotive engine, automotive systems, automotive maintenance, automotive safety, or automotive tools. Oral presentation and written report are required.
Prerequisite: 65–260

65– 356 Vehicle Dynamic
Credits: 3 Hours: 4
The fundamentals of vehicle dynamics including vehicle performance, braking performance, vehicle loads (aerodynamics, rolling resistance), ride, steady–state cornering, suspension, rollover, and tires.
Prerequisite: 65–259

65– 357 Automotive Drivability Diagnosis
Credits: 3 Hours: 4

Automotive performance diagnostic methods and strategies by using traditional and advanced diagnostic equipment. Analyzing physical measurement (pressure, temperature, voltage) for different automotive mechanical and electrical systems to discover the root cause of automotive performance faults.
Prerequisite: 65–260

65– 358 High Performance Engines
Credits: 2 Hours: 3
Mechanical design requirements of high–performance engines and its subsystems. Fundamentals of turbocharger selection, intercooler design, fuel injection requirements, intake and exhaust systems, control and testing engine performance.
Prerequisite: 65–260

65– 399 Field Training
Credits: 4 Hours: 16
Students should spend 14 weeks in one of automotive dealer garages, to get acquainted with real life to participate in real life practices and daily work routines. The student is enrolled in small groups under mutual supervision from college and industrial establishment to carry out some assignments. Students should submit a final report at the end of training period to a committee in the department, where he will be examined.
Prerequisite: Passing 50 Credits

Department of Chemical Engineering Technology

Overview:

The programs of the Department of Chemical Engineering Technology aim to give the student a thorough understanding of chemical engineering by combining theoretical aspects of the discipline with hands–on practical experience, all taught within a friendly and informal atmosphere through five–semester educational and training programs. The graduate will be able to enter and succeed in working in petroleum refineries and chemical industry. The program graduate is an 'Assistant Engineer', and can serve in operation, maintenance, and safety inspection of chemical and petroleum industry. The department offers a baccalaureate in engineering technology that started in the 2012–2013 academic year. The program graduate is an Engineer and can serve in one or more of the four tracks listed below.

Programs:

This department was established in 1976/1977 as part of Kuwait Institute for Applied Technology offering a single applied education program on 'Unit Operation' until it was replaced in 1980 by two majors on 'Chemical Industries' and 'Petroleum Industries'. The two majors were under continuous revision based on job market needs, industry required skills, and technology progress to emerge as

- Refinery Operation Technology
- Chemical Industries Technology

The baccalaureate degree program has four different technology tracks directed to serve workforce markets and they are:

1. Petroleum Technology Track.
2. Chemical Processing Technology Track.
3. Water and Environment Technology Track.
4. Industrial Safety Technology Track.

Department Laboratories

The department runs eleven laboratories, all equipped with state–of–art experimental apparatus to simulate and analyze professional aspects of chemical process technology and refinery operation technology:

- General Chemistry Laboratory
- Physical Chemistry Laboratory
- Fluid Mechanics Laboratory
- Water Technology Laboratory
- Heat Transfer Laboratory
- Mass Transfer Laboratory
- Corrosion Laboratory
- Petroleum Refining Laboratory
- Petroleum Products Testing Laboratory
- Process Control Laboratory
- Air Pollution Laboratory

Department of Chemical Engineering Technology

Program: Chemical Engineering Technology (Baccalaureate)

1. Major Core Courses (48 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	151B	Introduction to Chemical Engineering Technology	3	3	75-151C, 76-101B
55	231B	Physical Chemistry	3	3	75-101C
55	232B	Physical Chemistry Laboratory	1	2	75-101C
55	251B	Transport Phenomenon	3	3	55-151B, 76-201B
55	252B	Unit Operations Laboratory (1)	2	4	55-151B, 76-201B
55	261B	Chemical Engineering Thermodynamics	3	3	55-151B, 55-231B
55	291B	Field Training (1)	3	20	55-251B
55	302B	Unit Operations Laboratory (2)	2	4	55-252B
55	321B	Chemical Reaction Engineering	3	3	55-251B, 55-261B
55	331B	Environmental Engineering	3	3	55-151B
55	351B	Equipment Operation and Safety	3	3	55-221B, 55-251B
55	361B	Computer Applications in Chemical Engineering	3	3	55-251B, 60-151B
55	381B	Unit Operations	3	3	55-251B
55	391B	Process Dynamics and Control	3	3	55-321B
55	392B	Process Dynamics and Control Laboratory	1	2	+55-391B
55	401B	Field Training (2)	3	20	55-291B, 55-391B
55	402B	Equipment Sizing and Selection	3	3	30-201B, 55-381B
55	451B	Process Modeling, Simulation, and Optimization	3	3	55-361B, 55-391B

2. Major Elective Courses (9 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	211B	Material Science and Corrosion	3	3	55-151B
55	461B	Quality Control	3	3	76-202B
55	463B	Pharmaceutical Technology	3	3	55-381B, 75-151C
55	467B	Oil Upstream Operations	3	3	55-381B
55	468B	Biotechnology	3	3	55-321B, 55-381B
55	469B	Special Topics in Chemical Engineering Technology	3	3	55-402B
55	471B	Project in Chem. Eng. Tech.	3	3	30-201B, 55-401B
55	492B	Advanced Process Control	3	3	55-391B

3. Technology Track Requirements Courses (9) Credits

Track One: Petroleum Technology Code: 046501-BA

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	403B	Refining Processes	3	3	55-381B
55	404B	Refining Products and Testing	3	4	75-241B, 55-403B
55	407B	Catalysis	3	3	55-321B

Track Two: Chemical Processing Technology Code: 046502-BA

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	411B	Chemical Processes Technology	3	3	55-381B
55	413B	Separation and Mixing Processes	3	4	55-381B, 75-241B
55	415B	Polymer Technology	3	3	55-321B

Track Three: Water and Environment Technology Code: 046503-BA

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	421B	Water Desalination Technology	3	3	55-381B
55	423B	Wastewater Treatment	3	4	55-321B
55	441B	Pollution Management and Control	3	3	55-321B, 75-241B

Track Four: Industrial Safety Technology Code: 046504-BA

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
55	431B	Hazard Recognition, Evaluation, and Control	3	3	55-351B
55	433B	Industrial Hygiene and Ergonomics	3	3	55-431B
55	435B	Safety Personnel Duties	3	3	55-431B

4. Courses Transferred to diploma graduates (63) Credits

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
64	101B	Engineering Drawing	2		
60	151B	Introduction to Computing	3		
55	221B	Industrial Safety	2		
30	101B	English (1)	3		
01	102B	Islamic Culture	3		
03	231B	Loyalty and Work Ethics	3		
		Free Elective 1	3		
		Free Elective 1	3		
76	101B	Math (1)	3		
56	101C	Physics (1)	3		
56	105B	Physics Laboratory (1)	1		
75	101C	General Chemistry	3		
75	105B	General Chemistry Laboratory	1		
55	151B	Introduction to Chem. Eng. Tech.	3		
55	231B	Physical Chemistry	3		
55	232B	Physical Chemistry Laboratory	1		
55	251B	Transport Phenomenon	3		
55	252B	Unit Operations Laboratory (1)	2		
55	351B	Equipment Operation and Safety	3		
55	331B	Environmental Engineering	3		
55	291B	Field Training (1)	3		
		Major Elective 1	3		
		Major Elective 2	3		
		Major Elective 3	3		

Department of Chemical Engineering Technology

Program: Chemical Process Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
75	110	General Chemistry	3	4	
81	255	Transport Phenomena	4	5	75–110, 56–113
81	280	Unit Operations	4	5	81–255
81	283	Thermodynamics	3	3	82–183
81	293	Reactor Technology	3	3	82–183, 76–106
81	295	Measurement and Control	3	5	81–293
82	169	Introduction to Computers	2	4	
82	183	Chemical Eng. Calculations	3	3	75–110, 76–105
82	273	Quality Control	2	4	76–106, 82–169
82	282	Computer Applications in Chemical Engineering	2	4	81–283, 81–280
82	304	Chemical Processes	4	5	81–293,82–273
82	395	Equip. Operation and Safety	3	3	82–304, 81–295
82	399	Field Training	6	18	81–293,82–282, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
81	163	Oil and Natural Gas	3	3	82–183
81	192	Polymer Engineering	3	3	82–183
81	286	Air Pollution	3	3	81–293
81	288	Catalysis	3	3	81–293
82	223	Chemical Engineering Calculations (2)	3	3	82–183
82	264	Industrial Corrosion	3	3	81–293
82	277	Wastewater Treatment	3	3	82–273
82	278	Water Desalination	3	3	82–273
82	285	Chemical Engineering Thermodynamics	3	3	81–283
82	288	Optimization	3	3	82–282
82	289	Topics in Chemical Engineering	3	3	82–282
82	305	Project	3	3	82–304

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
81	270	Industrial Safety	2	2	30–162
81	290	Introduction to Environmental Engineering	2	2	81–270, 30–171

Department of Chemical Engineering Technology

Program: Refinery Operating Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
75	110	General Chemistry	3	4	
81	255	Transport Phenomena	4	5	75–110, 56–113
81	273	Petroleum Prod. and Testing	2	4	76–106, 82–169
81	280	Unit Operations	4	5	81–255
81	283	Thermodynamics	3	3	82–183
81	293	Reactor Technology	3	3	82–183, 76–106
81	295	Measurement and Control	3	5	81–293
81	304	Petroleum Refinery Processes	4	5	81–293,81–273
81	395	Refinery Equipment Operation and Safety	3	3	81–304, 81–295
81	399	Field Training	6	18	81–293,82–282, Passing 50 credits
82	169	Introduction to Computers	2	4	
82	183	Chemical Eng. Calculations	3	3	75–110, 76–105
82	282	Computer Applications in Chemical Engineering	2	4	81–283, 81–280

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
81	163	Oil and Natural Gas	3	3	82–183
81	192	Polymer Engineering	3	3	82–183
81	286	Air Pollution	3	3	81–293
81	288	Catalysis	3	3	81–293
81	305	Project	3	3	81–304
82	223	Chemical Engineering Calculations (2)	3	3	82–183
82	264	Industrial Corrosion	3	3	81–293
82	277	Wastewater Treatment	3	3	81–273
82	278	Water Desalination	3	3	81–273
82	285	Chemical Engineering Thermodynamics	3	3	81–283
82	288	Optimization	3	3	82–282
82	289	Topics in Chemical Engineering	3	3	82–282

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
81	270	Industrial Safety	2	2	30–162
81	290	Introduction to Environmental Engineering	2	2	81–270, 30–171

COURSES DESCRIPTION

1. Baccalaureate Program

01-102B Islamic Culture
Credits: 3 Hrs.: 3
The impact of Islam on Arabic culture, cultural meaning of Islamic rules, and tradition of early Islamic communities.

03-105B Islamic Arabic Civilization
Credits: 3 Hrs.: 3
The course deals with the concept of civilization, foundations and characteristics of Islamic civilization, Arab civilization before Islam, (the political system, the financial and administrative system, the judiciary system and its development, the military system), social life in Muslim countries, economic life, development of the education system in Islam, Islamic arts, cultural and ideological renaissance, Arabic and Islamic civilization systems, their features in science and literature, influence of the Arab and Islamic civilization on modern European renaissance.

03-115B Kuwait and Development
Credits: 3 Hrs.: 3
The course is an integrated study of the development of Kuwait, covering the historical, geographical, economic and demographic aspects. The course also deals with services offered as education and its reflection on development and cultural and scientific renaissance. Also, it deals with Kuwait's relations with the outside world.

03-231B Loyalty and Work Ethics
Credits: 3 Hrs.: 3
Professional ethics, of moral issues which are important and relevant to engineers, including: the social responsibility of engineers; conflicts of interest; intellectual property issues; codes of conduct; corporate responsibility and the ethics of whistle-blowing; environmental issues; morally acceptable levels of risk; and the moral implications of technology.

15-107B Introduction to Psychology
Credits: 3 Hrs.: 3
This course discusses the principles of behavior, its influences and academic objectives, the well-known schools in psychological applications and methods of research, sensory organs of perceptions, glands and the nervous system, motives and emotions, memory, learning, intelligence and individual differences and behaviors of disturbances and their treatments.

22-104B Establishing and Managing Small Businesses
Credits: 2 Hrs.: 2
Definition, criteria, forms and characteristics of small projects. Pioneering, foundation and implementation. Factors of success and failure. Planning and organization of small projects. Decision making, counseling and leadership, and supervision. Management of human resources. Financial and marketing management. Feasibility study and credit and revenue systems .

30-101B English (1)
Credits: 3 Hrs.: 3
Skills in listening, speaking, reading, and writing, with a special emphasis on reading; development of reading skills; developing critical thinking; respond to ideas in a well-organized written format; reading-related writing skills.

30-151B English (2)
Credits: 3 Hrs.: 3
Reinforcement of academic writing skills; writing of different types of essays based on the ideas they are exposed to in the reading selections; emphasis on the writing process from brain storming and outlining to producing a complete documented piece of writing.
Prerequisite: 30-101B

30-201B Technical Report Writing
Credits: 3 Hrs.: 3
Principles of organizing, developing, and writing technical information such as: preparation of project proposals and reports, professional oral presentation; report forms and rhetorical patterns common to scientific and technical disciplines; technical writing conventions; Numerous written assignments required.
Prerequisite: 30-151B

55-151B Introduction to Chemical Engineering Technology
Credits: 3 Hrs.: 3
Basic Concepts and unit conversion; introduction to chemical engineering and chemical process industry; flow sheets fundamentals: units, concentrations, gasses and gas mixtures; steady state material and energy balances; introduction to unsteady state material and energy balance.
Prerequisite: 75-151C, 76-101B

55-211B Material Science and Corrosion
Credits: 3 Hrs.: 3
Fundamentals; atomic structure, atomic arrangement, atomic imperfections, mechanical properties, processing and concept of engineering design of materials; electrochemical basis of corrosion, corrosion prevention by cathodic protection, inhibitors, alloying and heat treatment, passivation, stress corrosion cracking, corrosion fatigue.
Prerequisite: 55-151B

55-221B Industrial Safety
Credits: 2 Hrs.: 2
Overview of industrial safety and general causes of accidents; industrial hygiene and loss statistics; safety economics; classification of hazards; hazard identification and risk assessment, personal protective equipment, ergonomics and Work related Musculoskeletal Disorders (WMSD's).
Prerequisite: 30-151B

55-231B Physical Chemistry
Credits: 3 Hrs.: 3
Properties of pure substances: Phase diagrams, Property tables, equations of state; The first law of thermodynamics and applications for closed and open systems; The second and third law of thermodynamics and applications; chemical reaction equilibria.
Prerequisite: 75-101C

55-232B Physical Chemistry Laboratory
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of physical chemistry.
Co-requisite: 75-101C

55-251B Transport Phenomena
Credits: 3 Hrs.: 3
Formulation of the physical laws of momentum, heat, and mass transport, with emphasis on their interrelationship. Application of these principles to basic transport processes. Diffusive and convective transport mechanisms.
Prerequisite: 55-151B, 76-201B

55-252B Unit Operations Laboratory (1)
Credits: 2 Hrs.: 4
Laboratory studies demonstrating principles of fluid mechanics and heat transfer. Emphasis is on laboratory safety, correlation of experimental results and on written reports and oral presentation.
Prerequisite: 55-151B, 76-201B

55-261B Chemical Engineering Thermodynamics
Credits: 3 Hrs.: 3
Review of first and second law of thermodynamics. Concepts of phase and reaction equilibria, excess properties, fugacities, activity coefficients, and models of non-ideal solutions; thermodynamics applied to chemical processes.
Prerequisite: 55-231B, 55-151B

55-291B Field Training (1)
Credits: 3 Hrs.: 20
Practical training for a period of 7 weeks in a chemical industrial facility; Emphasis on the application of chemical principles (mass and energy balance), flow sheeting, and safety regulations. Practice of engineering ethics, teamwork, and self-responsibility.
Prerequisite: 55-251B

55-302B Unit Operations Laboratory (2)
Credits: 2 Hrs.: 4
Intensive laboratory experiments illustrate the application of chemical and physical principles to chemical process; emphasis is given to mass transfer, simultaneous heat, mass transfer, and chemical kinetics.
Prerequisite: 55-252B

55-321B Chemical Reaction Engineering
Credits: 3 Hrs.: 3
Reaction equilibrium, reaction kinetics, interpretation of batch reactor data, ideal reactors, design for single and multiple reactions, isothermal and non-isothermal homogeneous reactions; introduction to heterogeneous catalysis
Prerequisite: 55-251B, 55-261B

55-331B Environmental Engineering
Credits: 3 Hrs.: 3
Fundamental principles in environmental engineering; chemical principles for separation, processing and technologies used for treating and recovery of wastes; qualitative and quantitative analysis and treatment of environmental problems; environmental legislations.
Prerequisite: 55-151B

55-351B Equipment Operation and Safety
Credits: 3 Hrs.: 3
Main tasks of a chemical plant engineer: industrial application of major equipment; practical information on the working principles and engineering basis for major equipment, monitoring operating conditions and troubleshooting, following safety regulations and using safety gear, managing startups and shutdowns, equipment maintenance, dealing with chemical process equipment emergencies; special emphasis on safety aspects of operation.
Prerequisite: 55-221B, 55-251B

55-361B Computer Applications in Chemical Engineering
Credits: 3 Hrs.: 3
Numerical methods and applications to chemical engineering problems; Lagrange interpolation; integration; numerical solution of ordinary differential equations; boundary value problems, and systems of differential equations; introduction to numerical solutions of partial differential equations; emphasis on the use of spreadsheets, Matlab, and Mathcad.
Prerequisite: 55-251B, 60-151B

55-381B Unit Operations
Credits: 3 Hrs.: 3
Fluid machinery, heat exchangers, condensers, evaporators; phase equilibria, binary and multi-components separations; equilibrium stage concept of process design for distillation and absorption
Prerequisite: 55-251B

55-391B Process Dynamics and Control
Credits: 3 Hrs.: 3
Concepts of process control, including dynamic modeling of processes, transfer functions, open loop response, feedback control, controllers and tuning methods, closed loop response, stability analysis, Measurement and instrumentation, frequency-domain.
Prerequisite: 55-321B

55-392B Process Dynamics and Control Laboratory
Credits: 1 Hrs.: 3
Applications of fundamental principles of the dynamics and control of chemical processes including open loop and closed-loop dynamics; controller tuning, computer control, and simulation of chemical processes.
Co-requisite: 55-391B

55-401B Field Training (2)
Credits: 3 Hrs.: 20
Practical training for a period of 15 weeks in a chemical industrial facility; Emphasis on reactive processing, control systems, equipment sizing, selection and operation, safety and environment.
Prerequisite: 55-291B, 55-391B

55-402B Equipment Sizing and Selection
Credits: 3 Hrs.: 3
Introduction to practical engineering methods for specifying or selecting type of equipment used in chemical industry such as; piping systems, control valves, pumps, compressors, heat exchangers, towers, mixers, reactors, storage tanks, etc.; materials of constructions; economics.
Prerequisite: 30-201B, 55-381B

55-403B Refining Processes
Credits: 3 Hrs.: 3
Crude oil properties; processes employed in petroleum refining operations; blending and other auxiliary processes; economics and optimization; environmental issues and regulations; laboratory experiments on crude oil characterization and major refinery units pilot plants, Laboratory experiments investigates the principles of petroleum refining.
Prerequisite: 55-381B

55-404B Refinery Products and Testing
Credits: 3 Hrs.: 4
Chemistry of petroleum products, sampling and labeling; ASTM specifications & evaluation of various types of petroleum products, blending; Laboratory experiment on various test methods, Laboratory experiments investigates the principles of petroleum products testing.
Prerequisite: 75-241B, 55-403B

55-407B Catalysis
Credits: 3 Hrs.: 3
Concepts in catalyst preparation, catalyst characterization, and kinetic analysis of catalytic processes; principles and factors affecting reaction rates; application to industrial catalytic processes
Prerequisite: 55-321B

55-411B Chemical Processes Technology
Credits: 3 Hrs.: 3
Material and energy balances for chemical processes; unit design and process evaluation; applications on local industries.
Prerequisite: 55-381B

55-413B Separation and mixing Processes
Credits: 3 Hrs.: 4
Fundamental principles and design of separation processes; batch and continuous flow; plate and packed towers; distillation, absorption, stripping, and extraction; fundamentals of mixing; operation, evaluation, and optimization; Laboratory experiments investigates the principles of separation and mixing processes.
Prerequisite: 55-381B, 75-241B

55-415B Polymer Technology
Credits: 3 Hrs.: 3
Introduction to Polymer Science; chemistry of polymers; chemical and physical properties of synthetic polymers; polymerization reactions; manufacture of polymers and composite materials.
Prerequisite: 55-321B

55-421B Water Desalination Technology
Credits: 3 Hrs.: 3
Properties of seawater; common methods of desalination; multiple stage flash desalination, vapor compression distillation, reverse osmosis, and electro-dialysis; pretreatment of sea water and post treatment of desalted water; introduction to industrial wastewater treatment.
Prerequisite: 55-381B

55-423B Wastewater Treatment
Credits: 3 Hrs.: 4
Introduction to wastewater treatment methods and technology, physical, chemical, and biological treatment; operation of equipment used in wastewater treatment; Laboratory experiments investigates the principles of wastewater treatment.
Prerequisite: 55-321B

55-431B Hazard Recognition, Evaluation, and Control
Credits: 3 Hrs.: 3
Risk Management Programs; Screening Analysis Techniques; Checklist Reviews; Preliminary Hazard Analysis; Safety Audits; WHAT-IF Analysis; Failure Modes and Effects Analysis; Hazard and Operability Studies; Fault Tree and Event Tree Analysis; Specific Hazard Analyses; Quantified Risk Assessment; Human Reliability; Training; Emergency Preparedness; and Hazard controls.
Prerequisite: 55-351B

55-433B Industrial Hygiene and Ergonomics
Credits: 3 Hrs.: 3
Fundamentals of industrial hygiene and ergonomics; chemical hazards; Epidemiology; Toxicology; Physical hazards; Biohazards; The industrial hygiene survey; Injury & illness prevention programs; Ergonomics; Ergonomic risk factors; Ergonomic worksite programs.
Prerequisite: 55-431B

55-435B Safety Personnel Duties
Credits: 3 Hrs.: 3
Appraising plant safety and setting priorities, Inspection/Auditing, Incident/Accident investigation, Emergency response, Safety training program, and implementing safety regulations (Hazard communication, preventive maintenance programs, Injury/illness record keeping, Lockout / Tagout procedures, Cold / Hot work permits).
Prerequisite: 55-431B

55-441B Pollution Management and Control
Credits: 3 Hrs.: 3
Study of all pollution from industries, with emphasis on sources, cause, effects and general control methods; air pollution; air quality and emissions standards; plume and dispersion models; unit operations for control of gaseous and particulate pollutants; monitoring techniques.
Prerequisite: 55-321B, 75-241B

55-451B Process Modeling, Simulation, and Optimization
Credits: 3 Hrs.: 3
Mathematical model formulation of chemical and physical processes; use of process simulators; optimization concepts; types of optimization problems and solution techniques.
Prerequisite: 55-391B, 55-361B

55-461B Quality Control
Credits: 3 Hrs.: 3
Principle, role, management, and history of quality control in chemical industry; concepts, techniques, and procedures of quality control; preparation of statistical control charts and selection of suitable sampling plans; fundamental concepts of reliability and experimental design; Laboratory experiments investigates the principles of quality control.
Prerequisite: 76-202B

55-463B Pharmaceutical Technology
Credits: 3 Hrs.: 3
Concepts necessary in the adaptation of engineering principles to pharmaceutical technology; Topics include: process engineering in drug manufacture such as mixing, drying and separation; basic pharmaceutical chemistry, formulations, production and design of drugs.
Prerequisite: 55-381B, 75-151C

55-467B Oil Upstream Operations
Credits: 3 Hrs.: 3
Fundamentals of oil and gas exploration and production; reservoirs; discovery; characterization of, and fluid flow through, porous media; principles of oil production performance, water flooding and enhanced oil recovery techniques.
Prerequisite: 55-381B

55-468B Biotechnology
Credits: 3 Hrs.: 3
Review of basic biological concepts such as cell construction, cell nutrient, and enzyme kinetics; large-scale production of enzymes; operation of bioreactors; recovery and purification of products; major biotechnology applications (in medicine, agriculture and environmental science, forensics).
Prerequisite: 55-321B, 55-381B

55-469B Special Topics in Chemical Engineering Technology
Credits: 3 Hrs.: 3
Topics of interest to chemical engineers not covered in regular courses; specific course description is made available prior to each offering; (May be repeated with change in topic for maximum credit of 3 semester hours).
Prerequisite: 55-402B

55-471B Project in Chemical Engineering Technology
Credits: 3 Hrs.: 3
Faculty supervised term projects or research assigned to individual student or groups on new or developing areas in chemical engineering; a written report and oral presentation are required.
Prerequisite: 30-201B, 55-401B

55-492B Advanced Process Control
Credits: 3 Hrs.: 3
State space methods; sampled data systems; discrete systems; multi-variable control; ratio and feed-forward control; closed loop analysis; control of complex chemical systems; design of controllers; advanced control techniques.
Prerequisite: 55-391B

56-101C Physics (1)
Credits: 3 Hrs.: 3
Vectors; statics; uniform accelerated motion; energy; momentum; uniform circular motion; simple machines; elasticity, and simple harmonic motion; Laboratory experiments investigates the principles of elementary physics.

56-105B Physics Laboratory (1)
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of elementary physics.

56-151B Physics (2)
Credits: 3 Hrs.: 3
Electricity and magnetism, light, and modern physics; Laboratory experiments investigates the principles of electricity and Magnetism.
Prerequisite: 56-101C

56-155B Physics Laboratory (2)
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of electricity and Magnetism.
Corequisite: 56-151B

57-111B Statics
Credits: 3 Hrs.: 3
Principles of mechanics force systems, equilibrium structures, distributed forces, centroids and friction.
Prerequisite: 56-101C

60-151B Introduction to Computing
Credits: 3 Hrs.: 3
Operating systems and basic software applications in a windows-based environment; word processing; spreadsheets for solving systems of linear and nonlinear algebraic equations, plotting, fitting data, building new functions and making iterations and loops.
Prerequisite: 76-101B

64-101B Engineering Drawing
Credits: 2 Hrs.: 4
An introductory course in the fundamentals of engineering drawing and the basics of Computer Aided Drawing (CAD). Manual drafting techniques are integrated with extensive use of AutoCAD. Topics include use of the drawing instruments, geometric construction, orthographic projection, technical sketching, sectional and auxiliary views and proper dimensioning techniques.

70-221B Electrical Circuits
Credits: 3 Hrs.: 3
Basic knowledge in Electrical Circuits, Electrical Variables, Basic electrical laws and elements, Electrical Power & Energy, Kirchhoff laws, Basic Circuit Analysis, basic electricity laws in DC and AC, RLC circuits, Power factor; Laboratory experiments investigates the principles of electrical circuits.
Prerequisite: 56-151B

75-101C General Chemistry
Credits: 3 Hrs.: 3
Introduction to the fundamental principles of chemistry, including chemical stoichiometry; properties of gasses, liquids, and solids; solutions; chemical equilibria; atomic and molecular structure; introduction to thermodynamics; reaction kinetics.

75-105B General Chemistry Laboratory
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of general chemistry.
Corequisite: 75-101C

75-151C Organic Chemistry
Credits: 3 Hrs.: 3
Basic fundamentals of organic chemistry: including nomenclature, chemical and physical properties, reactions and syntheses of the major classes of organic compounds; Laboratory experiments investigates the principles of organic chemistry.
Prerequisite: 75-101C

75-152B Organic Chemistry Laboratory
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of organic chemistry.
Prerequisite: 75-101C

75-241B Analytical Chemistry
Credits: 3 Hrs.: 3
Chemical equilibrium; gravimetric analysis; titration; electrochemistry; spectroscopy and separations; instrumental methods of chemical analysis; evaluation of analytical data; Laboratory experiments investigates the principles of analytical chemistry.
Prerequisite: 75-101C

75-242B Analytical Chemistry Laboratory
Credits: 1 Hrs.: 2
Laboratory experiments investigates the principles of analytical chemistry.
Prerequisite: 75-101C

76-101B Math (1)
Credits: 3 Hrs.: 3
Elementary analytic geometry, algebra, functions, limits of functions and continuity definition of derivatives and the techniques of differentiation; applications of the derivative; Anti-derivatives and indefinite integrals; definite integrals.

76-102B Math (2)
Credits: 3 Hrs.: 3
Definite integrals; applications and techniques of integration; logarithmic and exponential functions; inverse trigonometric and hyperbolic functions; improper integrals; infinite series.
Prerequisite: 76-101B

76-201B Applied Math for Engineers (1)
Credits: 3 Hrs.: 3
Ordinary differential equations; properties of special functions, solution methods including Laplace transforms, Fourier series, systems of linear differential equations, Partial differential equations with applications, introduction to optimization.
Prerequisite: 76-102B

76-202B Applied Math for Engineers (2)
Credits: 3 Hrs.: 3
Vector spaces, linear systems of equations, matrix operations, and linear transformations; statistics, linear regression and analysis of experimental data; probability distributions; complex variables.
Prerequisite: 76-201B

2. Diploma Programs

75–110 General Chemistry
Credits: 3 Hours: 4
Introduction to the fundamental principles of chemistry, including the following: chemical stoichiometry; properties of gases, liquids, and solids; solutions; chemical equilibria; atomic and molecular structure; introduction to thermodynamics; and reaction kinetics. Laboratory experiments explore principles of general chemistry.

81–163 Oil and Natural gas
Credits: 3 Hours: 3
Fundamentals of oil and gas exploration and production, reservoirs, discovery, fluid flow through porous media, principles of oil production performance, water flooding and enhanced oil recovery techniques, desalter operation, and gas and oil separation processes.
Prerequisite: 82–183

81–192 Polymer Engineering
Credits: 3 Hours: 3
Introduction to Polymer Science, chemistry of polymers, chemical and physical properties of synthetic polymers, synthesis of monomers, sources of raw materials, flow charts of manufacture of polymers, and polymer processing.
Prerequisite: 82–183

81–255 Transport Phenomena
Credits: 4 Hours: 5
Formulation of the physical laws of momentum, heat, and mass transport, with emphasis on their interrelationship. Application of these principles to basic transport processes. Diffusive and convective transport mechanisms, laboratory experiments investigate the principles and applications of transport laws.
Prerequisite: 75–110, 56–113

81–270 Industrial Safety
Credits: 2 Hours: 2
Overview of industrial safety and general causes of accidents; industrial hygiene and loss statistics; safety economics; classification of hazards; hazard identification and risk assessment, personal protective equipment, ergonomics and Work related Musculo–Skeletal Disorders (WMSD's).
Prerequisite: 30–162

81–273 Petroleum Products and Testing
Credits: 2 Hours: 4
Chemistry of petroleum products, sampling and labeling of gases, liquid hydrocarbon and water, ASTM specifications and evaluation of various types of petroleum products including Liquefied petroleum gas (LPG), naphtha, gasoline, kerosene, etc., Laboratory experiment on various test methods.
Prerequisite: 76–106, 82–169

81–280 Unit Operations
Credits: 4 Hours: 5
Fluid machinery, heat exchangers, condensers, evaporators; phase equilibria, binary and multi–components separations; equilibrium stage concept of process design for distillation and absorption; laboratory experiments investigate the principles and applications of separation processes.
Prerequisite: 81–255

81–283 Thermodynamics
Credits: 3 Hours: 3
Properties of pure substances: Phase diagrams, Property tables, equations of state; The first law of thermodynamics and applications for closed and open systems; The second and third law of thermodynamics and applications
Prerequisite: 82–183

81–286 Air Pollution
Credits: 3 Hours: 3
Pollution types with emphasis on sources, cause, effects and general control methods; air pollution; air quality and emissions standards; plume and dispersion models; unit operations for control of gaseous and particulate pollutants; and monitoring techniques.
Prerequisite: 81–293

81–288 Catalysis
Credits: 3 Hours: 3
Concepts in catalyst preparation, catalyst characterization, and kinetic analysis of catalytic processes; principles and factors affecting reaction rates; application to industrial catalytic processes.
Prerequisite: 81–293

81–290 Introduction to Environmental Engineering
Credits: 2 Hours: 2
Key concepts essential for understanding changes in the environment, understanding basic ecological patterns and processes, evaluating evidence about environmental changes, assessing the importance of such changes, and developing policy responses.
Prerequisite: 81–270, 30–171

81–293 Reactor Technology
Credits: 3 Hours: 3
Reaction equilibrium, reaction kinetics, interpretation of batch reactor data, ideal reactors, design for single and multiple reactions, isothermal and non–isothermal homogeneous reactions, and introduction to heterogeneous catalysis.
Prerequisite: 82–183, 76–106

81–295 Measurements and Control
Credits: 3 Hours: 5
Concepts of process control, including dynamic modeling of processes, transfer functions, open loop response, feedback control, controllers and tuning methods, closed loop response, and stability analysis, Measurement and instrumentation and frequency–domain analysis of control systems. Laboratory experiments investigate open loop and closed loop dynamics, controller tuning, computer control, and simulation of chemical processes.
Prerequisite: 81–293

81–304 Petroleum Refining Processes
Credits: 4 Hours: 5
Crude oil properties, processes employed in petroleum refining operations, blending and other auxiliary processes, economics and optimization, environmental issues and regulations, laboratory experiments on crude oil characterization, and major refinery units and pilot plants.
Prerequisite: 81–293,81–273

81–305 Project
Credits: 3 Hours: 3
Faculty–supervised term projects or research assigned to groups (minimum of 12 Students per class) on new or developing areas in refinery technology; a written report and oral presentation are required. The curriculum committee must preapprove the course proposal.
Prerequisite: 81–304

81–395 Refinery Equipment Operation and Safety
Credits: 3 Hours: 3
Main tasks of a petroleum refinery operator with a special emphasis on safety aspects of operation, including following safety regulations and using safety gear, operating rotary and stationary equipment, operating furnaces and boilers, monitoring operating conditions and troubleshooting, safe handling different types of chemicals, sampling process streams, preparing equipment for maintenance, and dealing with refinery equipment emergencies.
Prerequisite: 81–304, 81–295

81–399 Field Training
Credits: 6 Hours: 18
Practical training for a period of 15 weeks (270 hours) in a petroleum refining facility, Emphasis is laid on reactive processing, control systems, equipment sizing, selection and operation, and safety and environment.
Prerequisite: 81–293,82–282, Passing 50 credits

82–169 Introduction to Computers
Credits: 2 Hours: 4
Operating systems and basic software applications in a window–based environment; word processing; spreadsheets for solving systems of linear and nonlinear algebraic equations, plotting, fitting data, building new functions, and making iterations and loops, Introduction to Matalb.

82–183 Chemical Engineering Calculations
Credits: 3 Hours: 3
Basic Concepts and unit conversion; introduction to chemical engineering and chemical process industry; flow sheets fundamentals: units, concentrations, gasses, and gas mixtures; steady state material and energy balances; introduction to unsteady state material and energy balance.
Prerequisite: 75–110, 76–105

82–223 Chemical Engineering Calculations (2)
Credits: 3 Hours: 3
Single and multiphase systems; Review of the concept of energy and the first law of thermodynamics; Energy balances in non-reactive and reactive processes; Applications in simultaneous material and energy balances; Transient processes; introduction to process simulators; application on local industries.
Prerequisite: 82–183

82–264 Industrial Corrosion
Credits: 3 Hours: 3
Fundamentals of corrosion and corrosion control relevant to the chemical industry. Differentiate between types of corrosion and importance of material selection. Corrosion prevention and protection methods; and Corrosion Economics.
Prerequisite: 81–293

82–273 Quality Control
Credits: 2 Hours: 4
Principle, role, management, and history of quality control in chemical industry; concepts, techniques, and procedures of quality control, preparation of statistical control charts and selection of suitable sampling plans; and fundamental concepts of reliability and experimental design.
Prerequisite: 76–106, 82–169

82–277 Wastewater Treatment
Credits: 3 Hours: 3
Essential concepts of wastewater treatment, as well as the engineering design of unit processes for the sustainable treatment of municipal wastewater.
Prerequisite: 81–273 or 82–273

82–278 Water Desalination
Credits: 3 Hours: 3
Properties of water and aqueous solutions and engineering considerations; common methods of desalination such as multiple stage, flash distillation plant, vapor compression distillation, reverse osmosis, and electro–dialysis; pretreatment of seawater and post–treatment of desalted water.
Prerequisite: 81–273 or 82–273

82–282 Computer Applications in Chemical Engineering
Credits: 2 Hours: 4
Numerical methods and applications to chemical engineering problems, and use of spreadsheets and applied math–related packages; process simulation programs such as HYSYS and ASPEN PLUS are used to simulate chemical process operations, including distillation columns, heat exchangers and reactors.
Prerequisite: 81–283, 81–280

82–285 Chemical Engineering Thermodynamics
Credits: 3 Hours: 3
Review of first and second law of thermodynamics. Concepts of phase and reaction equilibria, excess properties, fugacities, activity coefficients, and models of non–ideal solutions; thermodynamics applied to chemical processes.
Prerequisite: 81–283

82–288 Optimization
Credits: 3 Hours: 3
Unconstrained optimization problems, linear programming problems, and nonlinear constrained optimization; Global search methods; elementary introduction to artificial neural networks, convex optimization, and multi–objective optimization; linear matrix inequalities.
Prerequisite: 82–282

82–289 Topics in Chemical Engineering
Credits: 3 Hours: 3
Selected topics in chemical engineering technology and innovations in industrial chemical processes. The curriculum committee must preapprove the selected topic.
Prerequisite: 82–282

82–304 Chemical Processes
Credits: 4 Hours: 5
Methodology of industrial chemical process, integration of fundamental chemical principles to industrial process, block flow diagram and process flow diagram, unit design and process evaluation using commercial process, applications on local industries; laboratory experiments investigate principles of physical chemistry, fluidization, and chemical reaction engineering.
Prerequisite: 81–293,82–273

82–305 Project
Credits: 3 Hours: 3
Faculty–supervised term projects or research assigned to groups (minimum of 12 Students per class) on new or developing areas in chemical technology; a written report and oral presentation are required. The curriculum committee must preapprove the course proposal.
Prerequisite: 82–304

82–395 Equipment Operation and Safety
Credits: 3 Hours: 3
Main tasks of a chemical plant operator with a special emphasis on safety aspects of operation, including following safety regulations and using safety gear, operating rotary and stationary equipment, operating furnaces and boilers, monitoring operating conditions and troubleshooting, handling different types of chemicals safely, sampling process streams, preparing equipment for maintenance, and dealing with industrial equipment emergencies.
Prerequisite: 82–304, 81–295

82–399 Field Training
Credits: 6 Hours: 18
Practical training for a period of 15 weeks (270 hours) in a chemical industrial facility, Emphasis is laid on reactive processing, control systems, equipment sizing, selection and operation, and safety and environment.
Prerequisite: 81–293,82–282, Passing 50 credits

Department of Civil Engineering Technology

Overview:

The Civil Engineering Technology curriculum prepares the graduates to work in coordination with civil engineers. It aims to provide the industry with assistant engineers capable of aiding engineers in executing and supervising civil engineering projects with the ability to continue their studies towards a higher degree.

Majors:

The department offers a set of courses through which the student may specialize in one of the following fields:

- Building Construction Technology
- Highways Engineering Technology
- Surveying Engineering Technology

Laboratories

Laboratories and workshops of the department of Civil Engineering Technology are equipped with testing machines, instruments, and tools including the following:

- Soil Mechanics and Foundation Laboratory
- Highway Testing Laboratory
- Concrete and Material Testing Laboratory
- Surveying Laboratory
- Sanitary Works Workshop

Department of Civil Engineering Technology

Program: Building Construction Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	107	Surveying	3	6	76–105
57	170	Engineering Statics	3	4	76–105
57	175	Computer Aided Drawing (CAD)	2	6	76–105
57	177	Construction Materials	3	4	57–170
57	260	Building Construction	3	4	57–175
57	266	Building Services	3	4	57–175
57	270	Strength of Materials	3	4	57–170
57	277	Quantity Surveying	3	3	57–260
57	278	Structural Analysis	3	4	57–170
57	280	Reinforced Concrete (1)	3	5	57–177,57–278
57	399	Field Training	4	16	Passing 50 credits
58	127	Fluid Mechanics	3	4	56–113
58	228	Transportation Engineering	3	3	54–107
58	271	Soil Mechanics	3	4	57–270

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	206	Surveying Works	3	4	57–107
57	275	Building Execution Drawings	3	4	57–175
57	279	Steel Structures	3	3	57–270 ,57–278
57	350	Computer Applications in Civil Engineering	3	4	57–175
57	360	Proper Execution of Buildings	3	3	57–260
57	369	Marine Structures	3	3	58–127
57	380	Reinforced Concrete (II)	3	3	57–280
57	381	Building Project	3	4	57–280
58	230	Road Safety	3	3	58–228

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
57	100	Introduction to Civil Engineering Technology	2	2	
57	101	Construction Site Safety and Health	2	2	

Department of Civil Engineering Technology

Program: Surveying Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	107	Surveying	3	6	76–105
54	206	Surveying Works	3	4	54–107
54	207	Fund. of Global Positioning System	3	3	54–107
54	210	Surveying Planning	3	4	54–107
54	399	Field Training	4	16	Passing 50 credits
57	170	Engineering Statics	3	4	76–105
57	175	Computer Aided Drawing (CAD)	2	6	76–105
57	177	Construction Materials	3	4	57–170
57	270	Strength of Materials	3	4	57–170
57	278	Structural Analysis	3	4	57–170
57	280	Reinforced Concrete (I)	3	5	57–177, 57–278
58	127	Fluid Mechanics	3	4	56–113
58	228	Transportation Engineering	3	3	54–107
58	271	Soil Mechanics	3	4	57–270

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	208	Geodesy	3	3	54–206
54	209	Aerial Surveying	3	4	54–107
54	306	Fundamentals of Global Information Systems	3	4	54–107
54	307	Map Projection and Drawings	3	4	58–206
54	320	Surveying Project	3	3	54–206
57	260	Building Construction	3	4	57–175
57	277	Quantity Surveying	3	3	57–260
57	350	Computer Applications in Civil Engineering	3	4	57–175
58	327	Highway Design	3	3	58–228

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
57	100	Introduction to Civil Engineering Technology	2	2	
57	101	Construction Site Safety and Health	2	2	

Department of Civil Engineering Technology

Program: Transportation Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	107	Surveying	3	6	76–105
57	170	Engineering Statics	3	4	76–105
57	175	Computer Aided Drawing (CAD)	2	6	76–105
57	177	Construction Materials	3	4	57–170
57	270	Strength of Materials	3	4	57–170
57	278	Structural Analysis	3	4	57–170
57	280	Reinforced Concrete (I)	3	5	57–177,57–278
58	127	Fluid Mechanics	3	4	56–113
58	228	Transportation Engineering	3	3	54–107
58	271	Soil Mechanics	3	4	57–270
58	274	Road Pavement	3	4	57–271
58	276	Traffic Engineering	3	4	76–105
58	328	Fundamentals of Roads Construction	3	3	58–228
58	399	Field Training	4	16	Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
54	206	Surveying Works	3	4	54–107
57	277	Quantity Surveying	3	3	57–260
57	350	Computer Applications in Civil Engineering	3	4	57–175
58	227	Water and Sanitary Engineering	3	3	58–127
58	230	Road Safety	3	3	58–228
58	327	Highway Design	3	3	58–228
58	329	Quality Control for Roads	3	4	58–274
58	330	Road Accidents Analysis	3	3	58–230
58	356	Transportation Project	3	3	58–228

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
57	100	Introduction to Civil Engineering Technology	2	2	
57	101	Construction Site Safety and Health	2	2	

COURSE DESCRIPTION

54–107 Surveying
Credits: 3 Hours: 6
Surveying branches. Types of Maps and Scales. Distance by chaining or taping. Maps for small areas. Areas of lands and planimeter. Leveling: use of level and adjustment, and reasons for errors. Compass and azimuths. Theodolites: use and types.
Prerequisite: 76–105

54–206 Surveying Works
Credits: 3 Hours: 4
Angular measurements, theodolites: uses and adjustments. Tachometry and its instruments. Traverses: Types and corrections. Topographic Drawing, contour maps, sextant and fundamentals of hydrographic surveying. Fundamentals of Aerial surveying.
Prerequisite: 54–107

54–207 Fundamentals of Global Positioning System (GPS)
Credits: 3 Hours: 3
Overview of the Global Positioning System, the NAVSTAR constellation and the various types of augmented GPS systems. Basic GPS components are covered, including satellites, ground stations, antennas and receivers, signals, timing and false signals, spoofing, jamming and cryptographic concepts.
Prerequisite: 54–107

54–208 Geodesy
Credits: 3 Hours: 3
The geoids – Degrees of triangulation networks: specifications, shapes, observations, base lines, GPS. Adjustments of the net using: triangle equations, local, side equations. Height of observation towers, indivisibility, and types of errors. Standard deviation and probable errors. Strength of figures in the net.
Prerequisite: 54–206

54–209 Aerial Surveying
Credits: 3 Hours: 4
Photogrammetry, photo interpretation, remote sensing, and GIS. Single vertical photograph. Stereoscopic vision. Measurements from Stereoscopic photo pairs. Flying maps: number of lines and photos. Ground control points and mosaics. Rectification. Fundamentals of Remote Sensing.
Prerequisite: 54–107

54–210 Surveying Planning
Credits: 3 Hours: 4
Horizontal curves: types and elements. Alignments using one theodolite, two theodolites, and chain from tangent – chain from long chord. Vertical curves: types and calculations of reduced levels for all points on the vertical curve. Factors affecting partitions of lands. Partitions of triangles and polygons.
Prerequisite: 54–107

54–306 Fundamentals of Geographic Information System (GIS)
Credits: 3 Hours: 4
Reviews GIS applications, data structures and basic functions, methods of data capture and sources of data, the nature and characteristics of spatial data and objects, identifying GIS hardware components, typical operations, products/applications, and differences between database models and between raster and vector systems.
Prerequisite: 54–107

54–307 Map Projection and Drawings
Credits: 3 Hours: 4
Enlargement and decrement of maps. How to draw a contour line on leveling net? Drawing of maps. Cartography and reproduction, symbols, plotting coordinates, longitudes, latitudes, radial, equator, and central projections. Equal, UTM, KTM, and Conical Projections, Calculations of projections.
Prerequisite: 58–206

54–320 Surveying Project
Credits: 3 Hours: 3
Introduction to general surveying techniques and problems. Case study and introduction, problem requirement, type of data for study, study format, computer software, data collection, data retrieval, data analysis, results and presentation, and proper solutions.
Prerequisite: 54–206

54–399 Field Training
Credits: 4 Hours: 16
In this course, the students are trained on job sites. Surveying students are trained to use survey instruments in the field such as leveling instruments, theodolites, chains, and others. Inspect work site, water and electricity supply to the site and other services using several types of maps and drawings.
Prerequisite: Passing 50 credits

57–100 Introduction to Civil Engineering Tech.
Credits: 2 Hours: 2
Introduction to selected subfields in the discipline, such as building construction technology, transportation engineering, surveying. Problem–solving exercises, applying fundamental steps of analysis, synthesis, discussion of issues related to engineering practice, working in teams, scheduling, evaluating risk, and making ethical decisions.

57–101 Construction Site Safety and Health
Credits: 2 Hours: 2
Falls in Construction, Guardrails and Safety Nets, Skylights and Other Openings, Roofs Training, Stairs Dangers, Ladder Safety, Safe Scaffold Construction, Types of Scaffolds, Inspections/Training, Excavations safety, Safe Working Conditions, Protective System Design, Electricity safety: Injuries, Hazards, Power Tools, Fire Protection, Emergency Action Plans, Exits, Fire Prevention, Hazard Communication, Labeling Material Safety Data Sheets, Material Disposal, Tool Safety, Materials Handling, Manual Material Handling, Mechanical Handling (Cranes), Stacking and Storing.

57–102 Introduction to Contracts and Specifications
Credits: 3 Hours: 3
Contract terms, contractual contract components and documents, general contract terms, general tender law, Technical conditions, administrative contracts, specifications.

57–170 Engineering Statics
Credits: 3 Hours: 4
Fundamental concepts of mechanics, units of measurements, force vectors: scalars and vectors, vector operations, equilibrium of a particle, the free body diagram, force systems, equilibrium of a rigid body; moment formulation, support reactions, simple trusses: method of joints, method of sections, internal loadings in beams, introduction to shear force and bending moment diagrams.
Prerequisite: 76–105

57–175 Computer Aided Drawing (CAD)
Credits: 2 Hours: 6
Computer–Aided Design (CAD) and modeling with a focus on construction and architecture specific applications, setting up a drawing electronically; defining coordinate systems, drawing and editing; construction techniques; display commands; effective layering; dimensioning and detailing, plotting.
Prerequisite: 76–105

57–177 Construction Materials
Credits: 3 Hours: 4
Aggregates: basic characteristics of aggregates, physical properties, types of aggregates (normal and manufactured); cement: manufacturing Portland cement, chemical composition of cement, properties of cement, types of Portland cement and their properties, other types of cement; introduction to concrete: materials, properties of fresh concrete, production of concrete, strength properties of hardened concrete. Metals, type of steel and their uses. Types of timber and their properties, defects in timber, durability and treatment of timber.
Prerequisite: 57–170

57–260 Building Construction
Credits: 3 Hours: 4
An introduction to the processes by which construction materials and systems are evaluated, selected, incorporated, and detailed in building design. Both measurable and immeasurable design responses to environmental energies are explored in soils, concrete, masonry, and metals. In addition, concrete construction will be studied in some detail because of its predominance in our building culture. This emphasis on· a single system will establish a foundation for further study of larger scale systems in subsequent courses. Issues of sustainability in building system design and construction process will be engaged throughout.
Prerequisite: 57–175

57–266 Building Services
Credits: 3 Hours: 4
Firefighting, protection and safety, design and practice, thermal and water insulation materials and their properties, fundamental mechanism of heat transfer, air–conditioning system principles, equipment, types and applications in buildings, principle of elevators 'Lifts' and escalators, and applications in buildings.
Prerequisite: 57–175

57–270 Strength of Materials
Credits: 3 Hours: 4
Section properties, centroid and moment of inertia, stress and strain: axial stress, axial strain, Poison's ratio, stress–strain relationship, shear stress and shear strain, combined stresses, oblique planes and general two–dimensional stress system, principal planes and principal stresses, temperature stress and strain, torsional stress, bending stress, column loading.
Prerequisite: 57–170

57–275 Building Execution Drawings
Credits: 3 Hours: 4
Introduction, basic design elements, circulation areas, different functions of spaces, stairs, lifts, escalators and utility rooms, building materials, structural systems and technicality versus form, recognized legends in various drawings, data assigned to all drawings, match concept with architecture and structure, manual drawing of basic architecture, computer aided drawing of basic architecture, project initial drawings, site plan, layout, block plans, mass plans and areas, plans for different floors, elevations and final presentation of the project.
Prerequisite: 57–175

57–277 Quantity Surveying
Credits: 3 Hours: 3
Specification, excavation and filling, plain concrete and reinforced concrete measurements, masonry, metals, wood, finishes, bills of quantities and total estimation.
Prerequisite: 57–260

57–278 Structural Analysis
Credits: 3 Hours: 4
Classification of structures, loading types, , principle of superposition, equations of equilibrium, determinacy and stability, coplanar trusses, the method of joints, the method of sections, zero–force members, internal loadings, , shear and moment diagrams for beams and frames, shear and moment functions, introduction to deflection and the elastic curve.
Prerequisite: 57–170

57–279 Steel Structures
Credits: 3 Hours: 3
Steel as structural material; types of steel and their uses; mechanical and physical properties of steel; tension members, compression members, structural steel beams, and connections.
Prerequisite: 57–270, 57–278

57–280 Reinforced Concrete (I)
Credits: 3 Hours: 5
Mechanical properties of concrete, loads on beams, analysis and design of reinforced concrete beams rectangular and T–sections, compression reinforcement, development length and bond reinforcement, shear in beams, short and long–term deflections, short columns, one–way slabs, isolated footing.
Prerequisite: 57–177, 57–278

57–350 Computer Applications in Civil Engineering
Credits: 3 Hours: 4
Operational features programing and their use in engineering computations, user–defined functions in Excel and MATLAB, performing mathematical operations to solve Civil Engineering problems in MS Excel and Matlab, simple optimization problems in MS Excel, Develop and program engineering analyses using Matlab and Excel, producing plots and graphs relating to programing outputs, formatting technical reports in MS word and incorporating results within, p Presenting results in a PowerPoint presentation.
Prerequisite: 57–175

57–360 Proper Execution of Buildings
Credits: 3 Hours: 3
Gain the capability of managing the project on site. Accomplish the main constraint of a project: Time, Cost, and Quality. A detailed study for each of these constraints with explanations on how it is affected by local industry.
Prerequisite: 57–260

57–369 Marine Structures
Credits: 3 Hours: 3
Coastal engineering, development of near shore wave, currents and tides, harbor structure and facilities, classification of ports according to functions and location, two–dimensional linear wave theory and its application for the estimation of different wave characteristics (length, depth, and height), the effect of shoaling on waves, wind–generated waves, tsunamis, basin oscillations and storm surge, harbor planning and construction, types of breakwaters and factors determining their selection, piers, bulk heads, dolphins and moorings.
Prerequisite: 58–127

57–380 Reinforced Concrete (II)
Credits: 3 Hours: 3
Analysis and design of one–way and two–way slabs, short and long columns analysis and design, isolated footing, combined footing, retaining walls, introduction to Prestressed concrete technology.
Prerequisite: 57–280

57–381 Building Project
Credits: 3 Hours: 4
Excavation and leveling works, planning of site works, concreting and curing, masonry, sanitary and plumbing works, electric mechanical installations, plastering and painting, false ceiling and interior decorations, doors and windows, carpentry and joinery, damp proofing and heat insulation, miniature representation and final presentation systems, hot water supply systems, service ducts, drainage, fire protections, design and installation of wet risers, dry risers and sprinklers, mechanical services, lifts and escalators.
Prerequisite: 58–280

57–399 Field Training
Credits: 4 Hours: 16
In this course, the students are trained on job sites. Building sites introduces students to the many aspects of construction starting with acquiring the site from the municipality office all the way to finishing.
Prerequisite: Passing 50 credits

58–127 Fluid Mechanics
Credits: 3 Hours: 4
Properties of fluids: units, mass density and specific weight, fluid static; fluid flow concepts and measurements: kinematics of fluids, steady and unsteady flows, flow measurement through pipes, flow of incompressible fluids in pipes, resistance in circular pipelines flowing, resistance of flow in non–circular sections, local loses, pipe network analysis, hydraulic structures, spillways, energy dissipaters and downstream.
Prerequisite: 56–113

58–227 Water and Sanitary Engineering
Credits: 3 Hours: 3
Quantity of water and sewage, population forecasting, factors affecting consumption, rainfall and runoff, hydrology, transpiration, ground water, occurrence of aquifer, water and waste water quality, examination of water and sewage, water treatment, removal of dissolved minerals from water, ion exchange, membrane processes, control of corrosiveness, odors, ion exchange, wastewater treatment, primary treatment, secondary treatment, the activated sludge process, and advanced waste treatment.
Prerequisite: 58–127

58–228 Transportation Engineering
Credits: 3 Hours: 3
Vehicle and human characteristics, road vehicle performance, geometric design of roads, traffic flow and queuing theory, road capacity and level of service analysis, traffic control and analysis at signalized intersections, and travel demand and traffic forecasting.
Prerequisite: 54–107

58–230 Road Safety
Credits: 3 Hours: 3
Accident distributions, accident trends and patterns, road surface, centrifugal force, stopping sight distance, passing sight distance, street illumination, vehicle lights, signs and marks, side clearances, road works, signs, signals and lights, cones and barriers, temporary through traffic, accident causes and factors, society, environment, vehicle, human error, road layout, road furniture, black sites, intersection exposure function, road user activity (links and junctions), remedial measures, change the situation, traffic calming, and reducing conflict points.
Prerequisite: 58–228

58–271 Soil Mechanics
Credits: 3 Hours: 4
Nature and characteristics of soils, soil classification, soil compaction, shear strength, effective stresses, consolidation, stress distribution and settlement of structures, types of foundations and their bearing capacity on soils, site investigation and characterization.
Prerequisite: 57–270

58–274 Road Pavement
Credits: 3 Hours: 4
Pavement layers, pavement life, traffic damage estimation, soil classifications and characteristics, aggregate, bitumen, Portland cement, lime, prime coat, tack coat, soil stabilization and compaction, stability tests, 'treating road bases, graded mixture, treating with bitumen, treating with cement, treating with lime, treating with CaCl or NaCl, surface, flexible, rigid, thickness design, asphalt mix design (super pave design), and concrete mixture.
Prerequisite: 57–271

58–276 Traffic Engineering
Credits: 3 Hours: 4
Traffic activity and types, field situation, future needs and requirements, planning, study area and zoning, trip studies, road users, future trips, proposals, traffic densities, speed flow determination, pedestrians, junction types, delays at priority intersections, weaving action, capacity, queuing process, congestion origination, restraint, back wave, emergency vehicles, pollutions, signalized intersections, signal cycle, phasing, capacity, effective green, conflict points, ultimate capacity, delays and optimum setting, average queue length.
Prerequisite: 76–105

58–327 Highway Design
Credits: 3 Hours: 3
General, existing network, new scheme, elements of design, requirements, links, junctions, sidewalks, utility spots, service areas, safety objects and facilities, center line, road division, surveying, general information, tools, GPS, mapping and contours, surveying software, rural road design flows, urban road design flows, comments, project application, case and situation, steps, surveys, data transfer, and design.
Prerequisite: 58–228

58–328 Fundamentals of Roads Construction
Credits: 3 Hours: 3
Basic illustration of the procedures in building road layers for both flexible and rigid pavements. This includes the steps and phases of constructing each layer, service lines and utility networks, equipment needed, and field tests.
Prerequisite: 58–228

58–329 Quality Control for Roads
Credits: 3 Hours: 4
Materials and standards, road construction phases, site investigation, material quality and quantity, aggregates, bitumen, granular soil, fine soil, fillings, curbstone, soil tests, relative compaction (%), field density, swelling factor (speedy), asphalt, asphalt cement, liquid asphalt, asphalt mix, layer check, sub grade, base layer, asphalt surface, and concrete surface.
Prerequisite: 58–274

58–330 Road Accidents Analysis
Credits: 3 Hours: 3
Accident investigation, single accident, site investigation, study area, contributing factors, traffic activity, hazardous locations, monitoring, identification, exposure, spots, route, priority ranking, accident costs and prevention, cumulative costs, society contribution, safety audit, action plans, data manipulation, data type, collection approaches, data format, time and date, collection at site, and data retrieval and analysis.
Prerequisite: 58–230

58–356 Transportation Project
Credits: 3 Hours: 3
Introduction to general road and traffic problems. Case study and introduction, problem requirement, type of data for study, study format, computer software, data collection, data retrieval, data analysis, results and presentation, and proper solutions.
Prerequisite: 58–228

58–399 Field Training
Credits: 4 Hours: 16
In this course, the students are trained on job sites. Transportation students are introduced to the field tests of the base and sub–base courses, and the different surface coating materials used in Kuwait.
Prerequisite: Passing 50 credits

Department of Electrical Engineering Technology

Overview:

The department of Electrical Engineering Technology aims at graduating the skillful, well–trained technicians needed by the State of Kuwait in the field of electrical machines and the transmission and distribution of electrical energy. This is achieved by teaching the students the basic knowledge and technical skills in their majors. Students also acquire the ability to follow the fast progress in Electrical Engineering Technology and continuing the academic studying in both theoretical and practical aspects of their majors.

Majors:

The department awards a Diploma degree in two majors:

- Electrical Machinery Engineering Technology
- Electrical Energy Transmission and Distribution Engineering Technology

The course curriculums of the two majors are carefully designed to provide students with an adequate theoretical background as well as acquainting them with practical skills required by the labor market through a number of modem laboratories and workshops equipped with modem tools, machines and measuring instruments. This provides a low density of students on the equipment, which will reflect on the great benefit of students to acquire different practical skills.

Laboratories:

In order to satisfy previously mentioned objectives, the department has established a large number of laboratories and workshops as follows:

- Electric power simulation laboratory
- High–voltage laboratory
- Two laboratories of small machines and transformers
- Laboratory of big electrical machines and their control, and fault detection
- Two wiring and installation laboratories
- Electrical instruments and measurements laboratory
- Electrical circuits laboratory
- Power electronics laboratory
- Installation workshop
- Maintenance of transformers workshop
- Electrical cables and circuit breakers workshop.
- Assembling and rewinding of DC electrical machines workshop
- Assembling and rewinding of AC electrical machines workshop
- Control of electrical machines workshop

Department of Electrical Engineering Technology

Program: Electrical Energy Transmission and Distribution Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
52	123	Electrical Machines (1)	3	4	70–110
52	175	Electrical Machines and Installations Workshop	3	7	52–123
52	227	Electrical Machines (2)	3	4	52–123
70	110	Electrical Engineering Fundamentals	3	4	
70	115	Electrical Circuits	3	4	70–110
70	161	Fundamentals of Electrical Power	3	4	70–115
70	246	Electrical Installations	3	4	76–106
70	265	Operation and Control of Power Systems	3	4	70–161
70	266	Electrical Substations	3	7	52–123
70	268	Transmission and Distribution of Electrical Power	3	4	70–161
70	362	Power System Protection	3	4	70–161
70	363	High Voltage Engineering	3	4	70–110,56–113
70	399	Field Training	6	24	70–161,30–162, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
52	233	Electrical Measurements	3	4	70–115
52	260	Power Electronics	3	4	70–115
52	340	Fractional HP Machines	3	4	70–115
70	216	Advanced Electrical Circuits	3	3	70–115
70	267	Power System Analysis	3	4	70–161
70	284	Computer Applications	3	4	
70	286	Advanced Computer Applications	3	4	70–284
70	292	Electrical Calculations	3	3	70–110
70	298	Project	3	4	
70	336	Electrical Maintenance	3	4	70–161
70	366	Electrical Power Stations	3	4	70–161

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	252	Industrial Management	2	2	
81	298	Industrial Safety	2	2	30–102

Department of Electrical Engineering Technology

Program: Electrical Machinery Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
52	110	Electrical Engineering Fundamentals	3	4	
52	115	Electrical Circuits	3	4	70–110
52	130	DC and Synchronous Machines	3	4	56–113,70–110
52	147	Power and Installation W–S	3	7	70–110
52	220	Transformers	3	4	76–115
52	237	Induction Machines	3	4	70–115
52	260	Power Electronics	3	4	70–116
52	270	Electrical Drives	3	4	52–260,76–106
52	286	Electrical Machines Control	3	7	52–237
52	330	Programable Logic Controllers	3	4	52–237
52	340	Fractional HP Machines	3	4	70–115
52	399	Field Training	6	24	52–130,30–162, Passing 50 credits
70	260	Power Systems and Protection	3	4	70–115

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
52	233	Electrical Measurements	3	4	70–115
52	250	Automatic Control	3	4	70–115
52	259	Digital Logic Circuits	3	4	
52	287	Advanced Computer Applications	3	4	70–284
52	297	Project	3	4	
70	216	Advanced Electrical Circuits	3	3	70–115
70	246	Electrical Installations	3	4	76–106
70	261	Power System Operation	3	4	70–260
70	284	Computer Applications	3	4	
70	292	Electrical Calculations	3	3	70–110

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	252	Industrial Management	2	2	
81	298	Industrial Safety	2	2	30–102

COURSE DESCRIPTION

52–130 DC and Synchronous Machines
Credits: 3 Hours: 4

This course covers theory, operation and performance of DC and synchronous machines. Topics include, basic principles, construction of DC and synchronous generators and motors as well as types, equivalent circuits, load characteristics, applications, voltage and speed regulation, power flow, torque, efficiency, and motors starting techniques. Parallel operation of synchronous generators is also demonstrated. The course includes laboratory experimental setup for different types of DC and synchronous machines.
Prerequisite: 56–113,70–110

52–147 Power and Installations Workshop
Credits: 3 Hours: 7

This course enables student to read and understand wiring diagrams to implement and troubleshoot electrical circuits. The student will be introduced to regulations, safety precautions, earthing, design of wiring system including conduits, wires, meters, main and sub–main distribution boards, fuses, sockets, light fittings, and other devices used in building installations. The course also covers methods of measuring earth resistance and insulation resistance.
Prerequisite: 70–110

52–220 Electrical Transformers
Credits: 3 Hours: 4

The course presents both theoretical and practical aspects of electric transformers. Transformer classifications, construction, theory of operation, equivalent circuit, efficiency, and regulation are covered. Methods of cooling (liquid–type and dry–type), three phase connections, special purpose transformers, e.g. induction furnace transformers and auto–transformers are also introduced. The transformer protection and testing are outlined as well.
Prerequisite: 76–115

52–227 Electrical Machines (2)
Credits: 3 Hours: 4

This course will focus on the construction, operation, equivalent circuit, vector diagrams, and efficiency of Synchronous Generators and motors, and Induction motors. Topics like winding arrangement, tests, power–torque relations, V–curves, torque–speed characteristics, methods of starting, and speed control will also be demonstrated.
Prerequisite: 52–123

52–233 Electrical Measurements
Credits: 3 Hours: 4

This course describes the principles of analog electrical instruments and errors in measurements. The course classifies the electrical instruments and their functions based on the instrument's structure: d'Arsonval meter movement, moving iron movement, Electrodynamometer movement, and induction. The course covers a wide range of electrical instruments: ammeters, voltmeters, ohmmeters, multi–meters, watt–hour meter, Wheatstone and Kelvin Bridges, and the megger.
Prerequisite: 70–115

52–237 Induction Machines
Credits: 3 Hours: 4
This course describes theory, operation, performance, and applications of single and three phase induction motors. Topics include types, construction equivalent circuits, power flow, efficiency, torque, maximum torque, power, and efficiency. Speed control, and starting techniques are also included. Laboratory experimental setup for different types of three–phase and single–phase induction motors are covered.
Prerequisite: 70–115

52–250 Automatic Control
Credits: 3 Hours: 4
This course provides the basic concepts of control systems; open and closed–loop, continuous and discontinuous systems, transducers, error detectors, feed–back, block diagrams, transfer function, and stability. The course also covers, time response of first and second order systems, system response to different inputs using Laplace transform. Applications such as frequency and voltage control of generators as well as speed control of DC motors, and position control are discussed.
Prerequisite: 70–115

52–259 Digital Logic Circuits
Credits: 3 Hours: 4
This course is intended to introduce the student to the basic concepts of digital circuits. The course introduces the principles of Boolean algebra and the design of combinational and sequential circuits with implementation at logic circuit level. The course covers the basic digital circuits, such as, inverters, multi vibrators, and other logic circuits. These circuits are to be implemented in the laboratory.

52– 260 Power Electronics
Credits: 3 Hours: 4
This course describes the principle of power electronics, its switching nature, the characteristics of different switching devices such as power diode, bipolar junction transistor, and thyristor. It also contains the basic types of converter topologies such as AC–DC rectifiers, DC–DC choppers, DC–AC inverters, and AC–AC voltage controllers. The study of these converters includes circuit topology, circuit waveforms, principle of operation, performance, methods of control, and applications.
Prerequisite: 70–116

52–270 Electrical Drives
Credits: 3 Hours: 4
This course describes the principle of electrical drive systems, their types, elements, characteristics, performance, and applications. Drive systems discussed in this course are single and three–phase induction motors drive systems, DC chopper drive systems, dynamic braking, and regenerative braking. Introduction to UPS systems is provided. Batteries, their types, characteristics, specifications, troubleshooting, application, battery chargers' types and performance are also studied.
Prerequisite: 52–260,76–106

52–286 Electrical Machines Control
Credits: 3 Hours: 7
This course covers theoretical and practical control aspects. In the first part of this course basic principles of electrical control circuits; types, components, DC, and induction motors starting, speed control, reversing and breaking techniques. Synchronous generator automatic voltage regulator is also covered. The second part provides students with opportunity of designing, wiring, checking, and troubleshooting practical electro–mechanical control systems.
Prerequisite: 52–237

52–297 Project
Credits: 3 Hours: 4
This course provides students with the opportunity to employ theoretical knowledge and devolved skills gained throughout their education in solving problems and in working as a team. The project involves selection of an appropriate engineering technology project for design and development, laboratory or workshop researching, designing, proto typing, debugging, and prototyping. The course requirement includes oral and written report and oral presentation.

52–330 Programmable Logic Controller
Credits: 3 Hours: 4
This course presents the basic concepts of automation engineering by programmable logic controllers (PLC) and its applications in electrical machines control. Numbering systems, basic logic circuits, construction of PLC, timers, registers, counters, developing PLC Ladder diagrams, statement list and induction motor control by PLC are presented. Practical control circuits are designed and implemented. The course covers PLC installation practices and Troubleshooting.
Prerequisite: 52–237

52–340 Fractional HP Machines
Credits: 3 Hours: 4
The course introduces classification of fractional horse special electric machines. Various types of special purpose electric machines including universal motor, permanent magnet motor, reluctance motor, brushless DC motor, stepper motors, linear induction motor and hysteresis motor are presented. The construction, operation, characteristics, performance, and applications of each machine are covered.
Prerequisite: 70–115

52–399 Field Training
Credits: 6 Hours: 24
Practical training in electrical machines in Kuwait power utilities and in private sector. In addition to learning the operation of different types of electrical machines and transformers, the student gains a practical experience in these fields and performs trouble shooting, maintaining, commissioning, and testing various electrical equipment.
Prerequisite: 52–130,30–162, Passing 50 credits

70– 110 Electrical Engineering Fundamentals
Credits: 3 Hours: 4
This course is designed to provide students with basic knowledge of DC and AC circuit network fundamental and basic laws. Students will be able to analyze simple, series, parallel, and series–parallel DC circuit networks by solving problems using Ohms law, Kirchhoff Voltage Law (KVL), Kirchhoff Current Law (KCL), and voltage and current divider rules. Also, they will be able to apply alternating waveforms and phasor concepts of AC circuits with single element by solving problems involving current, voltage, power, and power factor.

70–112 Green Electricity
Credits: 2 Hours: 4
This elective course will introduce the student to the various renewable energy technologies such as solar, wind, hydroelectric, and tidal power. Smart Grids, smart homes, and electrical transportation will also be represented. The various economic and environmental impacts of these systems will be discussed as well as the current challenges and limitations. The course is designed to appeal to a wider range of students. Therefore, all topics will be introduced with minimal mathematical or technical representations.

70–115 Electrical Circuits
Credits: 3 Hours: 4
Students will implement knowledge acquired in 70–110 on AC sourced circuits. They will also perform analysis using equivalent impedance and phasor diagrams. Student will learn and apply fundamental circuit analysis using mesh and nodal methods, maximum power transfer theorem, Thevenin, Norton, and Millman theorems and superposition. The concept of complex power is introduced and applied to R, RL, RC, RLC circuits. Finally, the students will acquire knowledge on polyphaser systems and different three phase source and impedance configurations.
Prerequisite: 70–110

52–123 Electrical Machines (1)
Credits: 3 Hours: 4
This course will focus on Magnetic fields, electromagnetic relations, and magnetic circuits. Principles of DC machines will be introduced for generators and motors relating to construction, equivalent circuit, performance characteristics, applications, parallel operation, starting, and speed control. Transformer theory, types, constructions, equivalent circuits, and performance will also be studied.
Prerequisite: 70–110

52–161 Fundamentals of Electrical Power
Credits: 3 Hours: 4
This course will focus on basic concepts of single phase and three phase power systems. Students will focus on synchronous generator and transformer circuit models, Calculation of power transmission line parameters: R, L and C; introduction to line models, and per unit system.
Prerequisite: 70–115

70–175 Electrical Machines and Installations Workshop
Credits: 3 Hours: 7
This workshop will focus on testing, assembling, and disassembling of power transformers; inspection, testing, and maintenance of generators and motors for possible defects and faults; electrical installation regulations and inspection in buildings; current carrying capacities of cables and wires; and firefighting alarm systems.
Prerequisite: 52–123

70–216 Advanced Electrical Circuits
Credits: 2 Hours: 3
Balanced and unbalanced three–phase circuits. Voltage, current and power calculations in three phase circuits. Transients in RL, RC and RLC circuits. Fourier series analysis, RMS and harmonic calculations for non–sinusoidal periodic waveform. Characteristics of simple electronic devices (Diodes, Transistors and Operational Amplifiers). Simple electronic circuits and their applications. Two–port circuit analysis.
Prerequisite: 70–115

70–246 Electrical Installations
Credits: 3 Hours: 4
This course covers methods of wiring used in buildings. The course will also enable the student to read and understand wiring diagrams in order to implement and troubleshoot electrical circuits. The student will also be introduced to: regulations, safety precautions, electrical wiring symbols, earthing, simple design of electrical distribution and lighting system, load calculations, and protective devices. Upon the completion of this course, the student should be able to install a complete wiring system including conduits, wires, meters, main and sub–main distribution boards, fuses, sockets, light fittings, and other devices used in building installations. The course also covers methods of measuring earth resistance and insulation resistance.
Prerequisite: 76–106

70–260 Power Systems and Protection
Credits: 3 Hours: 4
This course introduces an introduction to the power system structure. Various types of generating plants, overhead transmission system components and parameters are introduced. The course covers symmetrical short circuit current calculations, basics of power system protection. Protective relays, circuit breakers and protection schemes such as over current, earth leakage and differential protections are also introduced. Generators and motors protective schemes are discussed in detail.
Prerequisite: 70–115

70–261 Power System Operation
Credits: 3 Hours: 4
This course covers topics related to modern operation of electric power systems. A general background of the power system structure and operation aspects is introduced. The performance of transmission system is discussed, followed by the formulation and solution of the basic power flow problem. Economic load dispatching of thermal power units is also covered. Theory of reactive power compensation and frequency control aspects are presented.
Prerequisite: 70–260

70– 265 Operation and Control of Power Systems
Credits: 3 Hours: 4
This course covers DC power flow and economic dispatch. It will also cover power system control of frequency, voltage, and reactive power; Automatic voltage regulation (AGC) and speed. Introduction to unit commitment and power system stability will also be demonstrated.
Prerequisite: 70–161

70–266 Electrical Substations
Credits: 3 Hours: 7
This course covers power transformer theory, construction, performance, connection to networks, testing and maintenance. Substation earthing systems, layout and bus bar schemes, Insulators, surge arrestors, and protection systems are covered. Construction, performance and cooling systems of underground cables are covered. Cable parameters; calculations of insulation resistance; cable capacitance and ampacity; electrical and thermal characteristics; methods of laying, fault location and troubleshooting; cable joints, terminations, and earthing; and safety principles are demonstrated.
Prerequisite: 52–123

70–267 Power System Analysis
Credits: 3 Hours: 4
Network calculations: definition and formation of Ybus and Zbus matrices. Power flow analysis and symmetrical components. Balanced and unbalanced faults. Power system stability. Computer–aided analysis of the performance of a selected power system is required as a project.
Prerequisite: 70–161

70–268 Transmission and Distribution of Electrical Power
Credits: 3 Hours: 4
This course covers: Power system modeling, Current and voltage relations on a power transmission line for different line models; steady state performance; and the one line and reactance diagrams of a power system. Load characteristics for electric distribution systems, primary and secondary distribution schemes, voltage drop and regulation as well as power loss calculations, distribution transformers and application of capacitors to distribution systems will be covered.
Prerequisite: 70–161

70–284 Computer Applications
Credits: 3 Hours: 4
This course cover Implementation of computer software in solving different problems in electrical engineering, such as: solving electrical circuit analysis, power system analysis and electrical machines analysis. Software utilized are Excel spreadsheets, PSIM power electronics simulation, and introduction to Matlab and Simulink.

70–286 Advanced Computer Applications
Credits: 3 Hours: 4
In this second computer applications course, students will build on their software knowledge from the first course to plan, simulate, analyze, or graphically represent the design, operation, or control of a specific process in fields of electrical machines or power systems. Emphasis will apply on existing real–world systems with a choice of one or two projects to be worked on throughout the length of the semester.
Prerequisite: 70–284

70–292 Electrical Calculations
Credits: 3 Hours: 3
Matrix Algebra, Rational Functions, Partial fractions, Simple Laplace transform and its inverse. Differential Equations solution using Laplace transforms. DC and AC response of an R L C circuits, analysis of non–sinusoidal waveform, harmonic spectrum analysis, opening and closing circuit breakers in power systems.
Prerequisite: 70–110

70–298 Project
Credits: 3 Hours: 4
This course provides students with the opportunity to employ theoretical knowledge and devolved skills gained throughout their education in solving technical problems and in working as a team. The Project involves selection of an appropriate engineering technology project for design and development, laboratory or workshop researching, designing, debugging, and prototyping. The project course requirement includes written report and oral presentation.

52–336 Electrical Maintenance
Credits: 3 Hours: 4
This course provides students with practical skills and knowledge to carry out basic electrical maintenance tasks. It illustrates the following: Importance and benefits of electrical maintenance; Hazards of electric shocks and precautions; Utilizing test equipment as well as reading and interpreting circuit drawings, carrying out fault investigation and troubleshooting as well as repairing electrical circuits; Establishment of a planned and preventive maintenance program and perform tasks such as equipment inventory and record keeping.
Prerequisite: 70–161

70– 362 Power System Protection
Credits: 3 Hours: 4
This course covers symmetrical components, balanced and unbalanced faults as well as main components of protection systems, such as Fuses and relays. Protection schemes such as over-current, directional, differential and distance schemes are demonstrated. Generators, motors, transformers, bus bars, and transmission lines protection are explained. Testing and maintenance of protective relays are covered.
Prerequisite: 70–161

70– 363 High Voltage Engineering
Credits: 3 Hours: 4
This course covers the following topics: Safety principles and precautions, high voltage generation (AC, DC and impulse) and their applications, corona, high voltage measurements and testing methods, and insulation: application, coordination, arc extinction, breakdown and nondestructive testing. Classification, construction, and maintenance of circuit breakers are demonstrated.
Prerequisite: 70–110,56–113

70–366 Electrical Power Stations
Credits: 3 Hours: 4
The course covers the following: Loads, load characteristics and load modeling; system interconnections; power plant economies–Tariffs and power factor improvements; types of power stations: Thermal, nuclear and hydro power; parallel operation and control; and major electrical equipment's in power station. The student is introduced to sustainable energy.
Prerequisite: 70–161

70–399 Field Training
Credits: 6 Hours: 24
Practical training in generation, transmission, and distribution in Kuwait power utilities and in private sector. Emphasis is laid on operation, maintenance, control of technical systems, equipment setup, commissioning, calibration or installation, safety and environment.
Prerequisite: 70–161,30–162, Passing 50 credits

Department of Electronic Engineering Technology

Overview:

The Department of Electronic Engineering Technology aims to provide students with technological skills required to seek employment as assistant engineers in four diverse fields of electronic engineering technology and furnish clear and comprehensive education in each field of specialization. The department continuously updates its laboratories and workshops with modern requirements in constructing a technician career.

Majors:

The Electronic Engineering Department introduces four fields of specializations in electronic technology. These are as follows:

- Communications Engineering Technology
- Control Systems Engineering Technology
- Biomedical Electronics Engineering Technology
- Computer Engineering Technology

Laboratories:

The department has the following laboratories and workshops in addition to personal computer laboratories:

- Electronic Circuits Laboratory
- Components and Electronic Devices Laboratory
- Digital Electronics Laboratory
- Microprocessor Laboratory
- Industrial Electronics Laboratory
- Biomedical Equipment Laboratory
- Communications Laboratory
- Biomedical Equipment workshop
- Industrial Electronics Workshop
- Communications Workshop

Department of Electronic Engineering Technology

Program: Biomedical Electronics Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
53	105	Electronic Workshop	1	3	
53	135	Electrical Circuits (1)	4	6	
53	136	Electrical Circuits (2)	4	6	53–135, 76–105
53	137	Electronics (1)	4	6	53–135
53	139	Digital Circuits	4	6	
53	238	Electronics (2)	4	6	53–137
53	239	Microprocessor Fundamentals	4	6	53–139
68	191	Biomedical Principles	2	2	
68	289	Therapeutic Equipment	3	4	68–191, 53–135
68	290	Biomedical Measurements (1)	3	4	68–191, 53–135
68	307	Electronic Project (Biomedical)	2	3	68–290
68	391	Biomedical Measurements (2)	3	4	68–290
68	399	Field Training	4	16	68–290, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
68	294	Medical Imaging	3	4	68–191, 53–139
68	296	Hospital Supplies	3	3	68–191, 53–135
68	396	Maintenance of Biomedical Equipment	3	4	68–191
68	397	Computer App. in Biomedical Equipment	3	4	68–290, 76–106
68	398	Selected topics in Biomedical Electronics	3	3	68–391

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
53	208	Introduction to Electronics Engineering Technology	2	2	30–102
53	209	Founding and Operation of an Electronic Project	2	2	53–208

Department of Electronic Engineering Technology

Program: Communication Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
53	105	Electronic Workshop	1	3	
53	135	Electrical Circuits (1)	4	6	
53	136	Electrical Circuits (2)	4	6	53–135, 76–105
53	137	Electronics (1)	4	6	53–135
53	139	Digital Circuits	4	6	
53	238	Electronics (2)	4	6	53–137
53	239	Microprocessor Fundamentals	4	6	53–139
53	256	Electromagnetic Applications	3	4	53–136
53	263	Communication Theory	3	4	53–137
53	264	Digital Communications	3	4	53–263
53	307	Electronic Project (Comm.)	2	3	53–263
53	359	Antenna Theory	2	2	53–256
53	399	Field Training	4	16	Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
53	356	Microwave Communications	3	4	53–256
53	358	Optical Communications	3	4	53–263
53	364	Communication Electronics	3	4	53–263
53	366	Selected topics in Communications	3	3	53–263
53	367	Digital Communication Networks	3	3	53–264
53	369	Computer Applications in Communication	3	4	53–263, 76–106

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
53	208	Introduction to Electronics Engineering Technology	2	2	30–102
53	209	Founding and Operation of an Electronic Project	2	2	53–208

Department of Electronic Engineering Technology

Program: Computer Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
53	130	Electrical Circuits Fundamentals	3	5	
53	137	Electronics (1)	4	6	53–130
53	139	Digital Circuits	4	6	
53	239	Microprocessor Fundamentals	4	6	53–139
60	132	Comp. Programming Language (1)	4	6	76–105
60	205	Computer Maintenance	3	5	
60	307	Computer Project	2	4	60–132, 53–239
60	222	Computer Operating System	3	3	60–205, 60–132
60	235	Comp. Programming Language (2)	4	6	60–132
60	349	Computer Architecture	3	3	53–139
60	255	Computer Networks (1)	4	6	53–139
60	399	Field Training	4	16	Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
60	211	Computer applications	3	4	60–132
60	251	Communication of Digital Information	3	3	53–139
60	354	Computer Networks (2)	3	3	60–255
60	292	Introduction to Database	3	4	60–132
60	360	Selected Topics in Computer Eng.	3	3	60–132, 205,255
60	231	Object Oriented Programming	3	4	60–132
60	347	Microprocessors Peripherals	3	4	53–239
60	242	Internet Programming	3	4	60–132
60	234	Logic Circuit Families	3	3	53–139,137

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
53	208	Introduction to Electronics Engineering Technology	2	2	30–102
53	209	Founding and Operation of an Electronic Project	2	2	53–208

Department of Electronic Engineering Technology

Program: Industrial Electronics Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
53	105	Electronic Workshop	1	3	
53	135	Electrical Circuits (1)	4	6	
53	136	Electrical Circuits (2)	4	6	53–135, 76–105
53	137	Electronics (1)	4	6	53–135
53	139	Digital Circuits	4	6	
53	238	Electronics (2)	4	6	53–137
53	239	Microprocessor Fundamentals	4	6	53–139
69	274	Automatic Control	4	5	53–137
69	275	Industrial Electronics	4	5	53–238
69	307	Electronic Project (Industrial Electronics)	2	3	69–274
69	370	Industrial Instrumentation	3	4	69–274
69	399	Field Training	4	16	Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
69	376	Robotics	3	4	69–274
69	377	Computer App. In Industrial Elect.	3	4	69–274, 76–106
69	379	Selected topics in Industrial Elect.	3	3	69–370
69	382	Programmable Logic Controllers	3	4	53–139
69	385	Computer based control	3	3	69–274
69	386	Microprocessor Applications	3	4	53–239

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
53	208	Introduction to Electronics Engineering Technology	2	2	30–102
53	209	Founding and Operation of an Electronic Project	2	2	53–208

COURSE DESCRIPTION

53–105 Electronic Workshop
Credits: 1 Hours: 3
Introduction to graphical symbols of electronic components, standards, and abbreviations. Schematic, block, and logic diagrams, printed circuit boards. Safety and good practice and procedures in workshop. Recognition of passive and active electronic components. Introduction to electrical measurements devices: voltmeters and ammeters. Hand tools and soldering. Basic concepts in system operation, testing, and troubleshooting. Calibration of different types of equipment and systems.

53–130 Electrical Circuits Fundamentals
Credits: 3 Hours: 5
Basic knowledge of electrical circuits, electrical variables, basic electrical laws and elements, electrical power and energy, Kirchhoff laws, basic circuit analysis, basic electricity laws in DC and AC, RLC circuits, power factor.

53–135 Electrical Circuits (1)
Credits: 4 Hours: 6
Practical concepts of DC electrical circuits: current, voltage, resistance, and Power. Circuit analysis techniques and theorems. Capacitance, inductance, and magnetic circuit operation.

53–136 Electrical Circuits (2)
Credits: 4 Hours: 6
Fundamentals of AC electrical circuits, phasors, and complex numbers. Analysis of RC, RL, and RLC circuits. Series and parallel resonances. Transformers and their applications.
Prerequisite: 76–105, 53–135

53–137 Electronics (1)
Credits: 4 Hours: 6
Introduction to PN junction diodes and DC and AC applications. Transistors such BJT's and FET, MOSFET's DC and AC small signal analysis. Operational amplifiers: basic circuits and applications.
Prerequisite: 53–135

53–139 Digital Circuits
Credits: 4 Hours: 6
Fundamentals of binary and hexadecimal number systems. BCD and ASCII codes, truth tables and logic gates devices. Boolean theorems, combinational logic circuits, Karnaugh map, implementation of adders and subtractors, sequential circuits and Flip–Flops. Registers, counters, decoders, encoders, multiplexers, de–multiplexers, and their applications. A/D and D/A conversions.

53–208 Introduction to Electronic Engineering Technology
Credits: 2 Hours: 2
Historical evolution of different types of technology. Electronic technology from electromechanical to nanotechnology and main applications. Technical electronic laboratories, and skills, materials associated with electronics, solving engineering problems, use software programs and packages, simulation, and industrial safety.
Prerequisite: 30–102

53–209 Founding and Operation of an Electronic Project
Credits: 2 Hours: 2
Electronic factory/workshop organization. Electrical installation and factory layout. Main activities: production organization, testing, calibration, quality control, inventory control. Practical examples including equipment, materials, and machines used. Automatic testing and assembly presented.
Prerequisite: 53–208

53–238 Electronics (2)
Credits: 4 Hours: 6
Analysis of multistage amplifiers, active filters, power amplifiers and feedback oscillator circuits. Basic analog integrated circuits, voltage regulators, and wave shaping circuits.
Prerequisite: 53–137

53–239 Microprocessor Fundamentals
Credits: 4 Hours: 6
Introduction to 8085 microprocessor architecture, including bus system, memory map and size. Assembly language programming. Input/output data through programmable I/O devices, and asynchronous and synchronous communication.
Prerequisite: 53–139

53–256 Electromagnetic Applications
Credits: 3 Hours: 4
Wave propagation and transmission, including electromagnetic fields propagation of waves in transmission lines and atmosphere. Effect of medium on wave propagation and transmission.
Prerequisite: 53–136

53–263 Communications Theory
Credits: 3 Hours: 4
Introduction to analog modulation and demodulation techniques used in analog broadcasting and telephony, such as amplitude, frequency and phase modulation. Representation of periodic and aperiodic signals in time and frequency domains. Active and passive filters.
Prerequisite: 53–137

53–264 Digital Communications
Credits: 3 Hours: 4
Introduction to digital signal communications. Comparison of digital communication methods with analog communication methods. Methods coding, modulation and demodulation of signals.
Prerequisite: 53–263

53–307 Electronic Project
Credits: 2 Hours: 3
Applied project in communication under the supervision of department faculty. A written technical report and oral presentation describing the project operation are required.
Prerequisite: 53– 263

53–356 Microwave Communications
Credits: 3 Hours: 4
Microwave components and devices commonly used in microwave and wireless communication, including waveguides, passive components, active devices, and microwave antennas, receivers, and relays.
Prerequisite: 53–256

53–358 Optical Communications
Credits: 3 Hours: 4
Operational principle of different components used in optical communication systems, include generation, transmission, manipulation and detection of light. Passive and active devices in WDM systems.
Prerequisite: 53–263

53–359 Antenna Theory
Credits: 2 Hours: 2
Fundamental properties of antennas, types, transmission and reception of electromagnetic waves. Effects of medium and atmosphere on wave propagation and applications in wireless networks.
Prerequisite: 53–256

53–364 Communication Electronics
Credits: 3 Hours: 4
Hardware implementation of AM and FM modulators/Demodulators, including transmitter and receiver circuit. Multiplexing techniques such as FDMA, and TDMA.
Prerequisite: 53–263

53–366 Selected Topics in Communications Engineering
Credits: 3 Hours: 3
Selected topics in communication theory and design covering the latest advances in communication technology.
Prerequisite: 53–263

53–367 Digital Communications Networks
Credits: 3 Hours: 3
Introduction to the basic concepts of communication networks. Protocols and layers. Basic transmission media and their characteristics; techniques of data transmission through communication networks. Network architectures and topologies such as LAN, WAN, and MAN. ATM and frame relay transmission techniques. Concepts of network security.
Prerequisite: 53–264

53–369 Computer Applications in Communication Engineering
Credits: 3 Hours: 4
Introduction to computer hardware and software in various communication systems and how used to do an integral part in system operations. Simulation/calculation software packages introduced.
Prerequisite: 53–263, 76–106

53–399 Field Training
Credits: 4 Hours: 16
Applied training in real–time communication devices and systems, including maintenance and troubleshooting. An oral presentation and final written technical report are required.
Prerequisite: Passing 50 credits

60–132 Computer Programming Language (1)
Credits: 4 Hours: 6
Introduction to structural programming including memory concepts, decision making, and relational operators. Top–down control structures. Logical operators using repetition structure. Function definitions, prototypes, and application to modular programming. Declaring and storing for simple and multiple–subscripted Array and Pointers.
Prerequisite: 76–105

60–205 Computer Maintenance
Credits: 3 Hours: 5
Introduction to hardware, peripherals, and software with emphasis on computer operations, terminology, and organization. Installation, configuration, maintenance, diagnoses and troubleshooting of computer problems.

60–211 Computer Applications
Credits: 3 Hours: 4
Principles of database systems, including relational and hierarchical structures. Computer security and integrity. Database design and implementation of a real–life application using relational database tools.
Prerequisite: 60–132

60–222 Computer Operating Systems
Credits: 3 Hours: 3
Operation system. Structures and interrupt–Based I/O. Dual–Mode operation and hardware protection components. Synchronization, deadlock characterization, prevention, avoidance and recovery. Memory management, virtual memory, and file system organization.
Prerequisite: 60–205, 60–132

60–231 Object Oriented Programming
Credits: 3 Hours: 4
Introduction to object–oriented programming Java application applets, control structures, methods, arrays, string, graphics and GUI compon53s.
Prerequisite: 60–132

60–234 Logic Circuits Families
Credits: 3 Hours: 3
Basic electronic components such as diodes, transistors, and FETs, in the construction of digital logic gates. Switching operations of a transistor circuits and analysis of different logic families that constitute the building blocks of microprocessors in general.
Prerequisite: 53–137, 53–139

60–235 Computer Programming Language (2)
Credits: 4 Hours: 6
Object oriented programming using Java class libraries, Java environment and memory concepts including arithmetic, equality and relational operators. Java Applets and its applications to the internet. Control structures and formulating algorithms with Top–Down, Stepwise refinement. Creating Packages and controlling access to members within the super– and subclasses for public, static, private, and protected class members.
Prerequisite: 60–132

60–242 Internet Programming
Credits: 3 Hours: 4
Introduction to techniques for designing efficient algorithms using HTML and JAVA Applets in a dynamic programming environment. Graphics and Strings modularity. Abstraction, polymorphous and inheritance of object oriental techniques.
Prerequisite: 60–132

60–251 Communication of Digital Information
Credits: 3 Hours: 3
Introduction to digital data communication. Analog to digital conversion, base band modulation techniques, and data scrambling schemes. Band pass modulation schemes, data compression, data encoding, and error detection techniques. Relationship between bit and sample rates and their relation to channel bandwidth and capacity.
Prerequisite: 53–139

60–255 Computer Networks (1)
Credits: 4 Hours: 6
Introduction to computer networking including local area networks, wide area networks, protocols, standards, topologies and architectures, TCP/IP suite and addresses, equipment, and network operating systems.
Prerequisite: 53–139

60–292 Introduction to Database
Credits: 3 Hours: 4
Introduction to algorithmic problem solving, basic data structures, arrays, stacks, queues, linked lists, trees and graphs. Searching, sorting and hashing techniques for different data structures.
Prerequisite: 60–132

60–307 Computer Project
Credits: 2 Hours: 4
The design, construction, a presentation of an original project related to computer hardware and software. The project maybe assigned to an individual student or team of students. Detailed written and oral progress and final reports are required.
Prerequisite: 60–132, 53–239

60–347 Microprocessor Peripherals
Credits: 3 Hours: 4
Digital and analog serial and parallel Interfacing, including counter, keyboard, timer, direct video, graphics, mouse, and disk. Hardware implementation of interrupts.
Prerequisite: 53–239

60–349 Computer Architecture
Credits: 3 Hours: 3
Computer design methodology, including levels, models, cache, and virtual memories. Pipeline design techniques using RISC architecture, superscalar architecture, vector computers and multiprocessor systems.
Prerequisite: 53–139

60–354 Computer Networks (2)
Credits: 3 Hours: 3
Network topologies including bus, ring and star. WAN and remote activity including X25 and Frame Relay. ISDN and DSL, SONET synchronous optical networks and implementation. TCP/IP services and utilities. Tools utilized troubleshooting.
Prerequisite: 60–255

60–360 Selected Topics in Computer Engineering
Credits: 3 Hours: 3
Selected topics covering different aspects and trends in computer engineering technology.
Prerequisite: 60–132, 60–205, 60–255

60–399 Field Training
Credits: 4 Hours: 16
Applied training related to computer applications in private or public institutes. A detailed oral presentation and written technical report are required upon completion of the course.
Prerequisite: Passing 50 credits CTS

68–191 Biomedical Principles
Credits: 2 Hours: 2
Introduction to biomedical theory and equipment. The main physiological systems of the human body, including a brief introduction to human anatomy and common medical terminology used by the medical staff in hospitals.

68–289 Therapeutic Equipment
Credits: 3 Hours: 4
Introduction to theory and application of common therapeutic equipment such as pacemakers, defibrillators, ventilators, hemodyalisis machine, shortwave and microwave diathermy, electrosurgical generators, infusion and suction pumps, radiotherapy, and biomedical lasers.
Prerequisite: 53–135, 68–191

68–290 Biomedical Measurements (1)
Credits: 3 Hours: 4
Introducing bio–signals measurements and monitoring by collecting, conditioning, and displaying in–depth studies of diagnostic equipment such as: ECG, EMG, and EEG. Focus on physiological background, theory of operation, calibration maintenance, inspection, safety, and report writing.
Prerequisite: 53–135, 68–191

68–294 Medical Imaging
Credits: 3 Hours: 4
Introducing common medical imaging modalities such as X–rays, CT, ultrasound, MRI, and nuclear medicine. Safety considerations, and advantages and shortfalls of each modality. Overview of digital image processing.
Prerequisite: 68–191, 53–139

68–296 Hospital Supplies
Credits: 3 Hours: 3
Introduction to the main hospital departments and major equipment and instruments used. Proper installation of medical equipm53 and their supply of water, gas electricity, and ambient conditions required for operation.
Prerequisite: 68–191, 53–135

68–307 Electronic project
Credits: 2 Hours: 3
Implementation of a project in the biomedical field under the supervision of department faculty. An oral presentation and final written technical report that describes the project in detail is required.
Prerequisite: 68–290

68–391 Biomedical Measurements (2)
Credits: 3 Hours: 4
Introduction to biomedical measurements principles and equipment. Including blood pressure, flow, volume, composition, and oximetry; spirometers and related respiratory measurements audiometers and acoustic measurements.
Prerequisite: 68–290

68–396 Maintenance of Biomedical Equipment
Credits: 3 Hours: 4
Introduction to classical and modern maintenance techniques and troubleshooting of biomedical equipment. Use of service manuals and testing devices safely and efficiently for fault–finding.
Prerequisite: 68–191

68–397 Computer Applications in Biomedical Equipment
Credits: 3 Hours: 4
Introducing advances in computer hardware and software and their increasing role in various biomedical equipment. General and specific 'up–to–date' examples illustrated to demonstrate the integration with biomedical equipment in providing functions such as storage, control, and communication.
Prerequisite: 68–290, 76–106

68–398 Selected Topics in Biomedical Electronics
Credits: 3 Hours: 3
Selected topics covering different aspects and trends in biomedical electronics.
Prerequisite: 68–391

68–399 Field Training
Credits: 4 Hours: 16
Applied training in biomedical equipment service and installation. Report writing and practice relevant to professional work environment.
Prerequisite: 68–290, Passing 50 credits

69–274 Automatic Control
Credits: 4 Hours: 5
Basic concepts of control theory of open and closed loop systems. The block diagram representation is used to model a stable system. Introduction to transient and steady state responses of simple closed–loop control systems. Frequently response analysis, compensation, and stabilizing techniques for performance improvement.
Prerequisite: 53–137

69–275 Industrial Electronics
Credits: 4 Hours: 5
Basic theory of a process control system. Switching thyristors and triggering methods. Applications in the control of power, temperature, and liquid level.
Prerequisite: 53–238

69–307 Electronic Project
Credits: 2 Hours: 3
Applications of electronics principles to real–world project. Students will submit a status update and a final technical report that describes the project in detail.
Prerequisite: 69–274

69–370 Industrial Instrumentation
Credits: 3 Hours: 4
Study of electrical and electronic process sensors and actuators in a variety of applications. Practical application of complete systems.
Prerequisite: 69–274

69–376 Robotics
Credits: 3 Hours: 4
Basic concepts and practical aspects of robotics, including history, geometry, end–effect, design, types, sensors and programming. Application of robotics in industries and end–operation.
Prerequisite: 69–274

69–377 Computer Applications in Industrial Electronics
Credits: 3 Hours: 4
Introduction to computer hardware and software in various industrial electronics and control arrangements. General and specific illustrations of how to integrate computers in such systems to do control and measurement functions.
Prerequisite: 69–274, 76–106

69–379 Selected Topics in Industrial Electronics
Credits: 3 Hours: 3
Selected topics covering different aspects and trends in industrial electronics and control technology.
Prerequisite: 69–370

69–382 Programmable Logic Controllers
Credits: 3 Hours: 4
Introducing the basic concepts and components of the main elements of a PLC. Topics include PLC programming, system monitoring, and interface control techniques.
Prerequisite: 53–139

69–385 Computer–Based Control
Credits: 3 Hours: 3
Basic concepts and practical aspects of computer – based control systems. General low charts of algorithms of microprocessors used in classical control strategies.
Prerequisite: 69–274

69–386 Microprocessor Applications
Credits: 3 Hours: 4
A study of microprocessor software, hardware, application and tools for implementation. A full account of an operable practical example, hardware and software, implemented.
Prerequisite: 53–239

69–399 Field Training
Credits: 4 Hours: 16
Applied training in service industries. A written technical report and oral presentation detailing evaluated engineering tools and techniques are required.
Prerequisite: Passing 50 credits

Department of Laboratory Technology

Overview:

The Laboratory Technology curriculum provides theoretical and practical training for students in the fields of applied chemistry and applied physics. The department also offers basic courses, including mathematics for all college students.

Programs:

The department of Laboratory Technology offers the following specializations:

- Applied Physics
- Applied Chemistry

Laboratories:

Physics Laboratories:

- General Physics Laboratory
- Electricity and Magnetism Laboratory
- Thermal Physics Laboratory
- Sound and Properties of Matter Laboratory
- Physical Electronics and Instrumentation Laboratory
- Optics and optical Instruments Laboratory
- Modern and Advanced Physics Laboratory
- Computer Laboratory
- Bio Physics and Radiation Laboratory

Chemistry Laboratories:

- Analytical Chemistry and Environmental Laboratory
- General and Inorganic Chemistry Laboratory
- Glass Blowing Laboratory
- Instrumental Laboratory (I) & (II)
- Organic and Biochemistry Laboratory
- Petro–chemistry Laboratory
- Physical Chemistry Laboratory

Department of Laboratory Technology

Program: Applied Chemistry

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
75	110	General Chemistry	3	4	
75	112	Analytical Chemistry	3	4	75–110, 76–105
75	121	Inorganic Chemistry	3	4	75–110
75	130	Organic Chemistry	3	4	75–110
75	210	Instrumental Analysis (1)	3	5	75–112, 30–102
75	213	Instrumental Analysis (2)	3	5	75–112
75	215	Environmental Pollution	3	4	75–112
75	219	Nuclear and Radio Chemistry	2	2	75–110, 56–113
75	231	Physical Chemistry (1)	3	4	75–110
75	270	Computer App. in Chemistry	3	5	75–110, 75–130
75	312	Applied Analytical Chemistry	3	4	75–112
75	331	Applied Organic Chemistry	3	4	75–130
75	333	Petrol and Petrochemistry	3	4	75–130
75	399	Field Training	4	16	75–213, Passing 50 Credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
75	214	Sampling	1	2	
75	222	Drug Analysis	3	4	75–112
75	223	Nutritional Analysis	3	4	75–112
75	218	Polymers	3	3	75–130
75	232	Physical Chemistry (2)	3	4	75–231
75	241	Biochemistry	3	4	75–130
75	252	Glass Blowing	1	3	
75	272	Safety in Chemical Laboratories	2	2	
75	316	Literature Survey and Project	3	4	75–110, 30–102
76	151	Principles of Probability and Statistics	2	2	76–105
76	156	Advanced Mathematics	3	3	76–106

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
75	105	Scientific culture	2	2	
81	298	Industrial Safety	2	2	30–102

Department of Laboratory Technology

Program: Applied Physics

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
56	160	Electricity and Magnetism	3	4	
56	165	Thermal Physics	3	4	56–113
56	166	Optics	3	4	
56	167	Properties of Matter	3	4	56–113
56	168	Instrumentation	3	5	76–105
56	169	Radiation Physics (1)	3	4	56–113
56	202	Physical Electronics	3	4	56–160
56	203	Modern Physics	3	4	56–166
56	206	Computer App. in Physics	3	5	56–113
56	208	Waves and Sound	3	4	76–106
56	260	Optical Instruments	3	5	56–166
56	270	Radiation Physics (2)	2	3	56–169
56	399	Field Training	4	16	56–169, Passing 50 credits
75	110	General Chemistry	3	4	

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
56	152	Solid State Physics	2	2	56–113
56	205	Biophysics	3	4	56–113
56	264	Laser	2	2	56–166
56	271	Physics Project	3	4	56–169, 30–102
75	252	Glass Blowing	1	3	
75	284	Stores Management	1	1	
76	151	Principles of Probability and Statistics	2	2	76–105
76	156	Advanced Mathematics	3	3	76–106

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
75	105	Scientific culture	2	2	
81	298	Industrial Safety	2	2	30–102

COURSE DESCRIPTION

56–113 General Physics
Credits: 3 Hours: 4
Introduction, system of units, conversion of units, motion with constant acceleration, free fall, Newton's laws of motion, work and energy, conservation of mechanical energy, density and specific gravity, Hooke's law, elasticity, Young's, shear and bulk modulus, heat and temperature, specific heat, thermal conductivity, thermal expansion, pressure in fluids, atmospheric and gauge pressure, buoyant force, Archimedes' principle, viscosity, direct current circuits, Ohm's law, resistors in series, resistors in parallel.

56–152 Solid State Physics
Credits: 2 Hours: 2
Atomic binding and crystal binding, crystal defects, tools for studying structure of solids x–ray diffraction, electron diffraction, electrical properties of solids, free electron model, band structure model, thermal properties of solids, thermal conductivity, thermal expansion, thermal electric power, optical processes in solids, optical materials, magnetic solids and super conductors.
Prerequisite: 56–113

56–160 Electricity and Magnetism
Credits: 3 Hours: 4
Electric Charge, insulators and conductors, electroscope, Coulombs law, the electric field, electric flux, Gauss's law, electric potential, potential difference, potential energy, electric current, Ohm's law, resistance, resistivity, resistors in series, resistors in parallel, electric power, Kirchhoff's laws, capacitors, emf, potentiometer, magnets and magnetic field, magnetic force on electrical charge, magnetic force on wire carrying current, force between two parallel wires, ampere's law.

56–165 Thermal Physics
Credits: 3 Hours: 4
Temperature and thermometers, temperature scales, temperature measurements, thermocouples, thermal expansion of solids and liquids, kinetic theory of gases, the gas law and absolute temperature scale, heat and internal energy, heat capacity and specific heat, heat latent, mechanical equivalent of heat, heat transfer by conduction, convection and radiation, Stefan–Boltzmann law, the first law of thermodynamics, second law of thermodynamics, reversible and irreversible processes, entropy, heat engines.
Prerequisite: 56–113

56–166 Optics
Credits: 3 Hours: 4
Properties of light, geometrical optics, spherical mirrors, thin lenses, thick lenses, physical optics, interference, diffraction and polarization of light, applications.

56–167 Properties of Matter
Credits: 3 Hours: 4
Introduction, meaning of structure and property concept (other properties of materials such as electrical, optical, magnetic, and thermal properties of materials). classification of basic materials and comparison of their main physical properties, classification of advanced and smart materials with examples of its main properties, rotational motion of rigid bodies and center of mass concept, conservation of angular momentum, Newton's law of gravity. Moment of inertia of rigid body regular shapes and parallel axis theorem, rolling motion, velocity, and acceleration of center of mass of rolling regular shapes, mechanical properties of materials, Young's, Shear, and Bulk moduli, Poisson's ratio, Stress – Strain curve, Hooke's law and deformation energy for ductile and brittle materials, how to calculate the stiffness, ductility and other mechanical parameters from stress– strain curve. Viscosity and viscous fluids, kinematics viscosity, applications of viscosity, surface tension, capillary tubes.
Prerequisite: 56–113

56–168 Instrumentation
Credits: 3 Hours: 5
Measurement system, dimensional analysis, error analysis, systematic and random errors, graphical presentation of experimental data, curve fitting and regression analysis, fine measurements (Vernier caliber, micrometer, spherometer), ammeter, voltmeter, galvanometer, capacitors, solar cells, potentiometer applications, Wheatstone bridge, electrical resistivity, oscilloscope, electrical thermometers, different methods of temperature measurements, calibration methods devices calibration.
Prerequisite: 76–105

56–169 Radiation Physics (1)
Credits: 3 Hours: 4
Introduction to nuclear physics, structure and properties of the nucleus, binding energy and nuclear forces, natural radioactivity and emission of charged particles, radioactive decay series, alpha, beta and gamma decay, interaction of radiation with matter, nuclear fission, nuclear fusion.
Prerequisite: 56–113

56–202 Physical Electronics
Credits: 3 Hours: 4
Introduction to electronics (atom, materials used in electronics, current in semiconductors, N–type and P–type of semiconductors, PN junction, FW biasing and R biasing, diode operation, voltage cur devices rent characteristics, diode models, half wave rectification and rectifiers, full wave rectification and rectifiers, power supply filters and regulators, diode limiters and clampers, voltage multipliers, diode data sheet, Zener diode, Zener diode application, optical and other types of diode, BJT structure and operation, BJT characteristics and parameters, BJT as an amplifiers, BJT as a switch, Transistors categories and packaging.
Prerequisite: 56–160

56–203 Modern Physics
Credits: 3 Hours: 4
Introduction to special and general theory of relativity, quantum theory, discovery and properties of the electron, Planck's quantum hypothesis, black body radiation, photon theory of light and photoelectric effect, energy, mass and momentum of a photon, Compton effect, photon interactions; pair production, wave particle duality; principle of complementarity, wave nature of matter, early models of the atom, atomic spectra, Bohr model, De Broglie hypothesis, quantum mechanical view of atoms, quantum numbers of an electron, X–ray spectra and atomic number, fluorescence, phosphorescence, lasers, holography, molecular spectra, rotational and vibrational energy levels in molecules.
Prerequisite: 56–166

56–205 Biophysics
Credits: 3 Hours: 4
Force on and in the body, energy work and power of the body, pressure in the body, skull, pressure in digestive system and in urinary bladder, the sensory system, hearing, vision, general senses, physics of cardiovascular system.
Prerequisite: 56–113

56–206 Computer Applications in Physics
Credits: 3 Hours: 5
Importance of computers in physics, statistical analysis of data, regression analysis, teaching physics using computer, software packages to solve physics problems, computer applications in heat, waves, optics, electricity and magnetism, electronics, modern and nuclear physics.
Prerequisite: 56–113

56–208 Waves and Sound
Credits: 3 Hours: 4
Wave terminology, waves characteristics, energy transmission, superposition, reflection of waves, standing waves (applications), sound waves, speed of sound, quality of sound, interference of sound waves, beats (applications), shockwaves and sonic boom, production and reception of human sound, ultrasonic applications.
Prerequisite: 76–106

56–260 Optical Instruments
Credits: 3 Hours: 5
Introduction, optics of the eye, short and long sights, astigmatism, common optical instruments, grating and prism spectrometer, the resolution in grating and prism spectrometer, Biots polariscope, the polarimeter, Michelson interferometer, the magnifiers, types of objectives, types of eyepieces, optical microscope, total magnification, types of microscopes, resolution in optical microscope, improvements in resolution, construction and operation of the electron microscope types of electron microscopy.
Prerequisite: 56–166

56–264 Laser
Credits: 2 Hours: 2
Laser is the new area for different field of applications, industrials, communications, environmental and medicals. It is become very important for technological studies student at least to know the main idea of each of these applications, and as we expecting in the near future the development of the course will be necessary, it will be fully practical in the laboratory and in the field.
Prerequisite: 56–166 Optics

56–270 Radiation Physics (2)
Credits: 2 Hours: 3
Sources of natural and artificial radiation, application of ionizing radiation and radioisotopes in different fields in life such as industrial and medical, generation of energy using radiation and nuclear technology, nuclear reactors, radioactive environmental pollution, biological effects of radiation.
Prerequisite: 56–169

56–271 Physics Project
Credits: 3 Hours: 4
The students have to realize an original research project in the following subjects: electronics, optics, sound, solid state physics, radiation, environment protection and other area in physics.
Prerequisite: 56–169, 30–102

56–399 Field Training
Credits: 4 Hours: 16
Students are trained and participate in the operations, repair and maintenance of the instruments concerned with the physical methods of analysis, for a period of fifty–six days (5 hrs/day). At the end of training the student submits a technical report, accompanied by a presentation, describing all details about the tests performed and technical information acquired.
Prerequisite: 56–169, Passing 50 credits

75–105 Scientific Culture
Credits: 2 Hours: 2
The course will cover the history of science from a world perspective spanning a period from ancient times to the present. General areas covered will include the origins of science and its development and interaction with society. Specific topics will include technology evolution and the nature of the scientists. The syllabus is subject to change over the course of the semester.

75–110 General Chemistry
Credits: 3 Hours: 4
This course covers those chemical concepts most needed in most areas of science, emphasizes the basic principles of physical, inorganic, and organic chemistry. Topics include atomic structure, the periodic table, chemical bonding, the states of matter, solutions, chemical equilibrium, oxidation and reduction, electrochemistry, introductory organic chemistry. Laboratory experiments will be performed so as to facilitate an understanding of the chemical principles and experimental quantification and identification techniques.

75–112 Analytical Chemistry
Credits: 3 Hours: 4
This course covers the major methods of gravimetric and volumetric analysis used by analytical chemists. Topics include acid–base, complexometric, precipitation and redox titrations; elementary spectrophotometry. Theoretical and practical perspectives of chemical analysis are considered.
Prerequisite: 75–110, 76–105

75–121 Inorganic Chemistry
Credits: 3 Hours: 4
Review of atomic theory/structure and periodic trends; models of structure and bonding, including the covalent bond (emphasizing the molecular orbital approach), ionic bond (ionic structures and defects and the metallic bond (conductors, semi–conductors, insulators, alloys); chemistry of the main group elements; introduction to transitions metal chemistry, structural distortions, color and electronic spectra of transition metal complexes.
Prerequisite: 75–110

75–130 Organic Chemistry
Credits: 3 Hours: 4
This course covers the fundamentals of organic chemistry and includes nomenclature, structures, properties, functional groups, and basic reactions of the important classes of organic compounds. The principles of stereochemistry, reaction mechanisms and synthesis are presented. In addition to presenting basic techniques of organic chemistry, laboratory exercises demonstrate and clarify the principles presented in the lecture. Laboratories involving simple syntheses, purifications, and identification techniques are included.
Prerequisite: 75–110

75 –210 Instrumental Analysis (1)
Credits: 3 Hours: 5
An introduction to the principles and methods for analysis of chemicals using appropriate instrumentation. Modern analytical methods will be discussed in lecture.
Prerequisite: 75–112, 30–102

75–213 Instrumental Analysis (2)
Credits: 3 Hours: 5
A continuation of 75 211 with the introduction of the theory and application of spectroscopic methods for the analysis of molecular structures chemicals using spectrophotometers (UV, VIS, IR), chromatographs (GC and HPLC). Modern analytical methods will be discussed in lecture.
Prerequisite: 75–112

75–214 Sampling
Credits: 1 Hours: 2
Techniques and devices for sampling in diverse media will be treated, followed by a discussion of sample treatment prior to analysis including isolation, concentration and fractionation of analytes and classes of analytes.

75–215 Environmental Pollution
Credits: 3 Hours: 4
The subject matter of this course is sources, types, and effects of air and water pollutants. Students study air– and water–quality analyses and pollution control techniques. Laboratory exercises include measurement of particulates in air and chemical analysis of airborne and water pollutants.
Prerequisite: 75–112

75–218 Polymers
Credits: 3 Hours: 3
Introduces polymer science with a focus on polymer chemistry and polymerization reactions of important industrial polymers, their applications and how polymer properties depend on structure.
Prerequisite: 75–130

75–219 Nuclear and Radio Chemistry
Credits: 2 Hours: 2
The Atom and its Nucleus, Radioactive Decay, Nuclear Masses and Nuclear Stability, Nuclear Reactions; Interaction of Nuclear Radiation With Matter, Counters, Radiation Safety Precautions.
Prerequisite: 75–110, 56–113

75–222 Drug Analysis
Credits: 3 Hours: 4
This course covers approach to medicinal chemistry and an introduction to pharmacology, Physical chemical properties of drugs; types of chemical, principles of solubility, solution equilibria, chemical kinetics, heterogeneous systems and solids. Factors influencing the absorption, distribution, excretion, and metabolism of drugs in humans are presented.
Prerequisite: 75–112

75–223 Nutritional Analysis
Credits: 3 Hours: 2
Chemical properties of food constituents discussed in relation to their effect on processing, nutrition, and spoilage.
Prerequisite: 75–112

75–231 Physical Chemistry (1)
Credits: 3 Hours: 4
Introduction to the physical chemistry of solids, liquids and gases; electrochemistry, chemical phase equilibrium, thermodynamics and kinetics; the application and importance of chemistry and technology in industry. Emphasizes the applications of topics associated with thermodynamics and phase equilibrium.
Prerequisite: 75–110

75–232 Physical Chemistry (2)
Credits: 3 Hours: 4
Introduction to electrochemistry, thermodynamics and corrosion of metals. Emphasizes the applications on galvanic cells and electroplating. Also includes some qualitative analysis.
Prerequisite: 75–231

75–241 Biochemistry
Credits: 3 Hours: 4
The chemistry and biochemical interrelationship of carbohydrates, lipids, and nucleic acids; enzyme catalysis and introduction to metabolism.
Prerequisite: 75–130

75–252 Glass Blowing
Credits: 1 Hours: 3
A laboratory course in the manufacture, use and repair of scientific glassware. Six types of seals are constructed; a student–designed project is required.

75–270 Computer Applications in Chemistry
Credits: 3 Hours: 4
Introduction to the language of BASIC, and the use of micro computing in chemistry. The topics included in the course are the Windows Operating System, numerical methods associated with chemical computations, and instruction in the use of PC–based applications programs. These applications consist of general utility (productivity) programs, chemical structure drawing programs, molecular viewing and molecular modeling programs and quantum chemistry programs. Also included in the course is an introduction to Combinatorial Chemistry and Bioinformatics.
Prerequisite: 75–110, 75–130

75–272 Safety in Chemical Laboratories
Credits: 2 Hours: 2
This course serves as a comprehensive introduction to the field of environmental health science. How to recognize and counter laboratory hazards, including flammable, explosive, and toxic compounds. The course emphasis the roles and responsibilities of industrial chemists. Industrial hygiene and safety. Industrial chemical processes, their waste products, their environmental effects, and the treatment of pollutants.

75–284 Stores Management
Credits: 1 Hours: 1
Fluency of materials required for storing processes: handling and manipulation, labeling and indexing, protection of materials, storing restrictions.

75–312 Applied Analytical Chemistry
Credits: 3 Hours: 4
An introduction to advanced techniques and instrumentation used in modern inorganic chemistry, materials science, physical and analytical chemistry. The emphasis will be on synthetic methods and spectroscopic techniques for structure determination and material characterization, and chemical process technology.
Prerequisite: 75 –112

75–316 Literature Survey and Project
Credits: 3 Hours: 4
An individual research project that includes training in advanced laboratory skills, and the use of online searching techniques under the direction of a member of the faculty. Students are required to research and to communicate the results, utilizing the chemical literature, record keeping, writing reports and proposals and techniques of oral communication. Students are required to submit a written report. perform experiments including important applied chemistry procedures. Projects promote quantitative and interpretive skills as well as teamwork in a multidisciplinary environment.
Prerequisite: 75–110, 30–102

75–331 Applied Organic Chemistry
Credits: 3 Hours: 4
Introduction to spectroscopic characteristics or organic compounds; continued classification of 'reaction types' exhibited by organic molecules; chemistry of carbonyl compounds; 56ects of aromatic chemistry, heterocycles, nitrogen compounds, polymers, and biologically important molecules.
Prerequisite: 75–130

75–333 Petrol and Petrochemistry
Credits: 3 Hours: 4
Petroleum refining, catalytic and thermal petrochemical processes, soaps and detergents, specialty chemicals, are presented at the industrial level. Production of petrochemicals such as ethylene, methanol, and ammonia from natural gas. Catalytic and thermal processes for production of light petroleum products from heavier derivatives.
Prerequisite: 75–130

75–399 Field Training
Credits: 4 Hours: 16
The college offers a wide variety of undergraduate courses, and because these are taught in modules, students have a great deal of flexibility in choosing to study the 56ects of Chemistry, which interest them most. As well as scientific content, the courses emphasize team building, problem–solving and communication skills, and many recent successful graduates pursue careers in business and industry. Students receive individual support, and combined with good teaching, this produces a very high percentage of successful graduates.
Prerequisite: 75–213, Passing 50 credits

76–105 Mathematics (1)
Credits: 3 Hours: 3
Fundamental Concepts of Algebra: Algebra, Real Numbers, Coordinate Lines, Exponents and Radicals, Polynomials and Algebraic Expressions, Manipulation of Algebraic Expressions, Complex Numbers. Equations and Inequalities: Linear Equations, Quadratic Equations, Cubic Equations, Linear Inequalities, Fundamental Properties of Inequalities, Systems of Linear Inequalities, Word Problems. Functions of One Variable: Definitions, Graphs of Functions, Linear Functions, Composite and Inverse Functions, Quadratic Functions, Exponential Functions, Logarithmic Functions, Trigonometric Functions. Analytic Trigonometry: Fundamental Identities, Inverse Trigonometric Functions, Trigonometric Equations, The Law of Sines, The Law of Cosines, Polar Coordinates. Matrices and Determinants: Systems of Linear Equations, Matrices, The Algebra of Matrices, Some Special Matrices, Determinants, Solving Systems of linear Equations by Using Cramer’s Rule.

76–106 Mathematics (2)
Credits: 3 Hours: 3
Topics in Algebra: Exponential Equations, Logarithmic Equations, Arithmetic Sequences, Geometric Sequences, Infinite Series, The Binomial Theorem, Principle of Mathematical Induction. Topics in Analytic Geometry: Three–Dimensional Coordinate Systems, Vectors, The Dot Product, The Cross Product, Distance Formula and Segment Midpoint, Lines and Half–Planes, Circles and Ellipses, Plane Curves and Parametric Equations. Limits and Continuity: Average Rate of Change, Instantaneous Rate of Change, The Concept of Limit. Limits of Functions, Properties of Limits, Computation of Limits, Continuity, Limits Involving Infinity. Differentiation: The Derivative of a Function, Derivatives of Basic Functions, Rules of Differentiation, Implicit Differentiation, The Mean Value Theorem, Root Finding (Newton’s Method), Minimum and Maximum Values of a Function, Higher Order Derivatives. Integration: Antiderivatives (The Indefinite Integral), Integrals of Basic Functions, Rules of Integration, The Definite Integral, The Fundamental Theorem of Calculus, Applications (Area between Curves, and Work Done by a Force), Numerical Integration (Simpson’s Rule).
Prerequisite: 76–105

76–151 Principles of Probability and Statistics
Credits: 2 Hours: 2
Statistics: Population, Sampling, General Frequency, Distributions, Histograms Polygons, Pie Charts, Frequency Curves, Cumulative Frequency Distributions, Measures of Central Tendency (Mean, Median and Mode), Measures of Dispersion (Variance and Standard Deviation). Probability: Introduction, Events, Mutually Exclusive Events, Classical Probability, Empirical Probability, The Addition Law, Independent Events, Conditional Probability, Probability Distributions (Binomial, Poisson and Normal), Poisson Approximation to the Binomial Distribution, Normal Approximation to the Binomial Distribution.
Prerequisite: 76–105

76–156 Advanced Mathematics
Credits: 3 Hours: 2
Complex Numbers: Basics, Geometric Representation of Complex Numbers, Polar and Exponential Forms of a Complex Number; Products, Quotients, Powers, and Roots of Complex Numbers, Applications (Including Alternating–Current (ac) Circuits). Differential Calculus of Functions of Several Variables: Functions of Several Variables, Domains and Regions, Functional Notation Level Curves and Level Surfaces, Limits and Continuity, Partial Derivatives, Increment and Differential, Derivatives and Differentials of Composite Functions, The General Chain Rule, Partial Derivatives of Higher Order. Vector Differential Calculus: Vector Fields and Scalar Fields, The Gradient Field, The Divergence and the Curl of a Vector Fields, The Directional Derivative. Differential Equations: Solutions of Differential Equations, Separation of Variables, First Order Linear Differential Equations, Second Order linear Differential Equations with constant coefficients, The Characteristic Equation.
Prerequisite: 76–106

Department of Manufacturing Engineering Technology

Overview:

The main objective of this department is to perform a qualifying technical and applied program for higher education students considering the quantity and quality of the manufacturing processes and their required management, maintenance and replacement processes. Additionally, departmental duties also include performing applied research related to a wide spectrum of technological topics and the arrangement of many short courses, lectures and seminars that are directed to environmental needs, market requirements and continuous educational programs. The Department is divided into two main academic divisions: Manufacturing and Welding Technology. The mechanical production division covers a wide domain of technological topics in different branches such as metrology and accuracy, material technology, conventional and advanced manufacturing techniques and maintenance processes. The welding division covers a wide area of different conventional and advanced welding processes.

Majors:

The department offers two areas of specialization:

- Manufacturing Engineering Technology
- Welding Engineering Technology

Laboratories:

- Central College Workshops, which include machining, welding, forging, fitting (or filing), casting and fabrication of sheet metals workshops
- Materials and mechanical testing Laboratory
- Numerical Control and CAD and Computer Numerical Control (CNC) Laboratories
- Heat Treatment Laboratory
- Metrology Laboratory

Department of Manufacturing Engineering Technology

Program: Manufacturing Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
64	104	Computer Aided Mech. Drawing	3	5	
64	114	Foundry and Welding Processes	3	5	64–106
64	130	Machining Processes (1)	3	5	64–106
64	142	Metrology and Measurements	2	3	76–105
64	162	Engineering Materials	3	4	
64	215	Metal Forming	3	5	64–114
64	231	Machining Processes (2)	3	5	64–130
64	238	Comp. Numerical Control [CNC]	3	4	64–104, Co. 64–130
64	253	Material Handling and Inventory	3	4	64–106
64	254	Quality Control	3	4	76–106
64	260	Engineering Mechanics	3	4	56–113
64	263	Physical Metallurgy	3	4	64–162
64	324	Machines and Equip. Maintenance	3	4	64–106
64	398	Field Training	4	16	30–162,231–64, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
64	257	Production Planning and Control	3	4	64–253
64	274	Mechatronics	3	4	
64	316	Non–Conv. Manuf. Processes	3	4	64–231
64	356	Operations Research	3	4	76–105, 30–102
64	364	Non–Metallic Eng. Materials	3	4	64–162
64	374	CAD–CAM	3	4	64–238
64	397	Manufacturing Projects	3	5	64–215, 64–130
67	266	Non–Destructive Testing	3	4	64–162

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	106	Introduction to Engineering Technology	2	3	
64	252	Industrial Management	2	2	30–102

Department of Manufacturing Engineering Technology

Program: Welding Engineering Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
64	104	Computer Aided Mech. Drawing	3	5	
64	115	Manufacturing Processes	3	5	64–106
64	142	Metrology and Measurements	2	3	76–105
64	162	Engineering Materials	3	4	
64	254	Quality Control	3	4	76–106
64	260	Engineering Mechanics	3	4	56–113
64	263	Physical Metallurgy	3	4	64–162
67	132	Welding Technology (1)	3	5	64–106
67	233	Welding Technology (2)	3	5	67–132
67	258	Advanced Welding Technology	3	5	67–233
67	265	Welding Metallurgy	3	4	64–263
67	266	Non–Destructive Testing	3	4	64–162
67	381	Welding Specifications and Costing	3	4	67–132
67	398	Field Training	4	16	30–162,67–233, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
64	215	Metal Forming	3	5	64–115
64	253	Material Handling and Inventory	3	4	64–106
64	257	Production Planning and Control	3	4	64–253
64	274	Mechatronics	3	4	
64	324	Machines and Equip. Maintenance	3	4	64–106
64	364	Non–Metallic Eng. Materials	3	4	64–162
67	337	Polymer Joining	3	4	64–162
67	399	Welding Projects	3	5	64–115, 67–132

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	106	Introduction to Engineering Technology	2	3	
64	252	Industrial Management	2	2	30–102

COURSE DESCRIPTION

64–104 Computer Aided Mechanical Drawing
Credits: 3 Hours: 5

Students are introduced to the different systems of drawing standards, descriptive geometry, technical drawing. Such aspects are covered both by hand and by computer. Special attention is directed particularly toward the drawing of mechanical engineering components and their detailed assembly considerations.

64–106 Introduction to Engineering Technology
Credits: 2 Hours: 3

Introduction to a broad range of engineering technology topics and fields, such as mechanical design, manufacturing processes, engineering materials, mechanical workshops, data analyzing, and industrial safety. Discussion includes the roles, duties and responsibilities, fundamental skills and knowledge required in the various careers in the industry. Discussion on Engineering Technology as a profession, professional ethics, professionalism, and social responsibility. Seminars on topics of special interest to engineering technologists will also be included.

64–114 Foundry and Welding Processes
Credits: 3 Hours: 5

This course introduces students to various types of casting and welding processes used in manufacturing. The intent of this course is to teach students the general capabilities of several fundamental foundry and welding processes. At the end of this course a student should have a general understanding of the integrated processes where the specialized machines and operation principles can be implemented to produce a desired product.
Prerequisite: 64–106

64–130 Machining Processes I
Credits: 3 Hours: 5

This is one of two consecutive courses to study both theoretical and practical features of the machining operations which is the backbone of the manufacturing technology. Technical background is given in this course regarding the general safety measures in workshop, the skills development in manipulating hand tools as well as drawing interpretation and work layout. Fundamentals of single point tool machining are also covered by studying turning operations with applications on turning lathes.
Prerequisite: 64–106

64–142 Metrology and Measurements
Credits: 2 Hours: 3

This course produces a general view of several types of measurements and their principles associated with manufacturing processes and activities. Topics include the measurement of both linear and angular dimensions together with the assessment of accuracy of the manufactured surfaces. Linear measurements (length and diameter), angular measurements, screw thread measurement, accuracy concept, interchangeability, fit and tolerance, gauges, surface quality, motion and vibration measurements, pressure and flow measurements are of the main parameters to deal with.
Prerequisite: 76–105

64–162 Engineering Materials
Credits: 3 Hours: 4
This course aims to provide students with an understanding of the fundamental principles of material science especially for engineering materials. Topics covered in the course include atomic bonding, structure of crystalline solids, metallic and non–metallic materials, mechanical behavior and properties of metals and mechanical failure modes of materials systems. Fundamental principles underlying the correlation between mechanical properties and microstructure are emphasized.

64–215 Metal Forming
Credits: 3 Hours: 5
This course aims to introduce students to various types of metal forming operations: sheet metal and cutting, forging, rolling, drawing, bending. Extrusion and many other special metal forming processes. Emphasis is devoted to the operations adopted in local industries. Analysis of various metal forming processes to determine load requirements necessary for a particular metal forming operation, information used to select equipment and design tooling are intended in the course.
Prerequisite: 64–114

64–231 Machining Processes II
Credits: 3 Hours: 5
This is the second of two consecutive courses for machining which started by machining processes I. Technical background is given in this course regarding some conventional and advanced machine tools operations such as drilling, milling, grinding, broaching, and boring. Also, a sufficient background on theory of metal cutting and technology of cutting tools are considered. Additionally, many other aspects are studied such as a brief conclusion about nontraditional and chipless machining operations. Machines mass–production attachments and accessories are also considered.
Prerequisite: 64–130

64–238 Computer Numerical Control (CNC)
Credits: 3 Hours: 4
This course is intended for manufacturing students to study the main aspects of Numerical Control (NC) technology. The studied topics include the different structures of NC systems: Numerical Control (NC), Computer Numerical Control (CNC), and Direct Numerical Control (DNC). Both absolute and incremental positioning systems are studied in both open and closed loops systems. Also, the course covers the different CNC techniques such as the Point–To–Point (PTP) and contouring machining systems. Both manual and computer–aided programming is studied using EIA (G–M codes) standard and non–standard programming languages.
Prerequisite: 64–104, 64–130

64–252 Industrial Management
Credits: 2 Hours: 2
This course deals with the various aspects of industrial management including plant layouts and their apparatuses, organizational structure, required machines, tools and manpower. In addition, production quality and requirements are also emphasized. The course also involves the issue of time and motion study and health and safety policies and procedures.

64–253 Material Handling and Inventory
Credits: 3 Hours: 4
This course covers material handling systems with applications specific to manufacturing industries. Students will be involved in case studies, economic models and problem–solving of manufacturing material handling systems. Topics include bar coding, cranes, lift trucks, robots and conveyor systems.
Prerequisite: 64–106

64–254 Quality Control
Credits: 3 Hours: 4
This course focuses on industrial production and quality control. It covers the principle concepts of quality production and its relation to standardization. Philosophy and concept of quality control, quality assurance, inspection, probabilities and statistics, control, charts, and national and international standard organizations will be emphasized.
Prerequisite: 76–106

64–257 Production Planning and Control
Credits: 3 Hours: 4
The production planning and control systems are one of the basic activities that determine the effectiveness of a production enterprise. This course covers all management decisions, policies, plans and actions which relate to optimization of manufacturing objectives.
Prerequisite: 64–253

64–260 Engineering Mechanics
Credits: 3 Hours: 4
This course introduces the principles of static, resultant of coplanar force system, analysis of structures, centroids and center of gravity. Area moment of inertia, stress and strain, stress consideration, torsion in circular sections, and shear and bending moment in beams and stress in beams are also covered.
Prerequisite: 56–113

64–263 Physical Metallurgy
Credits: 3 Hours: 4
The course introduces students to metallic structure, equilibrium diagrams, curves and various types of heat treatment processes. Fundamentals of phase's transformations and binary phase diagrams, iron–carbide phase diagram, and principles of heat treatment of various alloys are emphasized. The students will gain practical experience in different types of heat treatment processes.
Prerequisite: 64–162

67–266 Non–Destructive Testing
Credits: 3 Hours: 4
This course addresses the main concept and aim of non–destructive testing of materials as applied to inspecting the integrity of different joints and structures, the course provides the theoretical principles of conventional NDT methods and their capabilities and limitations. It also introduces different NDT techniques: visual, dye penetrant, magnetic particles, ultrasonic, radiographic, Eddy current methods. Application of NDT to inspection of joints, quality process control and accept/reject criteria is emphasized. The practical sessions of this course include hand–on experiments by students for different NDT techniques. The associated laboratory session is designed to demonstrate calibration procedures, performing inspection techniques and interpretation of indications received from different discontinuities.
Prerequisite: 64–162

64–274 Mechatronics
Credits: 3 Hours: 4
This is an elective course for manufacturing students to establish a comprehensive connection between mechanical and electronic systems. It describes, in general, how physical, and mechanical quantity is provided using electric and electronic phenomena. Topics include the fundamentals of transducers and sensors which are often used in manufacturing machines and systems.

64–316 Non–Conventional Manufacturing Processes
Credits: 3 Hours: 4
This is an elective course for manufacturing students to shed light on the various non–traditional machining and chipless processes such as EDM, laser cutting, plasma cutting, chemical machining, etc. Also, some other specific operations are included such as honing, lapping, polishing, burnishing, etc.
Prerequisite: 64–231

64–324 Machines and Equipment Maintenance
Credits: 3 Hours: 4
This course covers the maintenance, wear and service life of equipment. Also, defects and repair methods of different machine parts, guide surfaces, gears and keys, shafts and bearings, spline shafts, coupling and clutches, leadscrew and nuts, threaded joints, vee belt drive, machine hydraulics, seals, and packing are also studied together with the restoration of worn parts to be welded, metallization, plating, and lubrication.
Prerequisite: 64–106

64–356 Operations Research
Credits: 3 Hours: 4
This course provides an overall knowledge of quantitative methods with regard to decision making. It covers the main concepts, tools, and techniques used in problems solving to help manufacturing companies to improve their performance.
Prerequisite: 30–102, 76–105

64–364 Non–Metallic Engineering Materials
Credits: 3 Hours: 4
This course introduces the students to various non–metallic materials used in industry such as polymers, ceramics, composites, and construction materials.
Prerequisite: 64–162

64–374 CAD/CAM
Credits: 3 Hours: 4
This course is intended for manufacturing students to extend their knowledge domain and experience regarding modern manufacturing computer operated systems. The course describes the common interface between design and manufacturing. The basics for the solid model structure are considered together with the associated design features such as scaling, rotation, and transformation. Techniques for the generation and the verification of the CNC program are also covered as an input stage to CAM. Additionally, some advanced topics are included such as the features of the different adaptive control (AC) machining systems.
Prerequisite: 64–238

64–397 Manufacturing Projects
Credits: 3 Hours: 5
This is a course in which students are introduced to the design and manufacturing of the integrated useful mechanical components, machines, and devices. Novel and state of the art concepts are emphasized. Also, the projects should reflect the technical background obtained through the previous courses.
Prerequisite: 64–130, 64–215

64–398 Field Training
Credits: 4 Hours: 16
The students should attend a training program at one of the approved institutions engaged in manufacturing engineering practice. The objective is to gain practical experience in real practice manufacturing engineering applications such as: foundry, forming, sheet metal, machining, welding, and inspection. The student should submit a formal report related to the program attended at the end of the training period. A minimum of 224 hours of supervised training is required for the course.
Prerequisite: 30–162, 64–231, Passing 50 credits

67–132 Welding Technology I
Credits: 3 Hours: 5
This course introduces the basic principles of fusion welding processes and improves welding skills for students. In Manual Metal Arc Welding (MMAW), types of welding machines, types of joints and joint preparation, and classification system for electrodes used in carbon steel welding will be covered. Oxy–Acetylene Welding theory, application, and equipment will be discussed in this course. Topics covered also include safety precautions for welding processes, the factors affecting residual stresses, distortion, and fatigue in welded joints, and soldering and brazing processes. In the welding workshop, joints preparation, soldering and brazing, gas welding and arc welding application practices will be performed on carbon steel specimens.
Prerequisite: 64–106

67–233 Welding Technology II
Credits: 3 Hours: 5
This course presents the fundamental aspects, principles, and practice of gas shield metal arc welding processes, i.e., MIG, MAG, TIG and PAW. The assembly of equipment, types of power sources, electrodes and wires used in welding, types of troche, and feed units will be covered in this course. The principles, equipment and consumables, flux, feed wire units of submerged arc welding process will also be emphasized. During practice in the workshop, the student will gain skills for conducting and performing satisfactory weld joints by these processes using carbon steel specimens. This course aims to provide students with an understanding of the fundamental principles of solid–state welding by electrical resistance processes such as Spot, Seam, Projection and Flash welding. Welding Cycle, equipment and Electrodes or Guns will be emphasized. The students will also study theory and applications of Flame–Cutting of metals. Arc Cutting, Plasma Arc Cutting, and Under Water Cutting Processes will be covered.
Prerequisite: 67–132

67–258 Advanced Welding Technology
Credits: 3 Hours: 5
This course aims to provide students with an understanding of the fundamental principles of some of new and advanced welding processes such as friction welding, cold–pressure welding, diffusion bonding, Ultrasonic welding, Laser beam welding, Electron beam welding, explosive welding, electro–slag welding, Thermit welding, and Underwater welding. These welding processes will be discussed with emphasis on principles and applications in industry.
Prerequisite: 67–233

67–265 Welding Metallurgy
Credits: 3 Hours: 4
This course provides the students with a fundamental understanding of the metallurgical characteristics of welded structures. It builds upon physical metallurgy principles learned in previous courses. When the students finish this course, they will know how microstructure evolves in the different regions of both fusion welds and solid–state welds. The students will also learn about the concept of weldability: the ability of a welded structure to be free of defects and capable of meeting its intended application.
Prerequisite: 64–263

67–266 Non–Destructive Testing
Credits: 3 Hours: 4
This course addresses the main concept and aim of non–destructive testing of materials as applied to inspecting the integrity of different joints and structures, the course provides the theoretical principles of conventional NDT methods and their capabilities and limitations. It also gives an introduction to different NDT techniques: visual, dye penetrant, magnetic particles, ultrasonic, radiographic, Eddy current methods. Application of NDT to inspection of joints, quality process control and accept/reject criteria is emphasized. The practical sessions of this course include hand–on experiments by students for different NDT techniques. The associated laboratory session is designed to demonstrate calibration procedures, performing inspection techniques and interpretation of indications received from different discontinuities.
Prerequisite: 64–162

67–337 Polymer Joining
Credits: 3 Hours: 4
This course introduces the basic characteristics of polymers, structures and welding, and joining of polymers by practice exercises. Several methods for joining polymers such as hot air welding, friction welding by mechanical means and ultrasonic friction, heat welding with metal plates or probes, solvent welding, adhesive bonding and dielectric heating and weld of plastic will be covered. The course will also discuss inspection and testing methods for polymers. During practice in workshop and lab, students will gain skills to conduct and perform satisfactory joining by these processes. In addition, they will perform inspection and tests for polymers.
Prerequisite: 64–162

67–381 Welding Specifications and Costing
Credits: 3 Hours: 4
This course will provide the student with the knowledge and skills necessary for reading welding and related blueprints and the knowledge of the welding symbols and joints. For welding costing, the student will be provided with the knowledge of the welding cost parameters and their importance. This course will also provide the student with an overview of the topic of welding codes and standards. It will introduce the student to the types and titles of standards that have been developed by various organizations for the specification and control of industrial welding. In addition, it will describe recommended philosophies for interpreting and applying some of the more commonly used standards. The three most widely used welding codes, AWS D1.1, ASME Sections VIII, IX and B31.1, and API 1104 will be covered.
Prerequisite: 67–132

67–398 Field Training
Credits: 4 Hours: 16
The students should attend a training program at one of the approved institutions engaged in manufacturing engineering practice. The objective is to gain practical experience in real practice manufacturing engineering applications such as: foundry, forming, sheet metal, machining, welding, and inspection. The student should submit a formal report related to the program attended at the end of the training period. A minimum of 224 hours of supervised training is required for the course.
Prerequisite: 30–162, 67–233, Passing 50 credits

67–399 Welding Projects
Credits: 3 Hours: 5
This is a course in which students are introduced to the design and manufacture of an integrated useful mechanical component, machine, or device. Novel and state of the art concepts regarding different welding techniques are emphasized. Also, the project should reflect the technical background obtained through the past semesters.
Prerequisite: 64–115, 67–132

Department of Mechanical Power and Refrigeration Technology

Overview:

The Mechanical Power and Refrigeration Department is dedicated to achieving the following objectives:

- To prepare specialized technical labor in the fields of mechanical power and refrigeration so that they meet the requirements of all governmental and private sectors. This is realized through regular educational and special training programs that lead to the required outcome.
- To offer engineering and technical consultation and to conduct applied research in the field of mechanical power and refrigeration and other related fields. This, in turn, helps to improve the performance levels in the industrial organizations.
- To develop the scientific and professional potentialities of the teaching staff through engineering and technical research activities.

Majors:

The department offers two areas of specialization:

- Mechanical Power Technology
- Air Conditioning and Refrigeration Technology

Laboratories:

Mechanical Power and Refrigeration Department has a variety of workshops and laboratories necessary to meet its requirements and to achieve its applied educational philosophy through the integration between theoretical study and practice.

- Air–conditioning laboratory
- Applied mechanics laboratory
- Basic skills workshop and Projects workshop
- Central air–conditioner equipment workshop
- Control laboratory
- Diesel engines workshop
- Fluid mechanics laboratory
- Gasoline engines workshop
- Internal–combustion engines laboratory
- Pipes and valves workshop
- Pumps and compressors laboratory
- Pumps and compressors workshop
- Refrigeration and A/C Troubleshooting laboratory
- Refrigeration and Air–Conditioning equipment workshop
- Refrigeration laboratory
- Turbines and steam boilers laboratory
- Vibration and theory of machines laboratory

Department of Mechanical Power and Refrigeration Technology

Program: Air Conditioning and Refrigeration Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
63	122	Fundamentals of Air conditioning	2	3	
63	123	Computerized HVAC and R Drafting	1	3	
63	126	HVAC and Air Distribution Systems	3	4	63–122
63	130	Fundamentals of Refrigeration	3	4	56–113
63	141	Principles of Electricity for HVAC and R Systems	3	4	30–102
63	149	Basic Skills Workshop 1	1	3	63–130
63	160	Fundamentals of Thermo fields	3	4	76–105
63	224	Chilled Water Systems	3	3	63–126
63	228	Thermal Load Estimation	2	2	63–160
63	230	Industrial and Commercial Refrigeration Systems	3	4	63–130
63	243	Fundamentals of HVAC and R Control	2	3	63–141
63	247	HVAC and R Control Systems	3	4	63–243
63	249	Basic Skills Workshop 2	1	3	63–149
63	254	Operation and Maintenance of HVAC and R Systems	2	3	63–249
63	264	Installation and Commissioning of HVAC Systems	2	2	63–249
63	320	Computer Applications of HVAC and R	2	4	63–228
63	356	Troubleshooting of HVAC and R Systems	2	4	63–264
63	399	Field Training	4	16	30–162, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
63	226	District Cooling	2	2	63–224
63	227	Special HVAC Systems	2	2	63–122
63	229	Advanced Computerized HVAC and R Drafting	2	4	63–123
63	231	Advanced Refrigeration Systems	2	3	63–230
63	244	Buildings Energy Management	2	3	63–243
63	257	HVAC and R Testing, Adjusting and Balancing	2	3	63–254
63	265	HVAC and R Sustainable Environment	2	3	63–122
63	266	Renewable Energy for HVAC and R Applications	2	3	63–122
63	350	HVAC and R Project	2	3	63–249

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
63	110	Supervision of HVAC and R Contracts	2	2	
66	125	Occupational Safety	2	2	

Department of Mechanical Power and Refrigeration Technology

Program: Mechanical Power Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
66	101	Mechanical Drawing	1	3	
66	105	Mechanics Skills Workshop	1	3	
66	114	Statics and Strength of Materials	3	3	
66	115	Machine Elements and Mechanical Vibrations	2	3	66–114
66	116	Machine Elements and Vibrations Lab	1	2	66–114
66	122	Fundamentals of Fluid Mechanics	3	3	76–105
66	126	Measurements and Control Technology	2	3	
66	133	Thermodynamics	2	3	56–113
66	183	Engines Workshop	2	4	
66	220	Fluid Machinery Technology	2	3	66–122
66	222	Fluid Lab	1	2	66–122
66	234	Power Station Technology	3	3	133–66
66	235	Fundamentals of Heat Exchangers	3	4	
66	241	Internal Combustion Engines	2	3	66–133
66	286	Fluid Machinery Workshop	2	4	30–102
66	292	Computer Applications	2	4	66–101
66	335	Gas Turbines Technology	2	3	66–234
66	336	Water Treatment and Desalination Technology	2	2	66–235
66	383	Mechanical Maintenance	2	2	66–286
66	399	Field Training	4	16	30–162, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
63	237	Refrigeration and Air Conditioning Technology	2	3	66–133
63	291	Electricity for Mechanical Engineering	2	3	
66	214	Theory of Machines	2	2	66–114
66	215	Mechanical Vibrations Applications	2	3	66–114
66	287	Projects	2	3	66–241
66	310	Special Topics in Mechanical Engineering	2	2	
66	324	Hydraulic and Fluid Power	2	3	66–122
66	325	Piping Technology	2	3	66–122
66	331	Renewable Energy Applications	2	2	
66	337	Heat Exchangers Technology	2	3	66–235
66	343	Industrial Pollution	2	2	66–241

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
66	124	Introduction to Mechanical Engineering Technology	2	2	
66	125	Occupational Safety	2	2	

COURSE DESCRIPTION

63–122 Fundamentals of Air–Conditioning
Credits: 2 Hours: 3
This course covers the properties of moisture air, Psychrometric properties such as specific humidity, humidity ratio, relative humidity, enthalpy of moisture air etc. It includes studying Psychrometric chart lines and air conditioning processes such as heating, cooling, humidification... etc. on Psychometric chart. This course also includes recognizing of different types of air conditioning system equipment.

63–123 Computerize HVAC and R Drafting
Credits: 1 Hours: 3
This course covers introduction to 2D HVAC drafting using CAD software, co–ordinate system, basic commands, entering points, screen menus, start drawings, mechanical parts drawing practice, hatching, modifying commands, selection sets, layers, dimensioning, add text and scale. Direct distance entry, object properties and zooming, legends and symbols used in the HVAC Industry, creating and inserting blocks will be covered. HVAC blocks library, duct routing, preparation of single diagram (SLD), preparation of layouts, double line diagram (DLD) will be included. Project set up into Architectural drawings and simple chilled water piping system will be included.

63–126 HVAC and Air Distribution Systems
Credits: 3 Hours: 4
This course covers types (local, VAV, CAV, etc.) of air conditioning systems including components, functions, and their applications. Also, the course covers comprehensively a typical air distribution system found in small buildings. This encompasses the assessment and selection of air moving and treating equipment. Content includes sizing of ductwork segments and selection of diffusers, registers, grilles and blower, and evaluation of the complete system performance.
Prerequisite 63–122

63–130 Fundamentals of Refrigeration
Credits: 3 Hours: 4
The course covers refrigeration definitions, applications, and methods of refrigeration. The course also covers theoretical and actual vapor compression refrigeration cycles. Analysis of simple vapor compression refrigeration cycle and effect of operating conditions using p–h diagram will be covered. Different calculations such as COP, compressor power, cooling capacity, condenser heat load, refrigeration effect, etc. will be covered. The effect of superheat and subcooling on the performance of refrigeration cycle will be covered. Types of refrigerants and refrigerant characteristics are also included. The impacts of the effect of different types of refrigerants on the environments such as global warming and ozone depletion will be studied. The types of different components of refrigeration units such as compressors, evaporators, condensers, and expansion devices as well as auxiliaries will be covered.
Prerequisite :56–113

63–141 Principles of Electricity for HVAC and R Systems
Credits: 3 Hours: 4
This course covers the fundamental of electricity and electronics for HVAC and R systems. Relationship between current and voltage in series and parallel circuits, wire sizing, Ohm's law and voltage drop will be included. The concepts of AC and DC current will be covered. Different HVAC and R electrical circuit components and their types will be covered. Magnetism principal, single and three phase induction motors and transformer will be studied. Also, the course covers electrical circuit protection components devices such as contactors, relays, starters, relays, timers, capacitors, etc. In addition, the use of semiconductors, diodes, sensors, and IC's in such field will be covered.
Prerequisite 30–102

63–149 Basic Skills Workshop 1
Credit: 1 Hours: 3
This course is a practical training for students on the basic skills of service processes on HVAC and R systems with using different types of tools and instrumentation such as in dehydration, charging, piping fabrication, etc. Also, it covers knowing and identifying different types of refrigerants as well as knowing their characteristics, leak detection methods. This course also focuses on HVAC and R tubing welding processes and their different methods such as cutting, bending, sewage, flaring, joining etc. Identifying electrical wires types and their handling will be covered. Refrigeration materials such as insulation's, piping types will be covered.
Prerequisite 63–130

63–160 Fundamentals of Thermo fluids
Credits: 3 Hours: 4
This course covers physical properties of fluids, pressure measuring devices, and continuity equation, Bernoulli's equation and its applications, compressible and incompressible flow. The course also covers pressure drops through piping, fittings, valves, nozzles, diffusers, etc. Also, the course covers pure substance phase diagrams, description, and different related tables. Ideal gas relations, first law of thermodynamics principles and its applications for open and closed systems will be included. The second law of thermodynamics, entropy, reversibility, and Carnot cycle will be covered.
Prerequisite: 76–105

63–224 Chilled Water Systems
Credit: 3 Hours: 3
The course covers types and components of chilled water A/C systems. Theoretical and practical procedures of startup, operation, and shutdown of chilled water A/C systems will be covered. The control circuit and components will be included. The basic selection of chilled water and hydronic systems such as piping systems (valves, pumps, fitting, etc.), FCUs units, AHUs units, and cooling tower will be covered. The operation, maintenance and troubleshooting will be covered.
Prerequisite 63–126

63–226 District Cooling
Credits: 2 Hours: 2
This course will be covered the theory and benefits of using district cooling systems. Principles for an efficient, reliable district cooling plant that serves multi–building facilities are described and demonstrated. The course will be addressed each component of equipment and the relationship with other equipment within the plant. Types of equipment and the choices available within a type such as chillers will be reviewed and the criteria for selection will be a part of this course. Chilled water distribution equipment will be selected. The course will be covered the rapid expanding and booming construction business in Kuwait has focused attention on use of efficient district cooling systems or new developments. Some of the key issues in the design and operation that can affect the efficiencies and viability of the District Cooling Plant will also be discussed. The installation, operation, maintenance, and troubleshooting of district cooling plant will be covered.
Prerequisite: 63–224

63–227 Special HVAC Systems
Credits: 2 Hours: 2
The course covers the most vehicles air conditioning system such as aircraft, trains, ships, hospitals, clinics, etc. Refrigeration cycle, components, operation, testing and maintenance of each type will be covered. Air supply devices and distribution systems in cabinet of these systems will be covered. Mechanical ventilation and environmental air quality within the cabin of each system will be studied.
Prerequisite: 63–122

63–229 Advanced Computerized H VAC and R Drafting
Credits: 2 Hours: 4
This course covers introduction to 3D HVAC drafting using CAD software, 3D co–ordinate system, Isometric drawing, viewing objects, viewports and view commands. Adding and mapping materials, primitive solids, Boolean operation will be included. Rendering and lighting, 3D ducting and piping layout projects as well as list for complete information for construction and installation will be covered.
Prerequisite: 63–123

63–230 Industrial and Commercial Refrigeration Systems
Credits: 3 Hours: 4
This course covers multi–pressure vapor compression and multi–evaporators systems, multi condenser of industrial and commercial refrigeration systems. Also, the course explains the importance of industrial refrigeration and introduces some applications of industrial refrigeration methods such as food processing, preservation, distribution, process of refrigeration and its cold storage. Also, he variable refrigerant flow VRF) refrigeration systems will be covered.
Prerequisite 63–130

63–231 Advance Refrigeration Systems
Credits: 2 Hours: 3
The course includes absorption, adsorption systems (types, components, operation, applications). Also, steam jet, thermo–electric, and solar refrigeration systems (types, components, operations, and applications) will be covered. The thermal analysis of refrigeration cycle of each system will be covered.
Prerequisite:63–230

63–237 Refrigeration and Air Conditioning Technology
Credits: 2 Hours: 3
The course covers the following main topics: Refrigerant types and properties, refrigeration systems, basic simple vapor compression refrigeration cycle, compound refrigeration systems, leak detection methods, Psychometric air properties, human comfort standards, air conditioning processes, cooling load calculation and air conditioning systems.
Prerequisite: 66–133

63–243 Fundamentals of HVAC and R Control
Credits: 2 Hours: 3
This course covers the fundamentals and advances of control theory including feedback control system, closed and open loop, block diagrams and their components. Also control modes such as two positions, timed two positions, proportional, integral, and derivative control mode systems as well as control classification and performance requirements. Then sensors and controllers for temperature, pressure, humidity, flow, level will be explained, their function and construction will be demonstrated. Controlled devices such as valves, dampers, actuators, and reversible motors will be studied as well as all auxiliary control components.
Prerequisite 63–141

63–244 Buildings Energy Management
Credits: 2 Hours: 3
The course will provide students with an overall view of energy use patterns in buildings, particularly large air–conditioned systems in large buildings, taking into account of environmental and economic factors. It will enable students to understand the processes of energy audit and survey, including the use of appropriate instrumentation, in order to identify opportunities for energy conservation and demand limitation in existing buildings and in new designs. Also it will enable students to integrate and to apply their knowledge of efficient operation of building services systems, to upgrade thermal performance of existing buildings and improve designs for new buildings.
Prerequisite: 63–243

63–247 HVAC and R Control Systems
Credits: 3 Hours: 4
This course covers the reciprocating compressor chillers control (capacity control methods, safety control and operation control). The centrifugal compressor chillers control (capacity control methods, surge control, safety control and demand control). Rotary and screw compressor control (capacity control methods). Air handling unit control (OX system, chilled water system, fresh air control and static pressure control, humidity and reheat control, variable air volume system and constant volume variable temperature systems control). Also commercial refrigeration and defrost methods control will be covered. Introduction about energy management and building automation will be covered.
Prerequisite 63–243

63–249 Basic Skills Workshop 2
Credit: 1 Hours: 3
This course is a practical training for students on the basic skills of service processes on HVAC and R systems such as methods of recovery, recycle and reclaiming of refrigerants, recognizing, etc. Duct fabrication processes such as cutting, bending, forming are included. Also, the piping used in chiller A/C systems (types, joints, connection, etc.) will be covered. Methods of retrofitting of old HVAC and R systems will be included.
Prerequisite 63–149

63–254 Operation and Maintenance of HVAC and R Systems
Credit: 2 Hours: 3
It is a practical training course on maintenance and operation procedures of most types of residential and commercial HVAC and R systems (such as refrigerators, deep freezers, water coolers, ice makers, soda cola, window, split A/C units, and central package units). Also, the course will cover all mechanical and electrical servicing of these systems. Preventive, periodic, retune, forecasting maintenance of each system will be included. Shaft aliments procedure of HVAC and R equipment's such as pumps, fans, blowers will be covered.
Prerequisite 63–249

63–257 HVAC Systems Testing, Adjusting and Balancing
Credits: 2 Hours: 3
The course covers testing, adjusting, and balancing the components of air conditioning systems including such as central package units, chillers, and related equipment's. It also covers air distribution devices, ductworks, air handling units, condensing units, fans, and coils. The hydronic systems including pumps water distribution systems and its related equipment will be involved. Methods of air balancing in central A/C systems and energy consumption will be covered. Testing and adjusting procedures include noise, pressures, velocities, CFM, temperatures, subcooling, superheat, etc. Actual sample of commercial and industrial HVAC and R contracts and its specifications in Kuwait will be analyzed.
Prerequisite: 63–254

63–264 Installation and Commissioning of HVAC and R Systems
Credit: 2 Hours: 2
This course covers the proper and safe installation of residential and commercial HVAC and R systems. Installation of air distribution systems will be studied. The related electrical field wiring and piping work will be covered. Commissioning procedures and inspection check list will be introduced. Start up; checkout procedures and adjusting the system according to the system specifications and performance data will be included. Commercial and industrial HVAC and R contracts and its specifications will be studied.
Prerequisite 63–249

63–265 HVAC and R Sustainable Environment
Credits: 2 Hours: 3
This course addresses indoor environmental quality (IEQ) problems and mitigation approaches. The course examines major sources, commonly identified pollutants and factors determining pollutant concentration in indoor environments. The course also will assess the overall impact of HVAC and R systems on the global environment and means of mitigating their adverse effects. It also assesses the linkage between refrigerants and energy efficiency, cost- effectiveness, safety, and other factors. Also, good practice principals during installation, operation and maintenance of HVAC systems will be covered.
Prerequisite: 63–122

63–266 Renewable Energy for HVAC and R Applications
Credits: 2 Hours: 3
The course covers the basic knowledge of renewable (sustainable) energy types such as solar energy, wind energy, biomass energy, wave energy, etc. Most of conversion renewable energy systems will be included. The methods and applications of using each type of renewable energy will be covered. The solar air conditioning systems will be included. The evaluation of use renewable energy in Kuwait will be included. Cost analysis of use renewable energy will be analyzed.
Prerequisite: 63–122

63–291 Electricity for Mechanical Engineering
Credits: 2 Hours: 3
Simple circuit construction and measurements. Ohm's law, DC and AC circuits, Single–phase and three–phase electricity. Devices and components; DC and AC generators, motors, transformers, electric current protection, and plant electrical distribution systems. Operation and application of electrical devices. Laboratory experiments to explore principles of electricity.

63–320 Computer Applications of HVAC and R
Credit: 2 Hours: 4
This course covers estimation of the proper HVAC system refrigeration capacity for residential buildings and evaluation of annual energy consumption of residential buildings. Emphasis on computer simulation techniques for analysis of building HVAC system refrigeration capacity and energy consumption will be covered. The topics include heat loss and gain in buildings, building heating and cooling load calculations, day lighting and energy efficiency. Design of the HVAC project compliance with Kuwait building energy code will be checked.
Prerequisite 63–228

63–350 HVAC and R Project
Credits: 2 Hours: 3
This course offers a capstone for knowledge acquired from other courses taught during the study in the college. The course provides the student with the essential capabilities and skills to do his project. This project can comprise either practical or theoretical approach to deal with certain task to find possible suitable ways for executing it. This includes analysis, planning, cost analysis, scheduling and execution of the project. The project may include one of the following options:
1. Construct a model of HVAC and R system or any components.
2. Develop a computer program or using available software for simulation and I or operation, analysis and selection of AIC and refrigeration components or systems (pipe sizing, duct sizing, pumps and/or fan selection, load calculations, etc.
Prerequisite: 63–249

63–356 Troubleshooting of HVAC and R Systems
Credit: 2 Hours: 2
The course covers the different troubleshooting techniques related to HVAC and refrigeration systems. The required steps to diagnose, analysis and define the mechanical and electrical malfunction of various residential HVAC and R units such as (refrigerators, deep freezers, water cooler, ice makers, cold stores, window, split, mini- split, central package) are included. Fault detection methods, remedy, and repairs whatever its applicable procedures are also covered. Also, the course will cover the main troubles and its repairs of automobile air conditioning equipment's.
Prerequisite 63–264

63–399 Field Training
Credits: 4 Hours: 16
Practical field training on different HVAC and R projects. The course includes installation of HVAC and R equipment, duct fabrication and installation, piping fabrication and installation, and maintenance and operation of HVAC and R systems. Training on maintenance and operation of central air–conditioning stations, basic design, control system and troubleshooting of HVAC and R systems. The supervision practice of HVAC and R project erection and manpower distribution.
Prerequisite: 30–162, Passing 50 credits

66–101 Mechanical Drawing
Credits: 1 Hours: 3
A study of the mechanical drafting includes symbols, dimensioning, design, and detail drawing of the basic elements of machines. Course covers the use of drafting techniques, lettering, geometric construction, multi–view, isometric view, and auxiliary view drawings. Students use computer software applications and produce working drawing, models, or other appropriate output to demonstrate the use of the product.

66–105 Mechanics Skills Workshop
Credits: 1 Hours: 3
This is a technical course that introduces common tools and machines found in mechanical workshops and provides training on basic skills required in mechanical technology tasks. In addition, it covers common symbols employed in engineering drawings.

66–114 Statics and Strength of Materials
Credits: 3 Hours: 3
This course covers force analysis and mechanics of materials. The notation of a vector and the properties of concurrent force systems are introduced. These properties are then applied to the equilibrium of a particle. The principles of rigid body equilibrium are explained and then applied to specific problems on frames and beams. The centers of gravity of simple and composed areas are given. Problems involving shearing force and bending moment are solved. Problems of stress and strain in different loading cases: axial, torsion and beam bending are also considered.

66–115 Machine Elements and Mechanical Vibration
Credits: 2 Hours: 3
Mechanical engineers are associated with the production and processing of energy and with providing the means of production, the tools of transportation, and the techniques of automation. The skill and knowledge base are extensive. Among the disciplinary bases are mechanics of solids and fluids, mass and momentum transport, manufacturing processes, and electrical and information theory. Mechanical engineering design involves all the disciplines of mechanical engineering. Therefore, this course aims to equip the mechanical engineering students with the fundamentals of these design activities and give them necessary skills to prepare complete, concise, and accurate calculation steps for machine elements. While the first part of the machine elements covering general stress analysis, failure conditions, shaft, spring, permanent and nonpermanent joints design, second part covers rolling contact and journal bearings, gears, clutches, flywheels, flexible machine element design and analysis tools. Also, in this course an introduction of vibratory systems, periodic motion, mass spring damper system, failures caused by vibrations will be covered.
Prerequisite: 66–114

66–116 Machine Elements and Vibrations lab
Credits: 1 Hours: 2
This course comprises a number of experiments in the field of machine elements and vibration. These include Static: Forces and Moments, Forces in a Truss, Internal Reactions– Methods of Section, Friction, Elastic Deformations, Buckling and Stability, Compound Stress vibrations, Simple Pendulum, Mass–Spring Systems, Torsional Vibration, Forced Vibration with Negligible Damping, Two Degree of Freedom Torsional Vibration, Whirling of Shafts.
Prerequisite: 66–114

66–122 Fundamentals of Fluid Mechanics
Credits: 3 Hours: 3
This course covers fluid mechanics fundamentals and applications. Topics include fluid properties, fluid static, manometer, pressure gauges, classification of fluid flow, conservation of mass, Bernoulli's equation, flow measurements, friction losses in pipes and pipe system connections.
Prerequisite: 76–105

66–124 Introduction to Mechanical Engineering Technology
Credits: 2 Hours: 2
This course is composed of two major sections. The first section introduces different disciplines in engineering technology, and the essential learning skills for students. In addition, this section covers related ethical, social, political and ecological issues. The second section covers the development of written specifications and the implications of different contractual arrangements. Topics include specification development, contracts, bidding material research, and agency responsibilities. Upon completion, students should be able to write the technical specification section for a typical contract, check the conformity of the contract’s outcome (e.g. project) with the associated technical specifications, and interpret contractual responsibilities.

66–125 Occupational Safety
Credits: 2 Hours: 2
This course offers students an introduction to standards and guidelines for safety in large scale industry, with special emphasis on oil industries and power plants. Topics include the need and justification for safety in the workplace, legal aspects of safety related insurance policies, common incidents, and accidents, first aid and emergency procedures, and safety investigation procedures. Furthermore, it covers protection against mechanical and non-mechanical (e.g. chemical and electrical) hazards.

66–126 Measurements and Control Technology
Credits: 2 Hours: 3
Fundamentals and practical issues in the fields of measurements and control; characteristics of measuring devices for temperature, flow rate, pressure, level, and speed. Control systems fundamentals: purpose, feedback control, block diagrams, multivariable control, and open loop control. Control actions: two position control, proportional, integral, and derivative control actions. Applications in control of temperature, flow rate, pressure, level, and speed.

66–133 Thermodynamics
Credits: 2 Hours: 3
Basic concepts and definitions, phase change processes of pure substances, steam property tables, ideal gas laws and processes. The first law of thermodynamics and its application to closed and open systems. The second law of thermodynamics; Carnot principles and entropy.
Prerequisite: 56–113

66–135 Energy and Water Conservation
Credits: 3 Hours: 3
Introduction to energy concepts including forms of energy, energy types and sources, useful energy and energy conversion, common uses of energy in society, energy conservation measures and economics. The course also includes water resources, properties of seawater, desalination processes, water treatment technologies, and water conservation applications.

66–183 Engines Workshop
Credits: 2 Hours: 4
Comprehensive practical training on spark ignition and compression ignition engines. Engine dismantling, recognition, inspection of parts, and engine reassembly. Diagnosis and finding of the most common faults.

66–214 Theory of Machines
Credits: 2 Hours: 2
This course introduces the theory of machines dealing with the kinematics of machines, relative motion, types of kinematics chains, and mobility. Displacement, velocity, and acceleration analysis of simple and complex mechanisms are presented. Balancing of rotating masses in the same plane and in different planes is studied. Balancing of single and multi–cylinder engines is also covered. Application for Cams; types, followers, displacement diagrams of the follower are covered.
Prerequisite: 66–114

66–215 Mechanical Vibration application
Credits: 2 Hours: 2
This course deals with the study of vibration in mechanical systems which is concerned with the oscillatory motions of bodies and the forces associated with them. This course aims to provide an understanding of the nature and behavior of dynamic engineering systems and the capability of applying the knowledge of mathematics, science, and engineering to solve engineering vibration problems. Fundamental aspects of mechanical vibrations, the types and causes of various vibratory motions are described. Free and forced vibrations are covered. Response of massless shafts to unbalance forces is presented. Sources of vibration in rotating machines are explained.
Prerequisite: 66–114

66–220 Fluid Machinery Technology
Credits: 2 Hours: 3
This course covers the theory of fluid machinery (Pumps and Compressors) and emphasizes the practical aspects of its applications. The course includes pump and compressor types, operating principles, applications, advantages, and disadvantages. The phenomena associated with pump and compressor operations and their flow regulations are also covered.
Prerequisite: 66–122

66–222 Fluid Lab
Credits: 1 Hours: 2
This lab covers fluid mechanics and fluid machinery experiments. Topics included are: fluid properties measurement, fluid static, pressure measurements, classification of fluid flow, conservation of mass, Bernoulli's theorem, flow measurements, friction losses in pipes, pump performance parameters, parallel and series pump connections, reciprocating compressor performance parameters.
Prerequisite: 66–122

66–234 Power Station Technology
Credits: 3 Hours: 3
This course provides knowledge of basic fundamentals and components required in thermal power plant engineering, working principals and performance evaluation. The course also provides the latest technology involved in thermal power plant engineering.
Prerequisite: 66–133

66–235 Fundamentals of Heat Exchangers
Credits: 3 Hours: 4
Fundamentals of heat transfer by conduction, convection, radiation. Steady heat conduction in solids. Forced and free convection in fluids. Boiling and condensation processes, heat exchanger applications and selection. Laboratory experiments to explore principles of heat transfer and to evaluate the boiling mode.

66–241 Internal Combustion Engines
Credits: 2 Hours: 3
Ideal cycles for spark ignition and compression ignition engines, engine testing and performance, fuel, cooling and lubrication systems in spark ignition and compression ignition engines, combustion processes, types of combustion chambers, power boosting and scavenging methods. Laboratory experiments to evaluate performance of internal combustion engines.
Prerequisite: 66–133

66–286 Fluid Machinery Workshop
Credits: 2 Hours: 4
The course is designed mainly to give the students practical experience on operation and maintenance of fluid machinery equipment. It is divided into three parts. The first part covers pump maintenance and trouble shooting. The second part deals with piping systems including piping and valve standards, materials and pipe fabrication and piping system construction. The third part covers the subject of reciprocating and centrifugal compressor maintenance.
Prerequisite: 30–102

66–287 Projects
Credits: 2 Hours: 3
The course aims to prepare senior students to pursue a complete project from its design stage up to testing and/or evaluating the product. This is achieved by means of experimental, theoretical and/or applied methodologies to produce a real or virtual product. The project and its product are identified in consultation with a project supervisor. This course enhances various student skills, such as: critical thinking, time management, teamwork, literal search, and communication.
Prerequisite: 66–241

66–292 Computer Applications
Credits: 2 Hours: 4
Use of computer programs to solve engineering problems in statics, dynamics, thermodynamics, fluid mechanics, heat transfer and strength of materials. Computational skills include programming language, parametric studies, graphics, and numerical integration.
Prerequisite: 66–101

66–310 Special Topics in Mechanical Engineering
Credits: 2 Hours: 2
This course typically covers a specific topic in Mechanical Engineering and is intended to enhance and expand the selection of offerings from semester to semester. Students enrolled in this course are assumed to have some knowledge of the topic they want to study and be capable of carrying out an independent research project. The course may also be offered at relatively short notice by visiting or specialist lecturers.

66–324 Hydraulic and Fluid Power
Credits: 2 Hours: 3
This course covers the basic knowledge for using fluids in transmitting power. The components of the fluid power systems such as pumps, cylinders, motors, seals, packing, and control valve are also covered in detail. Troubleshooting and maintenance of fluid power systems are also included.
Prerequisite: 66–122

66–325 Piping Technology
Credits: 2 Hours: 3
Basic principles of piping systems. Piping layout, fluid flow in pipes, codes and standards for piping selection, material selection for piping, components, and supports. Piping fabrication, non–destructive testing, troubleshooting and maintenance of piping systems.
Prerequisite: 66–122

66–331 Renewable Energy Application
Credits: 2 Hours: 2
This course introduces energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology. The course focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro. Energy conservation methods will be emphasized.

66–335 Gas Turbine Technology
Credits: 2 Hours: 3
This course covers the basic concepts of gas turbines. That includes gas turbine applications, types and components. The fundamentals, cycles and performance of gas turbine engine are covered. Lube oil system, fuel system, startup and shutdown procedure are described.
Prerequisite: 66–234

66–336 Water Treatment and Desalination Technology
Credits: 2 Hours: 2
Water resources, properties of seawater, thermal desalination processes, membrane desalination processes, hybrid desalination processes, Nano–fluids applications, forward osmosis technology, adsorption technology, wastewater characteristics, water treatment technologies.
Prerequisite: 66–235

66–337 Heat Exchangers Technology
Credits: 2 Hours: 3
Basic concepts of heat exchangers, heat exchanger types, overall heat transfer coefficient, fouling resistance, enhancement surface factor, LMTD analysis method, effectiveness–NTU method, pressure drop in heat exchangers, performance, and maintenance procedure of heat exchangers. Laboratory experiments to evaluate the performance of heat exchangers.
Prerequisite: 66– 235

66–343 Industrial Pollution
Credits: 2 Hours: 2
Types and sources of pollution, air pollution, water pollution, and soil pollution; general concepts of pollution control; pollution from power plants and oil refineries; pollution from automobiles; pollution control equipment for power plants; oil refineries and automobiles; domestic and industrial wastewater treatment; and noise pollution and the applied controlling techniques.
Prerequisite: 66–241

66–383 Mechanical Maintenance
Credits: 2 Hours: 2
Introduction to maintenance: definitions and principles, and the need for maintenance and its impact on productivity, cost, safety and life span of the equipment. In addition, the course introduces management aspects including planning, scheduling, automation, and techniques for improving the maintenance of a specific plant. The course also presents various aspects of proactive, predictive, preventive, and corrective maintenance characteristics and procedures. Selected maintenance cases are discussed with students.
Prerequisite: 66–286

66–399 Field Training
Credits: 4 Hours: 16
Practical training for a period of 14 weeks (224 hours) in a facility related to the student's major such as power stations, petroleum industries, and central workshops. Emphasis is on operation, maintenance, and control of technical systems; equipment installation, setup, commissioning, and calibration; health, safety and environment.
Prerequisite: 30–162, Passing 50 credits

Department of Petroleum Engineering Technology

Overview:

The College of Technological Studies has designed this program to prepare high school graduates to 66–t these requirements upon the successful completion of the program. The Petroleum Technology Program includes two specializations: one is exploration and development and the other is production and Export. The first aims to graduate assistant engineers in the exploration and development area, whereas the second aims to graduate them to work in the production areas. The primary objective of the Petroleum Engineering Technology Curriculum is to provide the student with sufficient science fundamentals, laboratory, and practical experience in order to work as a qualified technician in oil and gas producing and service companies.

Majors:

The department offers two areas of specialization:

- Petroleum Engineering Technology–Exploration and Development
- Petroleum Engineering Technology–Production and Export

Laboratories:

- Computer Lab
- Core preparation
- Corrosion
- Drilling Fluids
- Drilling Simulation
- Fluid Properties
- Petroleum Cementing
- Physical and Petroleum Geology
- Production
- PVT
- Routine Core Analyses
- Special core analyses

Department of Petroleum Engineering Technology

Program: Petroleum Exploration and Development Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
66	152	Fluid Mechanics	3	4	76–1066,56–113
75	142	Basic Chemistry	3	4	
78	102	Introduction to Petroleum Engineering	1	1	
78	212	Petroleum Engineering Calculations	2	3	76–105
79	122	Petroleum Geology Fundamentals	3	4	78–102
79	131	Reservoir Rock Properties	3	4	78–102
79	232	Reservoir Fluid Properties	3	4	76–106, 79–131
79	235	Formation Evaluation	3	3	76–106
79	236	Basic Reservoir Engineering	3	3	79– 232
79	241	Drilling and Well Completion	3	4	79–131
79	246	Water Injection Technology	3	4	79–236
79	342	Well Testing Technology	3	4	79– 236
79	390	Computer Applications in PEE	3	4	79–232
79	399	Field Training	6	24	30–162, 30–171, Passing 50 credits

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
78	279	Artificial Lift Technology	3	3	79–241
79	243	Blow Out Prevention	3	4	79–241
79	299	Project	3	4	79–232
79	356	Well Stimulation	3	3	79–241
79	357	Petroleum Economics	3	3	78–212

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	252	Industrial Management	2	2	
81	298	Industrial Safety	2	2	30–102

Department of Petroleum Engineering Technology

Program: Petroleum Production and Exporting Technology

1. Major Core Courses (42 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
66	152	Fluid Mechanics	3	4	56–113, 76–106
75	142	Basic Chemistry	3	4	
78	102	Introduction to Petroleum Engineering	1	1	
78	212	Petroleum Engineering Calculations	2	3	76–105
78	251	Petroleum Production Operations	3	4	79–232, 56–113
78	255	Well Performance	3	3	79– 236
78	257	Natural Gas Production Technology	3	4	79–232
78	399	Field Training	6	24	30–162, 30–171, Passing 50 credits
79	122	Petroleum Geology Fundamentals	3	4	78–102
79	131	Reservoir Rock Properties	3	4	56–113, 78–102
79	232	Reservoir Fluid Properties	3	4	76–106, 79–131
79	236	Basic Reservoir Engineering	3	3	79–232
79	241	Drilling and Well Completion	3	4	79–131
79	390	Computer Applications in PEE	3	4	79–232

2. Major Elective Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
78	113	Corrosion in Petroleum Facilities	3	3	75–142
78	279	Artificial Lift Technology	3	3	79–241
78	299	Project	3	4	79–232
79	356	Well Stimulation	3	3	79–241
79	357	Petroleum Economics	3	3	78–212

3. General Compulsory Courses (6 Credits)

Code	No.	Course Name	Cr.	Hrs.	Prerequisite
1	101	Islamic Culture	2	2	
64	252	Industrial Management	2	2	
81	298	Industrial Safety	2	2	30–102

COURSE DESCRIPTION

78–102 Introduction to Petroleum Engineering
Credits: 1 Hours: 1
Overview of petroleum industry and petroleum engineering, including nature of oil and gas reservoirs, petroleum exploration and drilling, formation evaluation, completion and production, surface facilities, reservoir mechanics, and improved oil recovery.

78–113 Corrosion in Petroleum Facilities
Credits: 3 Hours: 3
Theories and principles of corrosion and prevention. Inspection, welding problems, and application of corrosion prevention in petroleum production facilities.
Prerequisite: 75–142

78–212 Petroleum Engineering Calculations
Credits: 2 Hours: 3
Calculation of petroleum engineering from the perspective of dimensions and common units, these include the unit conversion and the consistency of units in the petroleum equations. Graph interpretation and data analysis and their applications in petroleum engineering field.
Prerequisite: 76–105

78–251 Petroleum Production Operations
Credits: 3 Hours: 4
Gathering and separation of gas, oil, and water; types of separators and configuration; dehydration and desalting principles; and heaters and heat exchangers. The calculation and simulation of flow in pipes, such as well bore and flow lines, will be covered using computer approach.
Prerequisite: 56–113, 79–232

78–255 Well Performance
Credits: 3 Hours: 3
Elements of producing wells, inflow performance for oil and gas wells, and single and multiphase flow in vertical and horizontal pipes. Choke performance. Well head separator and fluid treatment systems. Systems approach to well performance analysis. It also covers well performance using nodal analysis. Production decline analysis. Introduction to artificial lift systems.
Prerequisite: 79–236

78–257 Natural Gas Production Technology
Credits: 3 Hours: 4
Gas physical properties, vertical flow performance of gas wells, and absolute open flow potential. Gas transmission applications, Panhandle equation and gas pipelines. Static and dynamic flowing bottom hole pressures using the ATC and Cullender and Smith methods. Gas dehydration, sweetening, and gas metering.
Prerequisite: 79–232

78–279 Artificial Lift Technology
Credits: 3 Hours: 3
A review of IPR, flow in the well bore, flow in the flow line, improving well performance by decreasing flowing bottom pressure requirements, increasing well production by using artificial lift systems particularly those employed in Kuwait such as gas lift, electrical submersible pumps (ESP, and beam pumps.
Prerequisite: 79–241

78–399 Field Training
Credits: 6 Hours: 24
Advanced training in some units in the field of petroleum production and export facilities with emphasis on well corrosion surface flow line, gathering center facilities, wire line tools and its evaluation, drilling, crude oil transportation and storage, and well performance.
Prerequisite: Completion 27 major credits.
Prerequisite: 30–162, 30–171, Passing 50 credits

79–122 Petroleum Geology Fundamentals
Credits: 3 Hours: 4
This course covers the structure of the Earth: rocks (igneous, sedimentary, and metamorphic rocks), structural geology (Folds, Faults, and unconformity, plate tectonic theory. The course also covers sedimentary basins and oil potentialities of Kuwait, stratigraphy and geologic history, oil traps (source, reservoir, and cap rocks), and origin and migration of petroleum. The laboratory will emphasize preparation of subsurface and geologic maps and cross sections.
Prerequisite: 78–102

79–131 Reservoir Rock Properties
Credits: 3 Hours: 4
The course covers fundamental concepts of reservoir rock properties including porosity, absolute and relative permeability, fluid saturations, wettability, capillary pressure and formation factor and saturation index as obtained from electrical properties of saturated rocks. The course is supplemented with laboratory experiments.
Prerequisite: 78–102

79–232 Reservoir Fluid Properties
Credits: 3 Hours: 4
Physical principles of petroleum engineering, dimensional analysis, compositional parameters for mixtures, fundamental gas laws, elementary phase behavior equilibrium vaporization ratios, and critical conditions. A fluid properties laboratory is an integral part of the course, where some of the physical properties are determined.
Prerequisite: 76–106, 79–131

79–233 Exploration Methods
Credits: 3 Hours: 3
Various branches of geophysics and their relation to the science of geology. Introduce the student to physical characteristics and overview of geophysical methods. Interpret the distribution of geophysical data and their contrast. Solution of geological and environmental problems using geophysical methods. Applications of seismic waves which include analyses and interpretation of measured data.
Prerequisite: 79–122

79–235 Formation Evaluation
Credits: 3 Hours: 3
The qualitative and quantitative interpretation of well logging techniques as applied to formation analysis. The topics cover field examples and problems.
Prerequisite: 76–106

79–236 Basic of Reservoir Engineering
Credits: 3 Hours: 3
Rock and fluid properties required for reservoir engineering, volumetric calculations of oil and gas in place, gas reservoirs material balance, oil reservoirs material balance, reservoir fluid flow equations, water influx.
Prerequisite: 79–232

79–241 Drilling and Well Completion
Credits: 3 Hours: 4
Introduction to drilling systems: functions and design considerations of rotating system, hoisting system, and circulation system; drilling fluids calculation and selections; hydraulic programs; mud functions and equipment; capacity calculations in the drill string and annulus; slip velocity.
Prerequisite: 79–131

79–243 Blow Out Prevention
Credits: 3 Hours: 4
Formation pressures, kick signs, well control methods, leak off test, and understanding of kill sheet in well control operations. Well control equipment, and discussion actual problems encountered during well control operations.
Prerequisite: 79–241

79–246 Water Injection Technology
Credits: 3 Hours: 4
The course provides basic reservoir engineering aspects of water flooding. Specific topics to be studied include objectives of water injection and candidate reservoirs, selection of water injection patterns, physical properties related to water flooding, immiscible displacement and frontal advance theory, fractional flow of water, mobility and prediction of displacement efficiency at breakthrough. Water injection sources, water quality and its effect on injectivity.
Prerequisite: 79–236

79–299 Project
Credits: 3 Hours: 4
This course is designed for a student or group of students to apply their petroleum engineering knowledge to study a specific problem in exploration and development. The tasks are performed under an instructor's supervision and usually carried out in the laboratory or by using a computer.
Prerequisite: 79–232

79–342 Well Testing Technology
Credits: 3 Hours: 4
The course is intended to provide the students with the fundamental principles and a practical knowledge of well testing analysis techniques. It is designed to introduce the students to the classical well testing theory, standard interpretation techniques, and equipment involved. Emphasis will be placed on fluid flow in porous media, different types of well testing, wellbore storage, skin effect, type–curve matching, and gas well tests.
Prerequisite: 79–236

79–356 Well Stimulation
Credits: 3 Hours: 3
Productivity evaluation of oil and gas wells, causes of low productivity, detection of wellbore damage, acidizing fundamentals, acid treatment evaluation, low permeability formation productivity, basics of hydraulic fracturing, evaluation of productivity changes. Cost of stimulation methods and determination of their payout.
Prerequisite: 79–241

79–390 Computer Application in Petroleum Engineering
Credits: 3 Hours: 4
This course introduces students to the various computer applications in the petroleum field using any programming language. The student will learn operating systems in terms of working in the language environment, command line, types of commands, and the language file system. Preparing a model in terms of importing and exporting files through different computer operating systems and running the model through a simulator.
Prerequisite: 79–232

79–399 Field Training
Credits: 6 Hours: 24
Advanced training in some units in the field of petroleum exploration and development with emphasis on exploration technique, design drilling and well completion, well development (reservoir engineering analysis), well performance, and computer application in petroleum engineering.
Prerequisite: 30–162, 30–171, Passing 50 credits

Courses offered by College of Basic Education (CBE)

01–101 Islamic Culture
Credits: 2 Hrs.: 2
The impact of Islam on Arabic culture, cultural meaning of Islamic rules, and tradition of early Islamic communities.

03–112 Work Ethics and Loyalty
Credits: 3 Hrs.: 3
Basic concepts. Aims and goals of work. National and foreign values of work and loyalty. Social and psychological aspects of work. Defects of job environment on performance and loyalty. Steps taken to face problems on work sites.

07–141 Art Education (1)
Credits: 1 Hrs.: 2
The arts. Human expressions in arts. Performance, applied arts, sketching, the use of paints, pottery, enamels, and wood working.

07–142 Art Education (2)
Credits: 1 Hrs.: 2
Harmony of colors, theory of colors, practices in mixing, raw material handling, and appreciation of fine art.
Prerequisite: 07–141

08–110 Physical Education
Credits: 1 Hrs.: 2
The human body as a successful structure. Mechanical features of the human body, games and muscle development, and games and group action.

10–104 Research and Libraries
Credits: 1 Hrs.: 2
Types of libraries. Role of libraries: educational, informative, cultural, and social. Library dimensions. Different types of information resources (Arabic and foreign). Basics of evaluation of information resources. Research methodology. Information extraction, collection, and organization. Essay writing techniques. Significance of children literature.

13–151 Music Education (1)
Credits: 1 Hrs.: 2
The course aims to promote music appreciation, orients students in the basic language of music in the context of his/her culture. Music instruments, basic instructions on harmony, tone, overtones, fundamentals of orchestral music, and characteristics of master pieces.

15–114 Industrial Psychology
Credits: 2 Hrs.: 2
Introduction to psychology, motivation and behavior, anxieties and behavior, introduction to industrial psychology, individual differences in industry, acceptability between individuals and work, work analysis, industrial training, accidents in industry and safety, fatigue in industry, and human industry relations.

Courses offered by College of Business Studies (CBS)

21–164 Accounting
Credits: 2 Hrs.: 2
Definition of accounting. Accounting branches, registration of financial operations, registration, account books, and registers. Classification of financial operations, forwarding, auditing balance, and account types. Project assessment, project budget, stationary assets, mobile assets, expenditure, and income.

22–104 Small Project Development and Management
Credits: 2 Hrs.: 2
Definition, criteria, forms, and characteristics of small projects. Pioneering. Foundation and implementation. Factors of success and failure. Planning and organization of small projects. Decision making, counseling and leadership, and supervision. Management of human resources. Financial and marketing management. Feasibility study and credit and revenue systems.

25–166 Industrial Economics
Credits: 2 Hrs.: 2
Definitions, economic problem, and production possibility frontier. Demand and supply and market equilibrium. Elasticity and industrial projection. Theory of production. Cost, revenue, and market structures. Economic visibility. Industry in Kuwait.

30–099 English Language (Intensive)
Credits: 0 Hrs.: 6
Level 1 – This is a pre–intermediate course that aims to build on existing knowledge of vocabulary and grammar and to expand student's oral/aural skills in English. This is a remedial course for those students who could not pass the English placement test administered upon admission to the college system of PAAET.

30–101 English Language (1)
Credits: 3 Hrs.: 5
Level 2 – This is a 5–contact hour intermediate level course that aims to build on existing knowledge of vocabulary and grammar and to expand student's oral/aural skills in English. The Prerequisite is either passing the EPT exam or remedial course 099. This is a general English course offered at all five colleges of PAAET which include technological, Nursing, Health, and Business studies as well as the college of basic education.

30–170 English Language (2)
Credits: 3 Hrs.: 5
Level 3 – This is a 5contact hour high–intermediate course that aims to build on existing knowledge of vocabulary and grammar and to expand students' oral/aural skills in English. This 3rd level generally technical integrated skills course aims at equipping the students of CTS with the language proficiency they need to perform adequately at their respective workplaces. It focuses on writing and ensures the acquisition of writing competencies such as email, memos, and short technical reports. Reading technical material and processing it through summary is also an objective. On the speech level, this course will train the students in everyday English skills such as handling telephone calls and it will provide them with the confidence and structure needed to deliver effective short presentations, an oral skill that is becoming increasingly recognized as the highest standard of communicative ability in English.

CTS

College of Technological Studies
Campus Map

01	College Administration
02	Dean & Assistant Deans
03	Workshop and Lecture rooms
04	Manufacturing Engineering Technology Department
05	Computer Laboratories and Lecture rooms
06	Petroleum Engineering Technology Department
07	Chemical Engineering Technology Department
08	Electronic Engineering Technology Department
09	Civil Engineering Technology Department
10	Civil Engineering Laboratories
11	College Library
12	Student Cafeteria
13	Book Store
16	Storages
17	Cooling Towers
19	Mosque
20	Laboratories Technology Department
22	Electrical Engineering Technology Department
23	Mechanical Power and A/C Eng. Technology Department
	College Buildings
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	Parking