Faculty of Engineering - Assiut University

Bylaws for Graduate Studies

Credit hours system
Faculty of Engineering, Assiut University is interested in postgraduate studies sector in order to achieve the goals of establishing rules of scientific research. It is also interested in the applied scientific research in the degrees of diploma, master and doctorates. Moreover, Faculty of Engineering is interested in rehabilitating graduates of higher studies, so as to achieve sustainable development for scientific research.

The Faculty considers overall research plan every five years to upgrade the search for the service of society and the citizen, and the Faculty is distinguished with its interest in the scientific research tools in terms of the availability of laboratories, libraries and information network.

This Bylaw has been taken into consideration the reference framework of postgraduate regulations also contained the programs that serve the community and the environment in the five specialties of the Faculty; Civil Engineering, Electrical Engineering, Mechanical Engineering, Architecture Engineering and Mining and Metallurgical Engineering. The Faculty aims to increase the number of students enrolled at higher studies on their part.

Prof. Mohamed Aboelkassem Mohamed
Dean of Faculty of Engineering
Assiut University
It is a great honor when I have an opportunity to write the inaugural words for the bylaw of graduate studies in the Faculty of Engineering in Assiut University. The Faculty of Engineering in Assiut University is the first scientific institution in Upper Egypt awarded certificates Graduate Diploma, Master's degree and Ph.D. degree in most branches of engineering sciences. The postgraduate engineering study in the Faculty of Engineering provides the students with the advanced, effective, technology-based education justifying the expectations of the future of science and technology. It is always seeking to develop the state's activities in industry, construction, energy, electronic communications, transport, services and other engineering projects and technological fields, making incredible right to be distinct and leading scientific institutions in Egypt. According to the Accreditation Board for Engineering and Technology (ABET), the preparation of this Bylaw was started by faculty staff members and several members of the broader community in Upper Egypt. This group of many individuals engaged in a lively discussion regarding the mission and core values of the Faculty (past, present and future), future of the Upper Egypt and shaped an ambitious list of future goals and endeavours.

I would like to express my deep appreciation to all those who contributed in the output of this regulation. Also, I would like to thank deeply every member of the Faculty of Engineering in Assiut University whose efforts have been very instrumental to reach the present status in the engineering education in Upper Egypt, Egypt, and the Middle East.

Prof. Usama Sayed Mohammed
Vice Dean for Graduate Studies and Research
Faculty of Engineering
Assiut University
The Faculty Mission

The Faculty of Engineering graduates engineers in different disciplines to meet the technical requirements of industrial enterprises and service sectors. The Faculty provides its graduates with the foundations of knowledge and skills which comply with the international standards and requirements of major engineering projects in the field of their specialization. Our graduates are also instructed to have an awareness of the problems of society and the environment, side by side with the ethics of the profession. The mission extends to include constant update of its graduates' skills through intensive courses, workshops and graduate programs. Moreover, the Faculty contributes to the engineering sciences through graduate research and community service and environment development through professional consultations.

The Faculty Vision

The faculty of engineering is looking forward to ensuring its leadership in Egypt and in the Arab world by offering a distinctive engineering education.
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PREFACE

The Faculty of Engineering at Assiut University has begun graduate education since the end of the fifties of the twentieth century when it began the enrollment and registration for the Master, Ph.D. and postgraduate diplomas in the different disciplines of engineering, as shown in Table (1). Since that date, the Faculty has participated in preparing scientific staff for the engineering faculties of Egypt, the Arab world and some foreign universities through granting the Master's and Ph.D. degrees in the different disciplines of engineering. The system of graduate education in the Faculty of Engineering has evolved many times since its first establishment with internal regulations.

In August 1958, the Faculty issued the first Regulation for Graduate Studies. Thereafter, the Faculty has appointed the first vice dean for the affairs of Graduate Studies and Research in 1972. The Regulation for Graduate Studies has been amended several times in the years of 1981, 1985, 1995, 2001. New specialized diplomas were added in many of these amendments. Among the most important features of the Regulation of Graduate Studies in the Faculty of Engineering of Assiut University:

1. The Council’s of the scientific departments identify the need for new faculty members in the different disciplines and develop a research plan for five years concurrently with the Missions plan aiming at fulfilling the future needs of the department. The proposed research plan should also include research problems from industrial institutions, production and service sectors, and environmental problems in the geographical area surrounding the University. The research plan of the scientific departments should be presented to the Faculty Council for approval.

2. The Councils of scientific departments determine what is needed to complete the research infrastructure including equipment, devices, tools and the necessary trained technical technicians. The Faculty and University should provide the necessary funding within the available budget. The Council of each scientific department together with the Faculty Council monitors the implementation of these plans.

3. The research point of the Master’s and Ph.D. degrees should comply with the research plan of the department.
4. The research plan of the Faculty of Engineering consists of the research plans of the departments taking into account coordination with other engineering faculties to serve the industry and the development plan.

5. The departments describe, through specialized scientific groups, the various degree programs set forth in this Regulation as well as the description of courses that have should be taught. The departments may also introduce a diploma or a study program that is not highlighted in this Regulation or develop a new course in any of the programs mentioned in the Regulation. These new additions cannot be approved until proposing the program description and the scientific content and description of individual courses to the department Council for approval, followed by proposing in front of the Faculty and University Councils for approval. The Commission of Engineering, Technology and Industrial studies in the Supreme Council of Universities must approve the new diploma or study program.

6. Each department puts an annual plan for its needs of research assistants (not including demonstrators and teaching assistants) in the research points that require full-time study so that the University can provide grants following the recommendation of the Faculty Council. Each grant for a Master’s degree lasts for three years. Each grant for Ph.D. degree lasts for five years. Grants are approved annually and to be renewed every year following the study progress based on a recommendation letter from the supervisor and the department Council.

7. The research and study plans for the Master’s, Ph.D. and different diplomas should be associated with the development plans and the requirements of local areas environment and the surrounding areas to support the link between the Faculty and the community and encourages engineers working on various engineering institutions access to higher education.

8. The curriculum for graduate diplomas may include discussion panels and applied projects. It is advised that some specialized courses are given as optional courses which can be expanded to cover most of the areas of specialization.
Table 1. Scientific Departments in the Faculty of Engineering

<table>
<thead>
<tr>
<th>Civil Engineering Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering Department</td>
</tr>
<tr>
<td>Electrical Engineering Department</td>
</tr>
<tr>
<td>Mining and Metallurgical Engineering Department</td>
</tr>
<tr>
<td>Architectural Engineering Department</td>
</tr>
</tbody>
</table>

The current amendment, dated 2016, has introduced the following:

- A system for credit hours.
- A system for qualifying education for the graduates of practical scientific colleges and a system for preliminary education for engineering graduates in different disciplines.
- Diplomas in professional studies.
- The possibility of introducing diplomas in interdisciplinary research (between different departments).
- Master's Degree in Engineering courses-based, in addition to the Master's degree in Engineering Sciences and the Ph.D. degree in Engineering Sciences and the Graduate Diploma in various engineering disciplines in regulation. The main objective of introducing this degree, the Master's degree in Engineering courses-based, is developing the scientific capacity of a specialized field chosen by the student, using modern scientific techniques and methods through the study of a number of advanced academic courses and conduct applied research.

Degrees set forth in this Bylaw:

(A) Professional Studies Diploma:
This study aims at raising professionalism in all areas of professional engineering through the study of applied courses and practical exercises, and can be in interdisciplinary areas.
(B) Post-Graduate Diploma:
This study aims at raising the scientific competence in the applied fields of specialized branches of engineering through the study of applied and scientific courses and participating in working groups to prepare practical projects.

(C) Master's Degree in Engineering:
This study aims at raising the scientific capacity and development in the field chosen by the student, using modern scientific techniques and methods through the study of a number of advanced academic courses and conducting an applied research.

(D) Master's of Sciences Degree in Engineering:
This study aims at developing the research capacity, scientific thinking and development in the specialty area chosen by the student from the Faculty research plan, using the techniques of modern scientific methods through the study of a number of advanced academic courses and conducting academic and applied research proposed as a comprehensive thesis.

(E) Doctor of Philosophy Degree in Engineering Sciences:
This study aims at developing the independent thinking and the ability to innovate and develop, thereafter proposing science contributions in the specialty area and the subject chosen by the student. This should be conducted following the technical, research and accurate scientific approaches which improves the research capacity that has been developed through a scientific and applied research proposed as a comprehensive dissertation.

All the Diplomas and Degrees prescribed in this Bylaw are shown in Figure (1).
FIRST: THE GENERAL RULES

Article (1): Study System

The study follows the Credit Hours system and allows the enrollment of engineering graduates from the Egyptian Universities or graduates with degrees that have been neutralized by the Supreme Council of universities. Only graduates from practical colleges can be accepted to study the Professional Diplomas after passing the qualifying stage. The main features of the Credit Hours system, as listed in this Bylaw, are as follows:

(A) A Credit Hour for any academic course represents one lecture hour (or two lab hours) per week for the entire study period.
(B) The Regulation shows the number of lecture-hours and the corresponding credit hours for each course in all the programs provided for in this Regulation.
(C) An hour of written exam-time, at least, is allocated for each credit hour. The Faculty Council may modify the exam time, provided that the written examination-time is at least two hours and cannot exceed four hours, following a recommendation from the Graduate Studies Committee in the Faculty after a recommendation from the concerned department upon the request of one or more faculty member that has been approved by the specialized scientific group to modify what is contained in the tables attached to this bylaw.
(D) The written examination or only a part of it, in applied courses, may be replaced with a practical exam following the nature of the course and upon a recommendation of the department Council.
(E) Students enrolled for the Ph.D. degree have to pass a comprehensive Exam.

Article (2): The Enrollment and Study Dates

First: Enrollment for the Professional Diploma:

(A) The Faculty declares during the first week of the semester prior to starting of the study about the disciplines of practical colleges, other than the Faculty of Engineering, that will be allowed to enroll in the Professional Diplomas in the following semester, as well as the qualifying courses required for these Diplomas.
(B) All requests for enrollment, fulfilling the conditions for enrollment as shown in Article (3), should be presented to the office of Graduate Studies within two months from the date of the declaration, so that all the procedures, payment of fees and official endorsements from the scientific councils are satisfied. The result of acceptance should be announced before the starting date by at least one week.

Second: Enrollment for the Post-Graduate Diplomas:

(A) The Faculty declares during the first week of the semester prior to starting of the study about the Post-Graduate Diplomas that will be available in the different scientific departments of the Faculty in the following semester.

(B) All requests for enrollment, fulfilling the conditions for enrollment as shown in Article (3), should be presented to the office of Graduate Studies within two months from the date of the declaration, so that all the procedures, payment of fees and official endorsements from the scientific councils are satisfied. The result of acceptance should be announced before the starting date by at least one week.

Third: Enrollment for Master's and Ph.D. Degrees:

(A) Accepting applications for enrollment in the Master's and Ph.D. degrees will start in the first week of the semester that precedes the studying semester of both first and second semesters of the year, and will end within two months from that date.

(B) Enrollment for these grades is fulfilled after meeting the conditions for enrollment described in Article (3) during the month preceding the start of the study and paying the tuition fees. The result of acceptance will be announced before starting the study by at least one week.

Fourth: The Academic Calendar for all Programs according to the Credit Hours System is indicated as follows:

The academic year is divided into three semesters as follows:

(A) The First Semester: starts from the third Saturday of September for the period of 15 weeks.
(B) **The Second Semester:** starts from the second Saturday of February for the period of 15 weeks.

(C) **The Summer Semester:** The Faculty Council, following a recommendation from the concerned department and the Graduate Studies Committee within the Faculty, may announce studying in the Summer Semester in the department. The Summer Semester starts from the first Saturday of July for the period of 7 weeks.

**Article (3): Conditions for Enrollment**

(A) Obtain an approval from the concerned department.

(B) Obtain an approval from the institution with which the student is affiliated, according to the number of credit hours that he will register for, as indicated in Article (5).

(C) Complete all the required documents from the Office of Graduate Studies in the Faculty.

(D) Pay the tuition fees before starting of the study during the open dates set by the Office of Graduate Studies.

(E) The University Council may add other conditions deemed necessary before acceptance. These conditions may include conducting an entrance exam (written) for new students and requesting extra, complementary courses and limiting the number of admitted students following the available resources in the department and the Faculty. These conditions are added following a proposal from the concerned department Council and a recommendation from the Graduate Studies Committee and an approval by the Faculty Council and the university council. The details of the conditions for enrollment of the M.SC. and the Ph.D. will be indicated in Article (25), Article (29) and Article (33).

**Article (4): Suspending the Enrollment**

The Faculty Council may suspend the enrollment of a postgraduate student, following a request by the department Council and a recommendation of the Graduate Studies Committee, in the following cases:

(A) **Military Service:** The student must submit a request to suspend his registration for the duration of his military service during the first
three months of his service attaching documents that support his request.

(B) **Travelling Abroad**: The student must submit a request to suspend his registration before traveling (or during the first month of traveling) on an official mission or a holiday, attaching documents that show necessity of traveling for more than one month.

(C) **Disease**: The student must submit a request indicating his illness, supported by an official prescription from the Medical Office in the University highlighting the duration of suspending his enrollment, conditioned that it is not less than a month.

(D) **Delivery and Child Care**: The student can apply to suspend enrollment for child care supported by a certificate of birth.

(E) **Other Cases**: The concerned department addresses other individual cases, accompanied by supporting documents to determine the eligibility of the student to suspend his enrollment. The department sends a recommendation to the Graduate Studies Committee in the Faculty, which in turn sends its recommendation to the Faculty Council for approval.

In all the above cases, it is required that the total suspending periods not exceed two study years during the period of registration for postgraduate studies. The University, following a recommendation from the department Council and the Graduate Studies Committee and the approval of the Faculty Council, may override this requirement.

**Article (5): Conditions of Registration**

(A) Student can register in the first or second semesters of the year in a number of courses with 6 credit hours.

(B) Students, who wish to register in the first or second semesters of the year in a number of courses with credit hours of more than 6 hours and up to 12 hours, have to provide documentation for devoting at least one day of studying each week. The maximum number of credit hours per week, that a student can enroll-in, is 18 hours, where the student must provide documentation for devoting at least two days of studying each week.

(C) Available courses for registration depend on the number of enrolled students, according to the decision of the concerned department council and the faculty.
(D) A student can enroll in the summer courses with a number of credit hours not exceeding 6 hours, conditioned on devoting at least one day of studying each week.

**Article (6): Conditions for Amendment and the Withdrawal from Courses**

(A) A student has the right to replace courses by other courses within two weeks of starting the study, without contradicting Article (5) and after obtaining an approval from the concerned department council and on the recommendation of the main supervisor or academic advisor (for the study of Master of Engineering and Diplomas). This right does not apply to the summer semester.

(B) A student may withdraw from a course within the eight weeks at most from the beginning of the first and second semesters, and within four weeks at the most from the beginning of the summer semester. In this case, the course will be considered incomplete and is subjected to the statement on withdrawals as shown part (E) of Article (14). A student may not refund the tuition fees in case of withdrawal.

(C) A student who wants to resume studying, he has to re-register in any course he previously failed or withdrew from, conditioned on paying of the prescribed fees.

**Article (7): Examination Dates**

(A) The final examination of the first and the second semesters are held after the end of the study in a date selected by Graduate Studies Committee followed by approval of the Faculty Council and the University Vice President for Graduate Studies and Research.

(B) The final examination of the summer semester is held after the end of the study in a date selected by Graduate Studies Committee followed by approval of the Faculty Council and the University Vice President for Graduate Studies and Research.

**Article (8): Attendance**

A student will not be allowed to enter the final exam of any course if he did not achieve an attendance rate of at least 75% based on a report of the instructor with briefing the concerned department council and a
recommendation from the Graduate Studies Committee followed by the approval of the Faculty Council. In this case, the student fails the course and does not get any credit points.

**Article (9): Terminating of Enrollment**

The Faculty Council will terminate the student's enrollment in the following cases:

(A) The student's average score, that is required to continue enrollment during the specified periods, was not achieved.

(B) Fraud cases that require termination of registration.

(C) Submitting a report by the supervisory committee or the academic advisor to the department Council stating lack of seriousness of the student in the research or the study.

(D) In the case of the Master's or Ph.D. Degrees; submitting a report by the judging panel that the thesis or the dissertation is not valid for gaining degree.

(E) The student himself submits a request to terminate his registration.

**Article (10): Re-entry**

If a student’s termination of enrollment has been done because of one of the reasons mentioned in article (9(A), 9(C), 9(E)), the Faculty Council may re-register the student upon a recommendation of the department Council and a recommendation of the Graduate Studies Committee, provided that he re-enroll in a specialty that is different from the previous enrollment in the cases of (9(A) and 9(c)). The student must apply according to the re-enrollment deadlines in accordance with Article (2), the general conditions for registration in accordance with Article (3) and the conditions for enrollment for each degree set forth in this Bylaw. The student may be exempt from some introductory courses if he was graded with at least "good" within a maximum of three years, on the recommendation of the concerned department council, Graduate Studies Committee and the approval of the Faculty Council.

**Article (11): Coding System for the Courses**

(A) The code of any course begins with a number (02), which represents the Faculty of Engineering.
(B) Then comes the department code which is:
Department of Civil Engineering (01),
Department of Mechanical Engineering (02),
Department of Electrical Engineering (03),
Department of Mining and Metallurgical Engineering (04),
Department of Architecture (05).

(C) Then comes the program level code and the course serial number as follows:
- **400-level** courses are taught to students in the qualifying and preliminary studies, according to the field of specialization.
- **450-level** courses are taught to students of the professional Diplomas and are provided with an applied nature.
- **500-level** courses are taught to students of the Diploma.
- **600-level or more** courses are taught to students in the Master’s and Ph.D. degrees.

**Table 2. Example for the digital code of a course**

<table>
<thead>
<tr>
<th>Faculty Code</th>
<th>Department Code</th>
<th>Course Level</th>
<th>Serial Number of the Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

**Example:** digital code 0202615 is the course No. 15 of the Master’s or Ph.D. degree in the Mechanical Engineering Department.

**Article (12): The Scientific Content of the Curriculum**

(A) The Faculty Council approves the scientific description of the graduate courses listed in this Bylaw after being proposed by a specialized scientific committee and the recommendation of the concerned department Councils. Scientific departments may also recommend the development of one or more courses in any of the academic programs at the request of one or more faculty members. The scientific content and description of the new courses should be discussed by a specialized scientific community and the department Council for approval. This should be followed by a recommendation by the Graduate Studies Committee and an approval of the Faculty Council (before the beginning of the semester in which the course will be taught) as well as approval of the Graduate Studies Committee of the university. This Bylaw
includes tables for the courses of each department in different scientific degrees, indicating the number of lecture hours, the corresponding number of credit hours and the number of hours of the exam.

(B) All graduate courses last for only one academic semester.

### Article (13): Grades

(A) Grading points, the Percentage and the Overall Grade are considered based on each course, as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Points</th>
<th>Percentage</th>
<th>Overall Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4</td>
<td>%95 or more</td>
<td>Excellent</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>From %90 and less than %95</td>
<td></td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
<td>From %85 and less than %90</td>
<td>Very Good</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
<td>From %80 and less than %85</td>
<td>Good</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>From %75 and less than %80</td>
<td></td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
<td>From %70 and less than %75</td>
<td>Pass</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
<td>From %65 and less than %70</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>From %60 and less than %65</td>
<td>Fail</td>
</tr>
<tr>
<td>C-</td>
<td>1.7</td>
<td>From %57 and less than %60</td>
<td></td>
</tr>
<tr>
<td>D+</td>
<td>1.3</td>
<td>From %53 and less than %57</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
<td>From %50 and less than %53</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>Less than %50</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td>withdraw or incomplete</td>
<td></td>
</tr>
</tbody>
</table>

(B) Student is given a certificate with the grade of each course in Arabic or English upon his request.

### Article (14): Average Grade Points:

(A) The grade of each course is calculated as the number of its credit hours multiplied by the grade points of the course.

(B) The points earned by a student in any semester equals the total number of points in the courses studied during this semester.

(C) The average points of a semester equal the result of dividing the total number of grade points obtained in this semester, by the total credit hours of courses.

(D) A student passes a course only if he gets at least a (C) grade.
(E) If a student requests to withdraw from a course, in accordance with the deadlines specified in part (b) of Article (6), the course will be considered incomplete and gets a grade W (withdrawn) and points 0, which do not count toward the average grade point. Students are not allowed to withdraw from more than one course per semester and a maximum of three withdrawals during the entire study period. Otherwise, the student will be considered lacking seriousness in completing his degree in which case, the Department Council will consider terminating his registration, following a report from the main supervisor (or academic advisor) and a recommendation from the Graduate Studies Committee following approval from the Faculty Council.

(F) After successfully completing all the course-work, the cumulative average grade point (GPA) equals the result of dividing the total number of grade points obtained in all courses divided by the total credit hours of these courses.

(G) A student does not get the Post-Graduate Diploma or the Professional studies Diploma unless he achieves an average of 2.0 points at least.

(H) A student must achieve in the course-work of the Master’s Degree an average of 2.7 points at least. A student must achieve in the course-work of the Ph.D. Degree an average of 2.7 points at least.

(I) A student, who has a cumulative average grade of less than (B-) in the Post-Graduate Diploma, will not continue toward the Master’s Degree.

(J) If the student fails for more than twice, he may re-register as a new student in another scientific field for one time only.

(K) Any course that a student gets less than (C) will be considered in the cumulative average grade and will not be considered within the approved credit hours in his stage. However, if he re-take the course and successfully passed it, the course will be included in the approved credit hours, with a grade (C+) at best.

(L) A student may be re-study courses, which had previously studied and where he got a grade point less than (3) in order to improve the average grade point or achieve the requirements for enrolling a degree. In this case, the student must redo the study and the test. The recent grade will be calculated with maximum grade points of (3) at the rate calculation.
Article (15): The Credit Hours

(A) A credit hour for any academic course is considered **50 minutes** each week over the entire semester. Each credit hour accounts for **(50 degrees)** in the evaluation.

(B) Each course has an allocated **year-work** of 30% of the highest grade. The concerned department Council may change this ratio before the beginning of the semester which it is not less than 20% and not more than 60%, after the approval of the Graduate Studies Committee, the Faculty Council and the university council at the request of the professor.

(C) New Diplomas, Master’s or Ph.D. Degrees may be introduced in disciplines that are not mentioned in this Bylaw, after being identified by the concerned department and recommended of the Graduate Studies and Research Committee, the Faculty Council, the University Council and approved from the Commission of Engineering, Technology and Industrial studies in the Supreme Council of Universities before starting the study with a sufficient time.

(D) The scientific content of any course listed in this Bylaw may be increased or modified following the scientific advances in the field, with no more than 10% of the scientific content mentioned in this Bylaw. The course amendment should be presented to a scientific committee within the department. Thereafter, the department Council, the Graduate Studies and Research Committee and the Faculty Council should approve the amendment.

Article (16): Tuition Fees

(A) Tuition fees should be collected at the start of each degree, as well as collecting the registration fees of every degree for every credit hour, including the equivalent credit hours for the research in the Master’s and the Ph.D. degrees.

(B) Teaching Assistant, Demonstrators and research students are exempt from all the fees mentioned in Part (A) for a period not exceeding five years from the date of registration for the degree. Then, normal fees will be collect for any non-complete course and annual fees equivalent to the credit hours of thesis’s and dissertations if the registration was renewed thereafter following a
recommendation from the department Council, the Graduate Studies Committee and the Faculty Council. The Faculty Council may modify the exemption period mentioned above at the recommendation of the department Council and the Graduate Studies Committee.

(C) The tuition fees are determined by the University following the suggestion of the Faculty Council.

(D) Fees associated with discussing Master’s and Ph.D. degrees are collected while forming the judging committee. The judging committee will not be formed unless these fees are paid.

(E) Fees associated with the comprehensive examination for the Ph.D. degree are collected before the date of the exam by at least two weeks.

**Article (17): Academic Advisor**

(A) The department Council assigns an academic advisor for each student after approving his enrollment for the qualifying and preliminary studies, as well as the Master’s Degree in Engineering courses-based system. The academic advisor shall continue until the end of study in the Diplomas or the Master's Degree courses-based.

(B) The main advisor (Article 18) fulfills the role of academic advisor for the students in the Master's in Engineering Science (M.Sc.) Degree and the Ph.D. Degree.

**Article (18): Scientific Supervising**

(A) Upon a student enrollment for Master's of Sciences in Engineering (M.Sc.) and the Ph.D. degree, the Faculty Council appoints an supervising committee of the faculty members. The committee is formed on the proposal of the concerned department Council, followed by the recommendation of the Graduate Studies Committee. The supervising committee is chaired by one of its members among the Professors or Associate Professors working as the main advisor for the student. Assistant Professors can also take part in the supervising committee. An external faculty member (out of the department or the Faculty) or an external professional engineer (from engineering institutions) who is expert in the
research field may take part in the supervising committee following an approval from the Faculty Council. The supervising committee is formed by a maximum of three members for the Master's of Science in Engineering (M.Sc.) and a maximum of four members for the Ph.D. Degree, with at least one Professor in the selected research field.

(B) In the case of travelling one of the supervising committee or having a faculty-leave for at least one year, a decision should be made according to the timing of travel and the registration date as follows:

**First:** In case of traveling before selecting a research points, the Faculty Council will appoint a replacement in the supervising committee, following a recommendation from the concerned department Council and the Graduate Studies Committee which do not contradict Part (A) of this article. He may stay in the supervising committee if the other committee members requested so.

**Second:** In case of traveling after selecting a research points, the advisor has to report to the department Council highlighting how the student is processing in his research. In response, the Faculty Council appoints a replacement (in the case of his desire to apologize at future participation in supervising) or adds a new committee member to the supervising committee, following the recommendation of the concerned department council and the Graduate Studies Committee with do not contradicting Part (A) of this Article.

(C) The supervising committee provides a report to the department council at the end of each academic year about the student's progress. This report is taken into account when making a decision by the concerned Councils before terminating the enrollment.

**Article (19): The Examination Committee**

(A) After completing the program requirements and presenting a public seminar showing results of the research, the student provides a written thesis or dissertation in the language of study within the department including two abstracts in Arabic and English. The supervising committee writes a report on the validity of the
thesis/dissertation for discussion which is presented to the department Council.

(B) The Faculty Council, following the recommendation of the department council and Graduate Studies Committee, forms a scientific committee to examine the thesis and judge it. The committee is formed by three members, one of whom is the main advisor (or other advisors of Professors, Associate Professors and Assistant Professor at a maximum of two members for one vote). One member must be from outside the university in the case of Master’s Degree (M.Sc.). Two members must be from outside the university in the case of the Ph.D. Degree. The Commission director is the oldest Professors. The University Vice President for Graduate Studies and Research must approve the examination committee after the approval of the Faculty Council. The public discussion cannot take place until after fifteen days from the date of approving of the examination committee.

(C) The thesis is forwarded to the examination committee for analysis and judgment. The committee members respond with their reports within a maximum of three months from the date of receiving the thesis. The department Council has the right to change the examination committee if the reports are not received within three months. The main advisor should coordinate to set a date to publicly discuss the thesis in a scientific discussion within six months. The public discussion should be announced at least one week ahead. The examination committee should meet and discuss the detailed individual reports from the committee members. The committee should discuss the student and provide a collective report about the thesis explaining the quality of the thesis, and the opinion of the committee in granting the degree. The committee may return the thesis to the student to complete what is considered weakness. The student will be given the opportunity to fulfill the committee requests within a maximum of six months. Approval of all the examination committee members is required for granting the degree.

(D) The individual reports and the cumulative report are presented to the concerned department Council, then the Graduate Studies Committee, the Faculty Council, and the University Council in order to grant the degree.
(E) Formation of the examination committee should be done before the end of the authorized period for the student. Approve the examination committee gives consent to extend the registration period for (six months) only.

(F) The examination committee selected by the department Council to judge a scientific thesis must have scientific contributions in the same field.

(G) A faculty member may not be in the examination committee of one of his relatives to the fourth degree.

(H) If one of the examination committee could not attend the discussion, the discussion may proceed in the presence of the other two members, provided that they include one of the advisors. The individual report of the absent member will be sufficient.
Second: The Qualifying Studies

Article (20): Enrollment Rules and Granting Conditions

(A) These studies are open to the graduates of practical colleges (not including the Faculty of Engineering) who are seeking to improve their professional competence in one of the fields of engineering.

(B) Students in this degree will have to finish 15 credit hours of the 400-level or higher determined by the concerned department. The courses are equivalent to the senior undergraduate level of engineering, according to internal bylaw of the Faculty. The courses are selected from the available courses that have never been studied by the student.

(C) The maximum period for the qualifying studies is one year. Whoever completes this study is allowed to enroll in the Professional Studies Diploma.

Third: The Preliminary Studies

Article (21): Enrollment Rules and Granting Conditions

(A) Preliminary studies are open for holders of the Bachelor of Science in Engineering or an equivalent degree recognized by the supreme Council of the Egyptian Universities.

(B) Students in this degree will have to finish 12 credit hours of the 400-level or higher as long as these courses have never been studied by the student.

(C) Duration of the preliminary studies is one year. Whoever completes this study is allowed to enroll in the graduate diploma.

(D) The concerned department can allow students registered in the Preliminary Studies to take courses at the Bachelor level without being counted towards the required credit hours listed in (B).
Fourth: Diplomas

1- THE PROFESSIONAL STUDIES DIPLOMA

Article (22): Enrollment Rules and Granting Conditions

(A) The Professional Studies Diploma is open for the graduates of Faculty of Engineering (whose field of study is different from that of the Diploma to which he applies for) and is also open to the graduates of practical colleges (not including the Faculty of Engineering) who passed all the required courses of the Qualifying Studies with a GPA of at least 2.7 points.

(B) The Professional Studies Diploma can be awarded in any of the following fields:
   a. Professional Studies in Civil Engineering.
   b. Professional Studies in Mechanical Engineering
   c. Professional Studies in Electrical Engineering
   d. Professional Studies in Mining and Metallurgy Engineering
   e. Professional Studies in Architectural Engineering

(C) Students in this degree will have to finish 18 credit hours at the 450-level provided that he has never studied before.

(D) The maximum period for The Professional Studies Diploma is one year. Whoever completes this study is not allowed to enroll in the Master degrees.

(E) Achieving a certification in the Professional Studies Diploma is not considered a permission to practice the profession in the field of the Diploma or achieving the membership in the Engineering Syndicate.

2- THE POST-GRADUATE STUDIES DIPLOMA

Article (23): Enrollment Rules and Granting Conditions

(A) These studies are open to the graduates of the Faculty of Engineering or an equivalent degree recognized by the supreme Council of the Egyptian Universities and who have successfully finished all the courses of the preliminary studies with a GPA of at least 2 points.
(B) Students in this degree will have to finish 18 credit hours at the 500-level or higher.

(C) The maximum period for this Diploma is one year maximum after finishing the preliminary studies.

(D) The Post-Graduate Studies Diploma can be awarded in any of the disciplines listed in table (2). The diploma name and discipline should be listed in the certificate.

Table 2. Graduate studies diplomas in different departments

<table>
<thead>
<tr>
<th>#</th>
<th>Concerned Department</th>
<th>Diploma</th>
</tr>
</thead>
</table>
| 1  | Civil Engineering       | 1. Structure Engineering  
                               2. Irrigation, Hydraulic and Water Resources  
                               3. Sanitary and Environmental Engineering  
                               4. Public Works Engineering            |
| 2  | Mechanical Engineering  | 1. Computer Aided Design and Manufacturing  
                               2. Power Plants  
                               3. Refrigeration and Air-conditioning  
                               4. Metal Cutting and Forming  
                               5. Turbo-machines and Pipe Networks  
                               6. Mechatronics Engineering  
                               7. Welding and Metal Casting         |
| 3  | Electrical Engineering  | 1. Electrical Power and Machines Engineering  
                               2. Communication Engineering  
                               3. Computers & Systems Engineering  
                               4. Electronics Engineering  
                               5. Power System Operation and Control  
                               6. Power Electronic Applications in Power Systems |
| 4  | Mining and Metallurgy Engineering | 1. Surface Mining Engineering  
                               2. Underground Mining Engineering  
                               3. Drilling and Prospecting for an Ores Engineering  
                               4. Environmental Engineering  
                               5. Rock Mechanics  
                               6. Ore Dressing  
                               7. Metallurgy and Engineering Material  
                               8. Engineering Surveying           |
| 5  | Architectural Engineering | 1. Architectural Design  
                               2. Urban Planning             |
3- INTERDISCIPLINARY STUDIES GRADUATE DIPLOMA

Article (24): Interdisciplinary Studies

The Faculty Council will form an academic council for each of the interdisciplinary diplomas. This council will have all the authorities of a department council in supervising interdisciplinary diplomas. Members of this academic council are preferred to be specialists in the concerned field. The president of this council will be the vice dean for graduate studies and research. Interdisciplinary diplomas will be opened based on a suggestion by the concerned department councils and the recommendations of the academic council and the graduate studies committee. Approval by the faculty council and the graduate studies council in the university is required.

The Faculty Council will specify in March every year the number and type of interdisciplinary diplomas that will open in the coming academic year according to the dates specified in Article (2) in this bylaw.

The Faculty Council can decide to hold admission test for students applying to interdisciplinary diplomas and limit the number of registered students according to the facilities available in each concerned department.
Fifth: Master's Degrees

Article (25): General Bylaws for the Master's Degree

1- Conditions for Enrollment

With the rules specified in Article (3) in this Bylaw, Potential students should:

(A) Have obtained a Bachelor's degree in the same discipline with at least a grade of “Good” from a Faculty of Engineering in any Egyptian University or any equivalent degree as approved by the Supreme Council of the Egyptian Universities.

(B) Have obtained a Bachelor's degree in the same discipline with a grade of “pass” If he achieved a Post-Graduate Diploma from any Faculty of Engineering recognized by the Supreme Council of the Egyptian Universities with at least general grade of "Good" or its equivalent.

(C) The Faculty Council, based on a proposal by the concerned department, can admit students with a graduation grade “Good” from any other Faculty of Engineering inside or outside Egypt in case there is an academic agreement between Assiut University and the other institution.

(D) The Department Council assigns an academic advisor for each student after approving his enrollment for the Master’s in Engineering as mentioned in Article (17) and assigns a supervisory committee from the faculty members in case of the M.Sc. Degree as mentioned in Article (18) in this bylaw.

2- Course Transfer

The Faculty Council can count other 600 level courses taken by the student during the past three years in other universities or institutes recognized by the Supreme Council of the Egyptian Universities toward the M.Sc. degree or the master in Engineering Degree provided that the grade is higher than 2.7 points. These courses should not exceed 6 credit hours.
3- Conditions to Grant the Master's Degree

(A) At least completing a minimum of two years for the M.Sc. Degree and 5 semesters for the Master of Engineering (M. Eng.) degree from the enrollment. Moreover, the duration of the Master’s program should have a maximum of 5 years in case of the M.Sc. Degree and a maximum of 8 semesters for the Master of Engineering degree from the enrollment unless the supervisors request an extension which is subject to the approval of the Department Council and the Graduate Studies Committee followed by an approval of the Faculty Council.

(B) Acceptance of the thesis or the research project from the defense committee.

(C) A student must achieve in the course-work of the Master's Degree a GPA of 2.7 points at least.

4- Canceling the Registration

The Faculty Council can cancel the student registration in one of the following cases as long as it does contradict with Article (9).

(A) The student has stopped attending courses or conducting research as stated in a report submitted to the department council by the supervisor.

(B) The student has failed in the exam twice or achieves an average grade less than 2.7 points.

(C) The examination committee has rejected the thesis/research project.

(D) The student has requested cancelation of his registration.

(E) The student has not paid the required fees.

(F) Plagiarism and cheating in exams by the student.

Article (26): Regulations for the Master in Engineering (M. Eng.)

(A) Assiut University will grant the degree of Master of Engineering (M. Eng.) (Course option in addition to an applied project). Successful students will be issued a certificate outlining the name of the department, research area, and thesis title. The certificate will also include a detailed description of the courses passed and the GPA and the title of his project.
(B) 30 credit hours at the 600 level courses are required. These courses will be set by the concerned department based on the proposal of the advisor in addition to an applied research project equivalent to 6 credit hours.

(C) The student should finish all the courses with an average at least of 2.7 points before working on his research project which should be approved by the Department and Faculty Council and the Graduate Studies Committee.

(D) The Department Council can modify the field of the research project based on a request from the supervisory committee. This modification should be approved by the faculty council and the Graduate studies committee. In this case, the student shall not be permitted to present his research project for the evaluation except after 6 months from the modification date.

(E) The student should pass an English language test with a score of at least 450 on the paper based TOEFL test or any equivalent international English language test. The Faculty council has the authority to change the required score according to the discipline. A student could be waived from this requirement if he passed such test within the 4 years preceding his registration date.

(F) The Department Council can approve changes in the research project only once during the study. This approval should be approved by the Faculty council and the graduate studies committee.

(G) The Department Council can ask the student to take some 500 level courses (up to 6 credit hours) which are taught in the department itself or in other faculties or institutes in Assiut University or any other recognized foreign university. These courses will not count toward the 18 credit hours mentioned in point (B) above if they were at the level of graduate diploma or a lower level.

(H) The Master of Engineering degree does not qualify students to register for the Ph.D. degree.

**Article (27): Regulations for the Master of Science (M.Sc.)**

(A) Assiut University will grant the degree of Master in Engineering (thesis option). Successful students will be issued a certificate outlining the name of the department, research area, and thesis
title. The certificate will also include a detailed description of the courses passed and the GPA.

(B) At the beginning of each semester, the department will specify at least 6-credit hours of 600 level courses that should be taken by the student to the total of 18 credit hours. Also a thesis (18 credit hours) is required for granting the degree.

(C) The student will start working on his thesis after passing a total of 18 credit hours with at least 2.7 points. The thesis topic will be chosen by the supervisory committee following a recommendation from the concerned Department Council and the Graduate Studies Committee following an approval from the Faculty Council.

(D) The student should pass an English language test with a score of at least 450 on the paper based TOEFL test or any equivalent international English language test. The Faculty Council has the authority to change the required score according to the discipline. A student could be waived from this requirement if he passed such test within the 4 years preceding his registration date.

(E) The Department Council can modify the thesis title based on a request from the supervisory committee. This modification should be approved by the Faculty Council and the Graduate studies committee and should be labeled as major or minor modification. If the change is major, the student shall not be permitted to form a defense committee except after 6 months form the modification date.

(F) The department council can ask the student to take some 500 level courses (up to 6 credit hours) which are taught in the department itself or in other faculties or institutes in Assiut University or any other foreign university. These courses will not count toward the 18 credit hours mentioned in Part (B) above if they were at the level of graduate diploma or a lower level.

(G) At least one paper should be accepted for publication in a peer reviewed journal or conference before the student can form his thesis defense committee.

(H) The Master Degree qualifies the student to register in the Ph.D. comprehensive exam.
Sixth: The Ph.D. in Engineering

Article (28): Disciplines

Assiut University will grant the Ph.D. degree in the disciplines outlined in Table.1. Successful students will be issued a certificate outlining the name of the department, research area, and thesis title. The certificate will also include a detailed description of the courses passed and the GPA.

Article (29): Registration Requirements

With the rules specified in Article (3) in this Bylaw, Potential students should:

(A) Have obtained a Master of Science (M.SC) degree in the same discipline from Faculty of engineering in any Egyptian University or any equivalent degree as approved by the Supreme Council of the Egyptian Universities.
(B) Pass successfully the comprehensive exam.
(C) Submit a request to the concerned Department Council, after obtaining the approval of one of the professors in the department to be his supervisor, to approve the supervision and specify the research topic.

Article (30): Joint Supervision

With the rules specified in Article (18) in this Bylaw, Supervision could be shared between professors from Assiut University and another supervisor from another foreign university that is recognized by the Supreme Council of the Egyptian Universities. In such case the supervision committee could be formed from a maximum of four faculty members.

Article (31): Degree Requirements

(A) 18 Credit hours at the 600 level courses or higher are required. These courses will be set by the concerned department based on the proposal of the supervising committee in addition to a thesis equivalent to 30 credit hours.
(B) The student shall pass the comprehensive exam within 10 months from the registration date.

(C) The student should finish all the Ph.D. courses with at least of 2.7 points before working on his research topic which should be approved by the department and faculty council and the graduate studies committee.

(D) The thesis research topic will not be specified before the student finishes his comprehensive exam with a GPA of at least 2.7 points.

(E) The Department Council can modify the thesis title based on a request from the supervisory committee. This modification should be approved by the faculty council and the Graduate studies committee and should be labeled as major or minor modification. If the change is major, the student shall not be permitted to form a defense committee except after 6 months form the modification date.

(F) The student should pass an English language test with a score of at least 450 on the paper based TOEFL test or any equivalent international English language test. The Faculty council has the authority to change the required score according to the discipline. A student could be waived from this requirement if he passed such test within the 4 years preceding his registration date.

(G) The department council can approve changes in the research topic only once during the Ph.D. This approval should be approved by the Faculty council and the graduate studies committee.

(H) The student should finish all the required courses within 3 semesters. The department council and the graduate studies committee can allow an exception for two courses which can be completed within the proceeding two semesters.

**Article (32): Course Transfer**

The Faculty Council can count other 600 level courses taken by the Ph.D. student during the past three years in other universities or institutes recognized by the Supreme Council of the Egyptian Universities toward the Ph.D. degree provided that the grade is higher than 2.7 points. These courses should not exceed 6 credit hours.
Article (33): The Comprehensive Exam

(A) The comprehensive exam committee will be formed from four faculty members in the same area of the research topic in addition to the main supervisor. This committee can include members from outside the department and should be approved by the department council and the graduate studies committee in the faculty.

(B) The committee will put the comprehensive exam which includes:
   a. An exam in the research area. The form of this exam and its duration will be set by the committee.
   b. A seminar to be held after passing the exam mentioned in point (a) with a minimum GPA of 2.7 points. In this seminar, the student will present the outlines of his research plan.

If the student fails in the comprehensive exam, he can apply for another exam after a period of one month and within four months of the first exam. If he fails in the second exam, his Ph.D. registration will be canceled.

Article (34): Conditions to Grant the Ph.D. Degree

(A) Passing the comprehensive exam.
(B) Acceptance of the thesis from the examination committee.
(C) Acceptance of two papers from the thesis, one of which should be in an international journal indexed in International databases.
(D) Completing a minimum of two years after passing the comprehensive exam. Moreover, the duration of the Ph.D. program should have a maximum of 5 years unless the supervisors request an extension which is subject to the approval of the department council and the graduate studies committee.

Article (35): Cancelation of the Registration

The Faculty Council can cancel the student registration in one of the following cases as long as it does not contradict with Article (9).

(A) The student has stopped attending courses or conducting research as stated in a report submitted to the department council by the supervisor.
(B) The student has failed in the comprehensive exam twice.
(C) The examination committee has rejected the thesis.
(D) The student has requested cancelation of his registration.
(E) The student has not paid the required fees. Assistant lecturers, research assistants, and students who obtained scholarships are exempted from this condition for a specified period as described in Article (16(A)).
(F) Plagiarism and cheating in exams by the student.
Seventh: Other Study Programs

Article (36): Exchange Programs

(A) The Faculty council, based on a proposal by the Department Council and the approval of the Graduate Studies Committee, can allow Graduate students to study some of their courses in other universities with whom Assiut University has a bilateral agreement or universities that are recognized by the Supreme Council of the Egyptian Universities. These courses will be counted toward degree requirements as long as they do not comprise more than 9 credit hours and provided that they were taken within the three years preceding the request to count these courses toward the relevant degree at Assiut University.

(B) Students who are registered as graduate students in other universities, with whom Assiut University has a bilateral agreement, can register for graduate courses in the faculty after getting the required approval from the Department and Faculty Council and the Graduate Studies Committee. Such students will be granted a certificate of these courses from Assiut University.

(C) The Faculty council, based on a proposal by the Department Council and the Graduate Studies Committee, can allow faculty members from other universities, with whom Assiut University has a bilateral agreement, to teach graduate courses in the faculty.

Article (37): Registering for Individual Courses (Non-Degree Courses)

(A) The Faculty Council, based on a proposal by the Department Council and the Graduate Studies Committee, can allow students who satisfy admission requirements outlined in this Bylaw to register for one or more graduate courses after paying the required fees. Students who pass the exams of these courses will be issued, after paying the required fees, a certificate indicating that they passed these courses without being issued any degree certificates.

(B) The Faculty Council, based on a proposal by the Department Council and the Graduate Studies Committee, can count some of these courses (to a total of 6 credit hours) towards a graduate
Diploma as long as the student grade was “Good” or higher and provided that they were taken within the three years preceding the request to count these courses toward a graduate diploma degree at Assiut University. This privilege does not apply to students registered in the Master or the Ph.D. programs.

**Article (38): Technical Courses and Trainings**

(A) The Faculty Council, upon approval of the University Council, can organize technical courses on the graduate level to develop or enhance certain Engineering skills. Duration of such courses will be set by the Faculty council based on a proposal by the concerned department. National and international academic and professional societies can take part in organizing such courses.

(B) Such technical courses and trainings do not entail awarding of any graduate degrees. However, an exam can be held at the end of these courses and successful candidates may be granted a certificate after paying the required fees. In case no such exam is held, course participants can be issued a certificate of attendance after paying the required fees.

**Article (39): Remote Learning**

(A) The Faculty Council can allow engineers to attend graduate courses (levels 500 and 600) through remote learning. Engineers who pass course exams successfully may be granted a certificate of completion from the faculty, after paying the required fees.

(B) These courses can be counted (up to a total of six credit hours) towards a Graduate Diploma or a Master of Engineering after successfully registering in these degree programs.
Eighth: Transitional period

Article (40): Modifying the Bylaw

The University Council can add, remove, or modify any article or program structure in this Bylaw to improve programs quality based on a proposal by the Faculty Council after taking the opinion of all Department Councils and a recommendation from the Graduate Studies Committee in the faculty. These changes should not violate any article in the Universities law.

Article (41): Validity of This Bylaw

This new bylaw will be applied on graduate students registering after the date of the decree of its acceptance from the Minister of Higher Education. Student registering before that date will abide by the current bylaw which was issued in 2001.
Figure (1) Flow Chart of the Degrees Prescribed in this Bylaw
TABLES FOR POSTGRADUATE STUDIES COURSES OF 
THE CIVIL ENGINEERING DEPARTMENT
1. Qualifying Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Civil Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 15 credit hours from the level of 400 chosen depending on his scientific and professional background from the following table:

Table (1-1):

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Week Hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Exercise/lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0201401</td>
<td>Mathematics</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201402</td>
<td>Theory of Structure</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201403</td>
<td>Properties and Strength of Materials</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201404</td>
<td>Design of Concrete Structures</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201405</td>
<td>Design of Steel Structures</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201406</td>
<td>Fluid Mechanics</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201407</td>
<td>Design of Irrigation Structures</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201408</td>
<td>Soil Mechanics and Geotechnical Engineering (1)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201409</td>
<td>Plane Surveying</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201410</td>
<td>Traffic and Transportation Planning</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201411</td>
<td>Sanitary and Environmental Engineering</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201412</td>
<td>Highway Engineering</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
2. Preliminary Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Civil Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 12 credit hours from the level of 400 or above chosen depending on his scientific and professional background from the following table:

Table (1-2):

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Week Hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0201425</td>
<td>Mathematics and Advanced Statistics</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201426</td>
<td>Theory of Structure</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201427</td>
<td>Properties and Strength of Materials</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0201428</td>
<td>Hydraulic of open channels</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
3. Professional Diploma Studies

Include a group of courses for Engineering graduate students. The student studies a number of courses, which he has not studied before, equivalent to 18 credit hours from the level of 450 chosen depending on his undergraduate field of study from the following table:

Table No. (1-3):

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Lecture</th>
<th>Exercise/lab</th>
<th>Credit Hours</th>
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4. Post-Graduate Diploma Courses

In this study, 18 credit hours must be selected from the level of 500 or above from the following diplomas:

4.1. Diploma in Structure Engineering

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4.2. Diploma in Irrigation, Hydraulic and Water Resources

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4.4. Diploma in Public Works Engineering

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5. Master Degree Courses- First and Second Stage

MASTER'S IN ENGINEERING DEGREE

Based on the suggestion from the academic advisor, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 30 credit hours are requested. In addition, an applied research (6 credit hours) must be done to achieve this degree.

MASTER'S OF SCIENCES (M.Sc.) DEGREE

Based on the suggestion from the supervision Committee, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 18 credit hours are requested. In addition, a scientific thesis (18 credit hours) must be done to achieve this degree.
### 5.1. Structural Engineering

**Table No. (1-8):**

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5.2. Irrigation and Hydraulic Engineering

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5.3. Sanitary and Environmental Engineering

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<td>Public Health</td>
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<td>Industrial Wastes Treatment</td>
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<td>Sanitary Drainage in Isolated Areas</td>
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<td>Environmental Laws and Legislations</td>
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## 5.4. Public Works Engineering

### Table No. (1-11):

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<th>Code No.</th>
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<td>Pavement materials properties and tests</td>
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<td>Embankment Strengthen</td>
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<td>0201645</td>
<td>Computer in Highway Engineering</td>
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6. Ph.D. Degree Courses

After the students pass the comprehensive exam, 18 credit hours (suggested from the supervisory committee) of level 600 or above must be studied. The proper numbers of credit hours in each semester are not less than 6 credit hours per week. In addition, a scientific thesis (30 credit hours) must be done to achieve this degree.
### 6.1. Structural Engineering

**Table No. (1-12):**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Week Hours</th>
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<td>Advanced Soil Mechanics and Foundation</td>
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<td>0201661</td>
<td>Advanced Theory of Structures (2)</td>
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<td>0201662</td>
<td>Advanced Reinforced Concrete (2)</td>
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<td>0201663</td>
<td>Prestressed and Precast concrete</td>
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<td>Advanced Steel Structures and Bridges(2)</td>
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<td>Advanced Properties and Strength of Materials (2)</td>
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<td>0201667</td>
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<td>0201668</td>
<td>Structures Dynamic and Earthquake Engineering</td>
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<td>0201669</td>
<td>Footing on problematic Soil (1)</td>
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<tr>
<td>0201670</td>
<td>Maintenance and Strengthening of Structures</td>
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<td>0201671</td>
<td>High Strength Concrete</td>
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### 6.2. Irrigation and Hydraulic Engineering

#### Table No. (1-13):

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<td>Design of Advanced Irrigation works</td>
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<td>0201673</td>
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<td>Big water structures</td>
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<td>0201676</td>
<td>Advanced Ports and Internal Navigation Engineering</td>
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<td>0201677</td>
<td>Hydraulics Modeling</td>
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<td>Computer Applications in Water Flow Fields</td>
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<td>Ground water (2)</td>
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6.3. Sanitary and Environmental Engineering

Table No. (1-14):

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<td>Drainage Engineering of Industrial Wastes</td>
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<td>Water and Soil Pollution (2)</td>
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<td>Advanced Technology for Water Treatment</td>
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<td>Wastewater Treatment</td>
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<td>Removal and Recovery of Heavy Metals from Water and Wastewater</td>
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### 6.4. Public Works Engineering

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<td>Highways Economics</td>
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<td>Technological Applications of Remote Sensing</td>
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<td>Advanced Railway Engineering</td>
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COURSES DESCRIPTION FOR POSTGRADUATE STUDIES
THE CIVIL ENGINEERING DEPARTMENT
1. Qualification courses

0201401: Mathematics

0201402: Theory of Structures

0201403: Properties and Strength of materials
* Properties, strength and testing of metallic materials:
* Properties, strength and testing of non-metallic materials:
  - Physical, chemical and mechanical properties of concrete aggregate,
  - Physical, chemical and mechanical properties of Cement,
  - Physical, chemical and mechanical properties of Gypsum and Lime,
  - Properties, strength and testing of Wood,
  - Properties, strength and testing of Bricks,
  - Properties, strength and testing of Tiles,
  - Properties, strength and testing of Plastic pipes,
  - Properties, strength and testing of Rocks.

0201404: Design of Concrete Structures

0201405: Design of Steel Structures

0201406: Fluid Mechanics
Fluid flow concepts, incompressible fluids in pipelines, pipe network analysis, pump-pipeline system analysis, gradually varied unsteady flow from
reservoirs, mass oscillations and pressure transients in pipelines, design of open channels (new methods), unsteady flow in open channels.

0201407: Design of Irrigation Structures

0201408 : Soil Mechanics and Geotechnical Engineering (1)

0201409: Plane Surveying
Principals of surveying , Chain surveying and adjustment, Types of map scale, Local and world map indexing, Types of traverses and traverse adjustment, Accurate area determination, Methods of area partitioning and border adjustment, Leveling (normal and accurate), Contour maps, Theodolite (Mechanical, optical and digital theodolites), Observing and computing the horizontal and vertical angles.

0201410: Traffic and Transportation Planning
An introduction to transportation planning- Urban transportation planning- Regional transportation planning- Transportation system alternatives- Characteristics of vehicle, driver, and route- Traffic flow characteristics- Traffic variables relationships- Traffic system control.

0201411: Sanitary and Environmental Engineering
Water Supply - Planning and Design of Water Distribution Systems - Appurtenance of Water Networks - Purification Systems of Surface and Ground Water - Wastewater (Sewerage) System - Planning and Design of Wastewater Systems - Appurtenance of Wastewater Systems - Pumping Stations and Rising Mains - Disposal of Wastewater.

0201412: Highway Engineering
Design element of highway in the longitudinal direction, cross section elements, at grade and separations intersections subgrade and pavement components, highway materials, soil stabilization, design of flexible
2. Preliminary Study Courses

0201425: Mathematics and Advanced Statistics

0201426: Theory of Structures
Normal stresses – Shear stresses – Combined and principal stresses – Deflection of statically determine structures by equation of Three moments – Moving loads – Buckling of columns.

0201427: Properties and Strength of materials

0201428: Hydraulic of open channels
The flow in open channels – Equation used for designing of the cross section of open channels – Specific energy, critical depth and force due to water movement – Gradually varied flow – Shape of water surface profiles.
3. Professional Diploma Studies

0201450: Statistics and Mathematics and numerical Analysis

0201451: Properties and Soil Mechanics

0201452: Properties of materials and new composites
* Properties, strength and testing of metallic materials:
* Properties, strength and testing of non-metallic materials:
  - Physical, chemical and mechanical properties of concrete aggregate,
  - Physical, chemical and mechanical properties of Cement,
  - Physical, chemical and mechanical properties of Gypsum and Lime,
  - Properties, strength and testing of Wood,
  - Properties, strength and testing of Bricks,
  - Properties, strength and testing of Tiles,
  - Properties, strength and testing of Plastic pipes,
* Complex materials which have a reinforced bond material:
  Stresses – Modulus of elasticity – Strength – Coefficient of thermal expansion – Brittle fibers with ductile bond material – Ductile fibers with brittle bond material – Mechanism of fibers with bond material – Effect of direction, type and dimension of fibers on the mechanical properties of a material.

0201453: Theory and analysis of structures
0201454: Computer Application in structures
One dimensional analysis of structures using differential equations – Derivation of stiffness matrices for one dimensional elements using finite element method.

0201455: Reinforced Concrete Structures

0201456: Design of Steel Bridges

0201457: Irrigation and drainage

0201458: Applied Hydraulics
Design of sediment transport pipelines. Pumping stations design and pump intake structures, Forces and stresses in pipes and bends, components in pipe system, valves selection and valve chamber design, thrust blocks design, economics of water resources projects. testing of pipes in laboratory and field. pipe systems optimization. Surge alleviating options, selection of pipe material, Flash floods tributary design.

0201459: Computer Applications in irrigation and hydraulics

**0201460: Remote Sensing**
Principles of remote sensing, Types of sensors in remote sensing, Digital image processing, Image rectification, Geographic Information Systems (GIS), Engineering applications of remote sensing.

**0201461: Astronomical and Geodesy Calculations**

**0201462: Applications of Computer in Surveying Projects**
Features of advanced programming languages. Applications of advanced computer programs in digital map drawing using ground surveying observations, Orientation of photographs for extracting coordinates and map drawing, Satellite image processing and classification for map production, Digital elevation modeling and earth work computations.

**0201463: Planning of Highways and Bridges Networks**
Highway network- Principles of highway centerline location and highway geometric elements- Highway cross-sections and profiles- Planning of highway intersections and interchanges- pavement materials- Design of flexible and rigid pavements.

**0201464: Methods of Pollution Control**
Concept of Environmental Pollution - Harmful Effects of Environmental Pollution - Protective Methods of Environmental Pollution Control - Remedial Methods of Environmental Pollution Control - Alternative Methods Environmental Pollution Control.

**0201465: Water Supply and Sewerage**
Water Supply - Planning and Design of Water Distribution Networks - Appurtenance of Water Networks - Purification Systems of Surface and Ground Water - Wastewater (Sewerage) System - Planning and Design of Wastewater Systems - Appurtenance of Wastewater Systems - Pumping Stations and Rising Mains - Disposal of Wastewater.
0201466: Applications of Computer in highway Engineering
Definition of computer solving software’s such as Civil 3D…etc. Basics of finite elements methods. Planning and design of highway, design criteria such as passing sight distance, stopping sight distance, transition curve and cut and fill volumes.
4. Post-Graduate Diploma Courses

4.1. Structural Engineering Diploma courses

0201501: Advanced Theory of Structures

0201502: Applied of Computer Engineering in numerical Analysis of Structures
Analysis of skeletal structures using equilibrium differential equations – Analysis of structures using stiffness method – Linear and non-linear analysis of structures – Concept of subdivision in analyzing structures.

0201503: Advanced Properties and Strength of Materials
General State of stresses and strains in the three dimensions- Theories of failure of different materials- Thin and thick cylinders- Elastic and plastic buckling of structural members exposed to compressive forces- Strain energy and different methods for calculating elastic deformations- Plastic analysis and theories of plastic failure for constructions- Concrete admixtures- Concrete with fibers- Strength of concrete against fire.

0201504: Soil Mechanics and Geotechnical Engineering (2)
Flow of water in soil – Studying problematic soil – Studying the construction of footing in the field. – Raft foundation – Settlement of soil and Methods of controlling – Studying of expansive and Collapsible soils – Method of soil stabilization

0201505: Advanced Reinforced Concrete
Different methods to design reinforced concrete elements ant its philosophy – General ultimate design of structures and Egyptian code special case – Ultimate design under bending moments, shear forces, torsion, compression and composite forces from these types – Ultimate design for performance of element with respect to cracking and deflection – Yield line theory and design of slabs – Reinforced concrete curved beams – Design of composite structural elements - Miscellaneous subjects.
0201506: Advanced Steel Structures (1)
Analysis and design of steel frames - Erection effects of steel construction
Design of steel - concrete composite structures e- (according to current Egyptian code and use of computer programs for the analysis of steel structural elements)- Strengthening and repair of steel and steel- concrete composite structures.

0201507: Field and Laboratory Tests of Soil
Field and laboratory tests of coarse soil - Field and laboratory tests of fine soil.

0201508: Rehabilitation and Maintenance of Structures
Types of defects of structures and its – Methods of investigation of structures by using new instruments – preparing of rehabilitation report and Rehabilitation, reform and protect materials – Structure and non structure reforms for structures- Different methods for Rehabilitation of reinforced concrete structures

0201509: Footing on the Problematic Soil
Studying of properties and behavior of expansive soil – Studying of properties and behavior of Collapsible soil - Studying of properties and behavior of fragmented soil – Studying of properties and behavior of soft soil.

0201510: Engineering Mathematics

0201511: Management of Works in Building Projects

0201512: Advanced Steel Structures (2)
Analysis and design of space trusses- Analysis and design of curved steel beams- Analysis and design of crane girders - Analysis and design of steel tanks. (according to current Egyptian code- Use of computer programs for the analysis of steel structural elements)
4.2. Irrigation and Hydraulic Diploma courses

0201513: Design of irrigation and drainage system
Planning and design of irrigation and drainage networks in perennial irrigation
- Types of canals: Main canals, Branch canals, Distributary canals
- Types of drainage
- Methods of farm irrigation systems
- The synoptic diagram.
Determine the water level in ditch canals
Determine the water level in drainage networks
Design of typical cross section of water channel, longitudinal section of ditch canals and drains
Design of open and tiles drainage.
Unsteady state and its equations
Sprinkler irrigation system
Comparison between sprinkler and surface irrigation
Sprinkler system components
Planning the system
Sprinkler system design procedure
Irrigation pumping plants
Trickle irrigation system
Advantage of trickle irrigation
Layout and component of a trickle system
Percentage of wetted area
Trickle irrigation duty.

0201514: Hydrology of surface water
Introduction, hydrologic cycle, precipitation, water losses, run off, travel time, time of concentration and lag, flood hydrographs and unit hydrograph, discharge measurements and rating curves construction, flood routing in rivers and channels.

0201515: Sediment Transport
Scour and erosion in open channel, theories of forces affecting sediment transport, shear stresses and velocities law in open channels, stable channel design, rate of sediment transport, ripples and dunes. reservoirs sedimentation and method of rehabilitation.

0201516: Advanced Soil Mechanics
General fundamentals to theory of soil bearing capacity
Types of soil causes roads problems
Methods of fixation of road beds
Improvement of of soil properties by using industrial materials in soil fixation.

0201517: Hydro-systems Engineering and Management
Economics of hydrosystems, linear programming with applications to hydrosystems, uncertainty and reliability analysis of hydrosystems, water demand forecasting, surface water system simulation, water distribution system optimization.
0201518: Advanced Hydraulics
Fluid flow concepts, incompressible fluids in pipelines, pipe network analysis, pump-pipeline system analysis, gradually varied unsteady flow from reservoirs, mass oscillations and pressure transients in pipelines, design of open channels (new methods), unsteady flow in open channels, sediment transport in pipelines.

0201519: Hydraulic Measurements
Evaporation measurements in laboratory and fields, velocity measurements in closed and open channels, discharge measurements in closed and open channels, pressures measurements through flow, rainfall measurements, infiltration measurements, error estimation in measurements and apparatus calibration, telemetry systems, remote sensing, monitoring networks, quality control and quality assurance.

0201520: Computer applications on groundwater movement

0201521: Design of Special Irrigation Structures

0201522: Reclamation of salty soils
Drainage investigations and Reclamation of salt soils - Study of topography of reclamation project- study of soils physical properties –Study of water sources – Study the problems of drainages – Observation wells - Study of sources of salinity in soil ,kinds and its distribution in soils. –Salts and its impacts on soil water quality . –Chemistry of salty soils and distribution. – Movement of salts in soils - Water requirements for leaching salty soils -
Standards for irrigation waters. –Irrigation water quality , and leaching efficiency.

0201523: Hydraulics Modeling
Dimensional analysis and similarity, scale effects in models, distorted and undistorted models, fixed bed and movable bed models, closed conduit models, models of hydraulic structures, model materials and construction, mathematical and numerical models.
4.3. Sanitary and Environmental Engineering Diploma courses

0201524: Advanced Water Supply Engineering

0201525: Plumbing Engineering

0201526: Water and Soil Pollution (1)
Importance and Properties of Water - Role of Water in Protection of Environmental Equilibrium - Pollution Sources of Surface and Ground Water - Determination of Pollution Status in a Water Stream - Legislations of Protection of Water Bodies from Pollution - Self-Purification of Water Streams - Soil Pollution Concept - Sources of Soil pollution - Harmful Effects due to Soil Pollution.

0201527: Air Pollution and Noise (1)
Importance of Air - Composition of Air (Atmosphere). Air Pollution - Some Harmful Effects and Impacts of Air Pollution - Control of Air pollution - Definition of Noise - Noise Pollution Impacts - Sources and Types of Noise pollution - Harmful Effects of Noise Pollution - Methods of Noise Pollution Control.

0201528: Wastewater Supply Engineering

0201529: Methods of Hazardous Wastes Removal
Classification, Characteristics and Sources of Hazardous Wastes - Transportation of Hazardous Wastes - Chemical, Physical and Biological - Treatment of Hazardous Wastes - Thermal Treatment of Hazardous Wastes -

**0201530: Sanitation Chemistry and Microbiology (1)**
Chemical Elements and Compounds - Chemical Analysis of Water - Chemical Equilibrium - Chemical Reaction Rates – Alkalinity – Coagulation - Bacteria, Parasites, Virus and Algae - Water borne Diseases - Biological Examinations of Drinking Water - Chemical Examinations of Wastewater Water.

**0201531: Environmental Pollution Control (1)**
Definition of Environment - Legislations of Environmental Protection of Water Bodies from Pollution - Legislations of Protection of Environment and Air from Pollution - Legislations of Protection of Industrial Environment from Pollution - Legislations of Environmental Protection from Radiological and Thermal Pollution.

**0201532: Food Pollution**
Importance of Food for Human - Importance of Water for Human. Food Pollution - Biological Pollution of Food ( Bacteria- Parasites – Fungi) - Chemical Pollution of Food ( Reserving Materials – Pesticides – Detergents – Coloring and Flavor Materials – Heavy Metals) - Radiological Pollution of Food - Soil Pollution - Factors Affecting Food Pollution ( Heat – Humidity – Backing – Storage – Transportation – Cleaning – Mishandling and Errors ) - Diseases from Food and Water - Methods of Food Preservation and Protection ( Cooling and Freezing – Sterilization – Drying – Salting – Sweetening – Addition of Reserving Agents ..) - Criteria of Food Preparing and Food Delivery Facilities - House Sanitation Criteria. Treatment and Standards of Safe Water - Legislations and Standards Related to Study.

**0201533: Chemical Analysis of Water and Wastewater**
Impurities and Pollutants of Water - Sampling of Water - Physical Analysis - Chemical Analysis - Biological Analysis.

**0201534: Construction of Utilities**
Field Studies and Preparing for Construction - Cutting and Foundation Works - Transportation, Storage and Arrangement of Pipes and Their Accessories - Washing and Disinfection of Drinking Water Pipelines - Construction Criteria of Pipelines.
0201535: **Computer Applications on Sanitary Engineering**

0201536: **Environmental Regulations and Legislations**
4.4. Public Works Engineering Diploma courses

0201537: Astronomical observances (1)

0201538: Maps Projection (1)
Types of map projections – Representation - Coordinate systems and lines of special properties – General equations of transformation.

0201539: Advanced Photogrammetry
Principle of photogrammetry, Applications of modern cameras in photogrammetry, Applications of photogrammetry in: architecture, historical structures, civil engineering projects such as design and planning for high ways and new cites.

0201540: Remote Sensing
Electromagnetic radiation at the earth’s surface, Sources and types of electromagnetic energy used in remote sensing, Different systems of remote sensing, Types and applications of earth resources satellites. Image processing and methods of extracting information for different applications, New trends in remote sensing.

0201541: Geographic Information Systems (GIS)
Definition and components of GIS, Methods of representing geographic features in GIS, Steps of forming a GIS, Methods of digital data organization in GIS, Methods of data analysis in GIS, Applications of GIS, Accuracy requirements and methods of accuracy testing in GIS, Choosing a GIS, Future applications of GIS.

0201542: Observation adjustment and applied statistics
Meaning of accuracy and adjusting of surveying observations. Adjusting of level net according to least squares – least squares for triangulation adjusting. least squares for adjusting trilateration statistical analysis for surveying measurements.
0201543: Advanced Transportation Planning and Traffic Engineering
An introduction to transportation systems- Definitions- Transportation problems and planning needs- Engineering characteristics of transportation systems- level of service- Elements of transportations and traffic schemes- Strategic planning.

0201544: Highways Geometric and Structural Design (1)
Highway geometric design elements: stopping sight distance and passing sight distance. Horizontal alignments, vertical alignments, highway cross-section elements and their characteristics, design of highway intersections and interchanges. Pavement types, principles of highway structural design, theories in stress analysis in flexible and rigid pavements, equivalent load calculations, pavement layers characteristics, principles and theories of pavement design, pavement construction methods, pavement materials evaluations and tests.

0201545: Asphalt Concrete Mixtures
Introduction-Types, properties and importance of additives in bituminous mixtures-Mixing proportion and conditions of additives in asphalt concrete mixes-Performance of improved asphalt concrete mixes-Evaluation of asphalt concrete mixes with additives results.

0201546: Materials and Equipments for Roads Construction
Definition for materials, which may be used in pavement layers in highways and airports and their properties-Methods and technology of construction–Equipment types are used in construction and their characteristics-Rates of working-Evaluation basis for the costs using- Requirements for equipments maintenance and its effect on workability.

0201547: Traffic Safety

0201548: Airports Engineering
An introduction, principles of airports planning, aircrafts characteristics and effects on airport planning and design, principles of geometric and structural design of airfield strips and aprons (runways and taxiways), Parking facilities, airport and land transportation services connections, stresses analysis theories, pavement thickness calculations.
0201549: Railway Engineering
An introduction, principles of railway planning, principles of geometric and structural design of railway, stresses analysis theories, track thickness calculations, planning and design of railway stations, operation systems.

0201550: Management of Road maintenance
An Introduction, collection data about highway networks, Data analysis, maintenance time table, Types of Defects pavement flexible asphalt, Types of Defects pavement rigid pavement, Flexible and rigid pavement maintenance.
5. Master Courses

5.1. Structural Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>0201604</td>
<td>Advanced Steel Structures and Bridges(1)</td>
<td>One dimensional finite element, truss element - Two dimensional finite element, beam element, plate element - Frame analysis using finite element method - Stability of steel columns and frames using finite element method - Stability of steel plate using finite element - Analysis of box girder bridges, design of steel-concrete composite girders and columns (Use of computer programs for the analysis of steel structural elements)</td>
</tr>
</tbody>
</table>
0201605: Advanced Engineering Mathematics (1)

0201606: Quality Control of Structures
- Quality control and requirements for the safety of reinforced concrete components and elements which include: States of quality control, Observation works and controlling.
- Limits and modulus of concrete quality control and requirements for carrying out reinforced concrete works: Limits and modulus of concrete quality control, Conditions and requirements for reinforced concrete works.
- Tests for the quality control of R.C. in the field: Field tests on the hardened concrete, methods of testing surface hardness of concrete, Ultrasonic tests on concrete, Core tests for concrete, Specific tests on reinforced concrete, Methods of measuring deformations and strains, Loading tests for reinforced concrete structures, Chemical tests on the hardened concrete and suitable and technical system for them.

0201607: Applied of Computer in Soil Mechanics
Dynamic of structures and footings – Methods of obtained of flexible and Rigid footing under static and dynamic loads effect – Spread of waves and separation of vibrations to the footings - Applied of computer in numerical analysis for the flexible and rigid footings and different loads.

0201608: Analysis of Structures Stability

0201609: New Materials and Rehabilitation of Structures
New materials used for protection and curing of constructions: Principles of selection, description and classification of materials used in protecting and curing of constructions, Classification of the used materials in the curing and maintenance of structural elements, Observation and limitation of the destructive constructions,
- Different technical methods used in the reinforcing and curing of constructions.
- Design and limitation of requirements used in curing and reinforcing the destructive structural members,
- Experimental applications including the following:
  * Curing and reinforcing the R.C. elements exposed to seismic forces,
* Analysis of R.C. constructions exposed to seismic forces,
* Calculation of the internal loads resulted from the seismic forces,
* Design of constructions resisting seismic forces,
* Egyptian Code for the design of constructions resisting seismic forces.

0201610: Defects and Cracking of Structures
Types of defects of structures – Causes of defects of structures and its failure –
Diagnoses of causes of cracking and evaluation of structures safety –
Protection of concrete structures – Concrete subjected to fire and necessary
precaution against fire when design concrete structures.

0201611: Composite materials in concrete structures
Load and stress- composite materials – mechanical behaviors and fabrication
process of composite materials - know constituent materials and properties
(resins and fibers) - design of composite section using fiber reinforced
polymer composite material- Analysis and design of strengthened reinforced
concrete beams and columns- Apply applications to building structures and
highway and railway bridges- Testing of FRP –strengthened structures

0201612: Prestressed Concrete
General concepts and methods of prestress – Losses in pre-stressed: elastic
failure of concrete, shrinkage, creep, yielding of steel, tied ends and friction –
Analysis and design of sections: stresses, cracking moment, maximum
moment, composite sections –
5.2. Irrigation and Hydraulic Engineering

0201613: Irrigation and drainage engineering process

0201614: Advanced Hydraulics (1)
Design of open channels (new methods), design of pipes networks, gradually varied unsteady flow from reservoirs, spatially varied flow in open channels, computational hydraulics, water quality modeling, soil water losses estimation, hydraulics properties of unsaturated soil, special topics in hydraulics.

0201615: Advanced Hydrology (1)
Introduction, hydrologic cycle, precipitation, water losses, run off, travel time, time of concentration and lag, flood hydrographs and unit hydrograph, discharge measurements and rating curves construction, flood routing in rivers and channels.

0201616: Underground Water Hydrology
Scope – Advantage and disadvantage of groundwater storage – Type of aquifers. - Groundwater exploration - Groundwater storage and supply, and water level fluctuations - Flow in confined and unconfined aquifers with no vertical accretion and with vertical accretion - Soil permeability measurement: Laboratory and field determination of hydraulic conductivity, Porosity, Storage coefficient, Specific yield.

0201617: Hydraulic Measurements Technology
Evaporation measurements in laboratory and fields, velocity measurements in closed and open channels, discharge measurements in closed and open channels, pressures measurements through flow, rainfall measurements, infiltration measurements, error estimation in measurements and apparatus calibration, telemetry systems, remote sensing, monitoring networks, quality control and quality assurance.
0201618: Soil-water-plant relationships

0201619: Hydraulics of Sediment Transport
Introduction, threshold of sediment transport, bed load and suspended load transport—suspended load distribution—bed forms (ripples and dunes)—experimental approach for sediment transport—reservoir sedimentation and method of rehabilitation.

0201620: Environmental Evaluation of Water Structures
Definitions and Expressions—Quality of water and its effects on environmental—Elements of water validity (physicals, chemicals and microbiological)—Sources and causes of water pollutions of surface water—Effect of pollutions on water components, plants, soil, animals and fishes—environmental effect on water structures on levels and depth of water, stream bed, suspended load, ground water, management of river sources and its discharge—waves on lack of storage structures and effect of water structures on biological system.

0201621: Pre-investigations of drainage and salt land reclamation projects
Studies of topography of land and soils of project area—study of drainage problems—observation wells—sources of salts formation in soils—types of salt and its distributions in soils—soils including dissolved and Indisolved salts—effect of soil with types of salts and their distribution—salt concentration water requirements for washing desalination soils—specifications of irrigation water and its quality—washing efficiency.
### 5.3. Sanitary and Environmental Engineering

**0201622: Advanced Study in Sanitary and Environmental Engineering (1)**
Examination of Water Quality and Safety - Drinking Water Standards - Design Methods of Water Distribution Networks - Appurtenance of Water Distribution Networks - Surface Water Treatment - Ground Water Treatment.

**0201623: Advanced Water Supply Engineering**

**0201624: Sanitation Chemistry and Microbiology (2)**
Chemical Elements and Compounds - Chemical Analysis of Water and Wastewater - Chemicals used in Water and Wastewater ( Coagulants) - Disinfecting Materials in Water Treatment - Ion Exchange - Reverse Osmosis - Biological Examinations of Drinking Water - Bacteria, Parasites, Virus and Algae.

**0201625: Solid Wastes**

**0201626: Waste Stabilization Ponds**
Introduction - wastewater treatment in WSPs - WSPs usage in north Africa - process design of WSPs - physical design of WSPs - operation and maintenance - monitoring and evaluation - rehabilitation and upgrading - wastewater treatment and storage reservoirs - effluent reuse.

**0201627: Computer in Sanitary Engineering**

**0201628: Public Health**
Sanitary Engineer - Impurities and Pollutants and Disease - Environmental Pollution and Its Effect on Public Health - Influence of Water and Wastewater
Projects on Environment - Legislations of Environmental Protection - Water Pollution - Air Pollution - Solid and Hazardous Wastes.

0201629: Industrial Wastes Treatment
Process and Methods of Wastewater Treatment (Physical Treatment – Biological Treatment - Chemical Treatment).
Treatment Using Oxidation Ponds.
Treatment Method of Industrial Wastes (Processes of Solid / Liquid Separation – Liquid Treatment after Separation of Most Solids. – Sludge (Solids) Treatment after Separation from Liquids.

0201630: Sanitary Drainage in Isolated Areas
Small Communities (Villages – Tourist Communities and Villages – Agricultural Communities – Camps) - Sources of Wastewaters - Wastewater Quantities and Characteristics - Purpose of Wastewater Treatment.
Treatment Methods (Physical Methods – Chemical Methods – Biological Methods) - Treatment in Zones of Non-Public Sewerage Systems (Septic Tanks – Imhoff Tanks – Collection Tanks – Drainage Trenches – Seepage Pits – Underground Drainage Pipes) - Treatment Stages of Wastewater - Preliminary Treatment (Screens – Grit Removal Chambers – Grease Removal Tanks) - Primary Treatment (Preliminary Treatment - Primary Sedimentation)
- Biological Treatment – Activated Sludge Methods (Aeration Tanks – Extended Aeration – Oxidation Ditches) - Biological Filter and Biological Contactors- Natural and Aerated Ponds – Land Treatment with Simplified Methods - Disposal and Reuse of Wastewater - Standards, Legislations and Codes related to Study.

0201631: Environmental Laws and Legislations
Protection of the River Nile and Water Bodies - Standards of Wastewater Disposal - Ponds and Swamps Removal - Regulation of Public Water Resources for Drinking and Domestic Use.
5.4. Public Works Engineering

0201632: Scientific Applications in Traffic Engineering
An Introduction- Mathematical models in traffic engineering- Collection and analysis of traffic data- Evaluation of analysis results- Evaluation of network analysis.

0201633: Transportation and Traffic Engineering Surveys

0201634: Transportation Economics
An introduction- cost/benefit analysis for transportation projects- Cost elements of transportation projects- Benefits elements of transportation projects- Risks and uncertainties in transportation projects- New directions for transportation projects funding.

0201635: Mathematical Models in Transportation and Traffic Engineering

0201636: Pavement Materials Properties and Tests
Basic characteristics of subgrade- Interested tests for highway engineering should be conducted for subgrade soil in both laboratory and field- Properties of gravelly soil used in base and subbase layers, which should be studied. Main tests should be performed on gravelly soil used in base and subbase layers of highways- Properties of mineral aggregates used in asphalt mixes- Mixture aggregates- Bitumen- Main tests for different types of asphalt.

0201637: Railways Embankments
Railway cross-section elements- Stresses analysis and design of rails- Stresses in sleepers and sleepers design- Modeling of railway cross-section using finite element analysis- Embankments support methods.

0201638: Geographic Information Systems (GIS)
Principle definitions, Definition and components of GIS, Methods of representing geographic features in GIS, Data organization in GIS, Applications of GIS.
0201639: Applications of Computer in Surveying Projects
Features of advanced programming languages. Applications of advanced computer programs in digital map drawing using ground surveying observations, Orientation of photographs for extracting coordinates and map drawing, Satellite image processing and classification for map production, Digital elevation modeling and earth work computations.

0201640: Advanced Geodesy (1)
Theory of probability and its application on the evaluation of observations – Analysis and evaluation of surveying and geodetic observations – Methods of adjusting observations and computing the condition equations – Solution of condition equations using matrices – General methods for adjusting observations – Error elapse.

0201641: Close Range Photogrammetry
Techniques of photogrammetry and its applications, Types of cameras used in close range photogrammetry, Control points for close range photogrammetry, Determination of object coordinates in close range photogrammetry, Engineering and architectural application of close range photogrammetry, New trends in close range photogrammetry.

0201642: Advanced Descriptive Geometry

0201643: Projective Geometry

0201644: Embankment Strengthen
0201645: Computer in Highway Engineering

Definition of computer solving software’s such as PLAXIS, ANSYS…etc. Basics of finite finite elements methods - Different types of load criteria such as Mohr Column, Drger Prager, Plasticity, analysis of Stability of slopes.
## 6. Ph.D. Courses

### 6.1. Structural Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0201663</td>
<td><strong>Prestressed and Precast Concrete</strong></td>
<td>Precast and prestressed concrete sections considering Analysis and design of sections: stresses, cracking moment, maximum moment, composite sections – Shear, bearing and bond stresses – deflection and curvature – Continuous beams – Special precast structural joints – Special structures (precast bridges).</td>
</tr>
<tr>
<td>0201664</td>
<td><strong>Advanced Steel Structures and Bridges (2)</strong></td>
<td>Dynamic and seismic analysis of steel structures -Ultimate strength and plastic design of steel structures – Nonlinear structural analysis – Analysis and design of steel tunnels with soil interaction – Analysis and design of cable stayed bridges- Use of computer programs for the analysis of steel structural elements</td>
</tr>
</tbody>
</table>
0201666: Advanced Engineering Mathematics (2)
Pesal and Legandre series – Perpendicular series – Integration transformation – complex series – Application on structural engineering (Plates, Shells, Beams, Suspended bridges, elastic and non elastic fields.

0201667: Computer Applications in Structural Design

0201668: Structures Dynamics and Earthquake Engineering
Introduction – Analysis of structures under dynamic loads – Earthquake loads – Seismic design of R.C. structures – Egyptian code for seismic design of R.C building – Bridges and tunnels – Numerical methods and computer application.

0201669: Footing on Problematic Soil (1)

0201670: Maintenance and Strengthening of Structures
- Types of new materials: Plastic plates reinforced with carbon fibers, Plastic plates reinforced with steel fibers, Plastic plates reinforced with glassy fibers,
- Methods of maintenance and reinforcing constructions by using new complex materials:
  * Reinforcing construction exposed to bending,
  * Reinforcing construction exposed to shear.

0201671: High Strength Concrete
6.2. Irrigation and Hydraulic Engineering

0201672: Design of Advanced Irrigation works

0201673: Advanced Hydraulics (2)
Boundary layer theories and their application drag and lift, hydrodynamics and flow of ideal fluids, flow of viscous fluids, unsteady flow in pipes and open channel, soil water hydraulics, pollutions movements through unsaturated soils.

0201674: Advanced Hydrology (2)
Run off hydraulics, travel time, time of concentration and lag, flood routing through reservoirs and rivers, probability application in hydrology, reservoirs design and management, flash floods estimation.

0201675: Big Water Structures
Elevation and drainage Station – Dams – Big spailes – Scours and sedimentation – protection of water structures – Methods of controlling of performance of structural water works and their maintenance.

0201676: Advanced Ports and Internal Navigation Engineering
Design of navigation canals cross sections, rivers and increasing its navigational efficiency, navigation locks, platforms and perthing, ports planning and wave breaking, natural phenomena: tide, wind and sea currents.

0201677: Hydraulics Modeling
Dimensional analysis and similarity, scale effects in models, distorted and undistorted models, fixed bed and movable bed models, closed conduit models, models of hydraulic structures, models materials and construction, mathematical and numerical models.

0201678: Computer Applications in Water Flow Fields
Introduction for the software used to solve the problems such as Excel, Matlab and Fortran- Fundamentals of finite element and finite difference methods- Numerical solutions of the differential equations and some applications on
water resources such as unsteady flow on open channels- Applications of rib networks on the field of hydraulics and irrigation.

0201679: Management and Economics of Water Sources
Distribution and control of water resources – Regular calibration and review present canals cross-sections – Control of water duties – Minimizing of water losses in irrigation network – Farm water management – Irrigation modernization.

0201680: Ground water (2)
Scope - Control of sea water intrusion - Flow in confined and unconfined aquifers with no vertical accretion and with vertical accretion - Groundwater geology investigation - Water level of groundwater fluctuations - Unsteady groundwater hydraulics - Groundwater exploration (Desk study- Field study) - Classification of subsurface water – Groundwater quality investigation – Source of groundwater pollution (agricultural water practices - pollution from sanitary drainage – pollution from industrial practices) - Confined flow to a well – Unconfined flow to a well – Well field design – Interference of wells – Well design – In site measurement of hydraulic coefficient – Well construction.
6.3. Sanitary and Environmental Engineering

0201681: Advanced Study in Sanitary and Environmental Engineering (2)
Sources of Wastewater - Methods of Wastewater Disposal - Design Criteria of Wastewater Works - Characteristics of Wastewater - Primary Treatment of Wastewater - Secondary Treatment of Wastewater - Tertiary Treatment of Wastewater.

0201682: Drainage Engineering of Industrial Wastes
Water Consumption in Industry - Characteristics of Industrial Wastewaters and Wastes - Types of Wastes and Their Sources - Disposal Standards in Water Bodies - Common Steps of Wastewater Treatment - Laws and Legislations for Environmental Protection and Water Pollution.

0201683: Air Pollution and Noise (2)
Components of Atmosphere - Air Pollution - Sources of Air Pollution - Particulates and Gases - Greenhouse Effect - Ozone Hole - Self - Purification of Air - Methods of air Pollution Control - Sources of Noise pollution - Safe Limit of Noise - Environmental Protection Legislations for noise Pollution.

0201684: Water and Soil Pollution (2)
Sources of Water Pollution - Oil Pollution of Water - Water Pollution with Liquid and Solid Wastes - Thermal Pollution of Water - Water Pollution with Pesticides and Synthetic Detergents - Water Pollution with Agricultural Fertilizers - Acid Rain - Water Pollution Control Methods - Soil Pollution due to Air and Water Pollution - Effects of Soil Pollution on Food Pollution - Methods of Soil Pollution Control.

0201685: Environmental Pollution Control (2)
Definition and Control of Environmental Pollution - Legislations of Environmental Protection from Diseases and Epidemics - Legislations of Environmental Protection from Food Pollution - Legislations of Environmental Protection from Pollution with Pesticides and Fertilizers.

0201686: Advanced Technology for Water Treatment
0201687: Wastewater Treatment
Characteristics of Wastewater - Standards of Wastewater that used in Irrigation - Laws of Protection of the River Nile and its Branches from Pollution - Secondary Treatment of Wastewater - Treatment Using Oxidation Ponds.

0201688: Computer Applications in Sanitary Engineering:
Optimal design of drinking water networks (WDNs) using computer - trace chemical changes in water as it travels in WDNs using computer – design and solution of sewerage networks by computer - different applications of computer in the field of Sanitary Engineering.

0201689: Removal and Recovery of Heavy Metals from Water and Wastewater
Definition of Heavy Metals - Role of Heavy Metals in Environmental Pollution - Harmful Effects of Heavy Metals on Public Health - Methods of Heavy Metals Measurement in Water and Wastewater - Processes of Heavy Metal Removal from Water and Wastewater.
6.4. Public Works Engineering

0201690: Planning and Operation of Public Transportation
An introduction- Classification of public transportation- New in public transportation technology- Planning of urban public transportation (bus-light rail)- operation of urban public transportation (bus-light rail).

0201691: Highways Geometric and Structural Design (2)
Geometric design control and criteria- Horizontal and vertical alignments- Intersections types and needs- Interchanges types and needs- Highways flexible pavement design- Highways rigid pavement design.

0201692: Highways Economics
An introduction- Economic analysis for costs and highway outcomes- Elements of highway construction and maintenance cost- Elements of highway transportation outcomes- Risks and uncleanness in highway projects- New approaches for highway projects financial managements.

0201693: Computer Applications in Transportation and Traffic Engineering
In transportation planning: Data saving, presenting and analysis- Travel demand models calibration - Use of travel demand models- Data analysis and evaluation- New applications.
In traffic engineering: Data saving, presenting and analysis- Use of programs in traffic signals and control- Network simulation- New applications.

0201694: Advanced Airports Engineering
Aircrafts characteristics and effects on airport planning- Air traffic control- Elements of airport planning- Runway geometric planning- Airport area geometric planning and design- Airport pavement design- Marking signs- Navigation aids and lightening- Airport drainage study.

0201695: Satellites Geodesy
Satellite orbits dynamics. The normal and tilted orbit- Geometry of satellite observations – satellite observations equations- analysis of the satellites data – Global system for determining the co-ordinates of the place – The main technical steps of GPs- The GPS receivers and observing.

0201696: Technological Applications of Remote Sensing
- Electromagnetic radiation of the earth s surface
- Types and sources of electromagnetic energy used in remote sensing
- Remote sensing systems
- Types and applications of the earth resources satellites
- Image processing and extraction of information from satellite images for different applications
- Application of remote sensing for mapping, planning and environmental studies
- Recent developments in remote sensing

0201697: Advanced geodesy(2)
Error propagation in case of correlated and in correlated measurements. Least squares techniques for adjusting surveying and geodetic observations., Adjusting triangulation and trilateration net work station - Using matrices - programming of condition equations for finding adjusted values- Error ellipse in three dimensions. The shape of earth - An approach to GPS.

0201698: Maps Projection (2)
Distortions theory – Conformal projections – Equal area projections – equal distance projection – Applications to cylindrical, Conical and Azimuthal projections.

0201699: Astronomical Observations (2)
The astronomical coordinates and solving spherical triangle- Astronomical instruments properties- correction of astronomical observations- value of longitudes convergence- Methods for estimation of longitudes , latitudes, types of time and its relation with longitudes and longitude of place.

0201700: Advanced Photogrammetry
- Systems of photogrammetry
- Mathematical concepts in photogrametry
- Orientation and triangulation
- Adjustment with additional parameters
- Digital photogrammetry
- Recent developments in photogrammetry

0201701: Planning of Railways and Branches
Elements of railway track- Horizontal curves- Vertical curves- Transition curves and super elevations- Horizontal and vertical curves locations- Different types of branches- Design of different types of branches- Locating of curves and branches.
0201702: Railway Operation
Mechanic and electronic signals in railways- Signals in railways- Selecting of block location and calculating its dimensions- Operating of single and dual line in railway- Mechanical connections of signals- Electronic signals.

0201703: Differential Engineering

0201704: Application of Computer In Engineering Drawing Works
Study of 2D and 3D Drawing programs - Writing and static analysis programs.

0201706: Advanced Railway Engineering
Train Time trip, geometric and structural design of railway, stresses analysis theories, track thickness calculations, planning and design of railway stations, operation systems.
MECHANICAL ENGINEERING DEPARTMENT
TABLES FOR POSTGRADUATE STUDIES COURSES OF
THE MECHANICAL ENGINEERING DEPARTMENT
1. Qualifying and Preliminary Study Courses

a) **Courses for Qualifying Studies:**
Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Mechanical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 15 credit hours from the level of 400 chosen depending on his scientific and professional background from the following table:

b) **Courses for Preliminary Studies:**
Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Mechanical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 12 credit hours from the level of 400 or above chosen depending on his scientific and professional background from the following table:
Table (2-1):

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<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
<th>Hours/Week</th>
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<td>0202401</td>
<td>Production Engineering</td>
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<td>3</td>
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<tr>
<td>0202402</td>
<td>Mechanics of Machinery</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<td>0202403</td>
<td>Stress Analysis</td>
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<td>Thermodynamics</td>
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<td>Machine Design (1)</td>
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<td>0202406</td>
<td>Fluid Mechanics</td>
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<td>0202407</td>
<td>Heat Transfer</td>
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<tr>
<td>0202408</td>
<td>Theory of Metal Cutting and Applications</td>
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2. Professional Diploma Studies

Include a group of courses for Engineering graduate students. The student studies a number of courses, which he has not studied before, equivalent to 18 credit hours from the level of 450 chosen depending on his undergraduate field of study from the following table:

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3- Postgraduate Diploma Courses

In this study, 18 credit hours must be selected from the level of 500 or above from the following diplomas:

3-1 Diploma in Computer Aided Design and Manufacturing

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3-2 Diploma in Power Plants

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### 3-3 Diploma in Refrigeration and Air-conditioning

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### 3-5 Diploma in Turbo-machines and Pipe Networks

Table (2-7):

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### 3-6 Diploma Mechatronics Engineering

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## 3-7 Diploma in Welding and Casting

Table (2-9):

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4- Courses for Master and Ph.D. degrees

The supervisor(s) suggests a number of courses from the following tables that are suitable for the chosen field of specialization of the student, the number of these courses should be equivalent to:

a) MASTER'S IN ENGINEERING DEGREE
The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 30 credit hours are requested. In addition, an applied research (6 credit hours) must be done to achieve this degree.

b) MASTER'S OF SCIENCES (M.Sc.) DEGREE
The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 18 credit hours are requested. In addition, a scientific thesis (18 credit hours) must be done to achieve this degree.

c) PH.D. DEGREE COURSES
After the students pass the comprehensive exam, 18 credit hours of level 600 or above must be studied. The proper numbers of credit hours in each semester are not less than 6 credit hours per week. In addition, a scientific thesis (30 credit hours) must be done to achieve this degree.
4-1 Design and Production Engineering

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### 4-2 Mechanical Power Engineering

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# 4-3 Mechatronics Engineering

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COURSES DESCRIPTION FOR POSTGRADUATE STUDIES
THE MECHANICAL ENGINEERING DEPARTMENT
1- Qualifying and Preliminary Studies Courses

0202401: Production Engineering
Basic Production Engineering (engineering materials, casting, metal forming, Joining of metals) - Metal cutting and Machining – Basic cutting tools and machines (lathes, shapers and planer, drilling, milling and grinding) - Measuring processes and quality control.

0202402: Mechanics of Machinery

**Prerequisites:** Mathematics (M101), Mechanics (Math 002), Physics (Phys 001), Stress Analysis (MD122), Engineering Analysis 2 (MP221)
Mechanisms – Speed Governor – Cams – Gear Trains – Flywheels Balancing of Rotating and Reciprocating Masses.

0202403: Stress Analysis

**Prerequisites:** Mathematics (M101), Mechanics (Math 002), Physics (Phys 001), Stress Analysis (MD122), Engineering Analysis 2 (MP221)
Loads and reactions (types of loads, types of supports) - Classification of beams – Axial Loads, Stress-Strain relationship, Poisson’s ratio - Shear stress and Factor of safety - Stresses caused by temperature – Torsion and Torque diagram - The torsion formula, Angle of twist of circular members – Shearing force and bending moment diagram Method of sections - Sign convention for shearing force and bending moment - Relation between shear force and bending moment - Bending of compound beams – Shear stresses in beams, the shear stress formula, Shear flow. Complex stresses and strains - Stresses on an inclined plane - Principal stresses, Maximum shear stress - Mohr’s circle of stress, Design of shaft - Stress and strain relationships - Relation between the elastic constants - Strains in an inclined plane - Mohr’s circle of strain- stress gauges – Deflection of beams Relations between shear force, bending moment, slope and deflection - Direct integration method - Maculoy’s method for deflection - Moment area method- The theorem of Castigliano - The three-moment equation for continuous beams.

0202404: Thermodynamics

**Prerequisites:** Mathematics (M101).
Heat and work – The first law of thermodynamics and its applications to the control mass and control volume - The second law of Thermodynamics and its applications to the control mass - Carnot Cycle – Entropy - Applications of the Second Law of Thermodynamics to the control Volume – Ideal gases –
Introduction on the reciprocating compressors – Simple steam, refrigeration, and Gas Cycles. Chemical reactions and combustion – Applications of the first and second Laws of thermodynamics on chemical reactions.

0202405: Machine Design (1)

Prerequisites: Machine Drawing and Construction, Stress Analysis


0202406: Fluid Mechanics

Prerequisites: Mathematics - Physics


0202407: Heat Transfer


0202408: Theory of Metal Cutting and Applications

Machine tools and machining operations (engine lathe, shapers, planners, machines using multi point tools, drilling, milling, broaching. machines using abrasives: Grinding machines) – Mechanics of metal cutting (chip formation process, forces acting on cutting tools, shear angle relationships, friction in metal cutting, temperatures in cutting zones) – Tool life and tool wear (crater wear, flank wear, tool life criteria) - Cutting tool materials – Machineability
evaluation – Mechanics of milling processes (horizontal milling, vertical milling, cutting forces in milling) – Nomenclatures of cutting tools – Tool in hand angles – Tool in use angles – Non-Conventional machining processes (abrasive jet machining, electric discharge machining, laser cutting, electrochemical machining) – Economics of metal machining (terms of machining costs, optimum cutting speeds for-minimum costs, maximum profit, maximum production rate) – Dynamometer design (lathe dynamometer, milling and drilling dynamometers, grinding dynamometer) – Laboratory experiments.

0202409 : Theory of Metal Forming and Applications
Stress and strain macroscopic plasticity and yield criteria – Work hardening – Plastic instability – Ideal work or uniform energy – Slab analysis, Force-balance deformation - Zone geometry – Formability – Bending plastic anisotropy – Cupping - redrawing and ironing – Complex stamping – Sheet metal properties.

0202410 : Mechanical Vibrations

0202411: Refrigeration and Air Conditioning

0202412: Internal Combustion Engines (1)
Prerequisites: Thermodynamics (2)- (MP 321), Fluid Mechanics (2)-(MP322)
0202413: Robotics
Basics of robotics - Analysis and design of robotic systems including arms and vehicles – Kinematics, Inverse Kinematics and Dynamics of robots (stationery and mobile robots) - Algorithms for describing, planning and commanding, robotic control systems – Constraints affecting motion of robots - Position, speed and force control of robot Grippers - Examples on various practical applications of robots.

0202414: Automatic Control (1)

0202415: Tractors and Farm Machinery
Classification of tractors according to their use and methods of tractions - Theory of traction - mechanics of traction and motion on unprepared soils - Design of tractor chassis and means of motion transfer - Performance of tractors - Factors that are considered in tractor design - Tractor maintenance - Characteristics of farm machinery - Types of farm machinery and farm capacity - Machinery for land preparations for cultivation - Machinery for land preparation for plant seeds - Planting machinery - Servicing machinery - Pesticide and insecticide - Harvesting machinery.

0202416: Engineering Processing of Agricultural Crops

0202417: Quality Control Systems
0202418: Measurement Instruments and Calibration


Static and dynamic characterization of the measuring instruments – transducers – pressure, flow, head, and temperature sensors – linear and angular displacement sensors – velocity sensors – strain gauge and method of temperature compensation – force and moment sensors – design of the measurement circuits – case study about design and fabrication of measurement instruments and circuits for student training and improving their skills.

0202419: Engineering Economy


0202420: Engineering Drawing and CAD

Types of lines and using of drawing instruments - Geometry of technical drawing - Multi-view projection (orthographic projection) - Dimensioning - Missing view and isometric drawing - Intersections of engineering solids - Sectional views - Steel construction drawing - Computer aided drawing (CAD) – Application using Auto-Cad program.

0202421: Numerical Analysis and Programming


0202422: Technical Report Writing

Professional communication (definition, means and topics) – Technical writing basics (definition, process and style)– Technical writing techniques (researching, summarizing, formatting, using visual aids, defining and describing) – Technical writing applications (memorandums and informal reports, formal reports, user manuals and letters) - Oral reports and presentation.
0202423: Fault Diagnosis in Mechanical Systems
Introduction – Main components of some mechanical power systems (power plants, water desalination plants, refrigeration and air-conditioning plants, heat exchangers) - Identifications of most common types of faults and their effect on those systems performance – Faults detection and correction.

0202424: Principles of Industrial Maintenance
Introduction - Preventive maintenance – Maintenance economy – Machines condition monitoring – Maintenance concepts and its relation to machines design, purchases, installation and operation – Machines condition monitoring requirements and instrumentation – Maintenance planning and managements – maintenance execution, evaluation and recording.
2- Professional Diploma Studies

**0202450: Engineering Materials and Applications**
Engineering materials and their structure - effect of stresses temperatures on the atomic structure of metals - Controlling the microstructure and the mechanical properties of material - Strain hardening and annealing - Relationship between properties and the phase diagram - Ferrous alloys - Steel and its alloys (special steels, stainless steel) - Nonferrous alloys (aluminum alloys, magnesium alloys, copper alloys, nickel and cobalt) – Ceramic materials - Ceramic glasses (atomic structure specifications and properties and its applications) – Polymers (classification of polymers, properties and atomic structure, applications) – Composite materials and its applications.

**0202451: Operation Research**
The art and science of operations research - Linear programming - Transportation problem - Assignment problems - Simplex method - Queuing theory – Simulation - Game theory - Projects management - Inventory models.

**0202452: Industrial Organization and Factories Planning**
Forecasting - Production planning - Inventory control - Maintenance process management and monitoring - Project scheduling and recourses - Manufacturing costs - Production systems - Product and process facility layout - Facility layout algorithms - Production management.

**0202453: CNC Machines Programming**
**Pre-requisite:** Production Engineering (1) - Production Engineering (2)
Principles of computerized numerical control - Utilize G and M code commands in programming a part program - Principles of CNC control system and machine - Classification of CNC Machines - Use of interactive simulation software – Industrial applications.

**0202454: Machine Design (2)**
**Prerequisite:** 0202405 Machine Design(1)
Springs – clutches and brakes – Belts – Rolling contact bearings – sliding contact bearings spur gear – Bevel gears- Worm and Worm wheel gears – Computer aided design – Auto Cad.
0202455: Industrial Robots
Actuators (electric actuators, hydraulic actuators, pneumatic actuators) – Grippers (hydraulic electric, pneumatic) – One and two stages grippers - On off gripper - Servo gripper – Sensors (position and displacement, speed, force, optical sensors) – Dynamics Robot manipulators - Robotic programming - Robotic manufacturing cells – Robot applications in flexible manufacturing systems – Reliability maintenance and safety of robots – Robot Applications in hazardous environment (chemical, etc.).

0202456: Fault Diagnosis in Mechanical Power Systems

0202457: Mechanical Failure

0202458: Reverse Engineering in Design and Development
Inspection of product and its previous performance – excluding the product from its manufacturing technique to predict its function - Determination of the controlling parameters (in performance, usage, etc.) - Product choice with consideration of standards and material specifications – Preparation of design documentations with consideration of available facilities.

0202459: Pumps and Compressors

0202460: Hydraulic Systems

Prerequisite: Fluid Mechanics - Automatic Control


0202461: Renewable Energy

Solar energy (Solar radiation flux, solar angles estimation energy and measurements of solar radiation fluxes, solar energy systems) – Nuclear energy (Nuclear fuel, radiation activity and depletion, nuclear reaction, nuclear reactors) – Biomass energy Conversion of biomass, energy generation from agricultural wastes and organic materials, biogas, systems of biogas generation) – Wind energy (available power, power factor, Principles of wind energy generation, curves of power and speed, site conditions, forces of lift and friction, wind energy systems) – Tidal energy – Geothermal energy.

0202462: Heat Exchangers


0202463: Internal Combustion Engines (2)

Prerequisites: Internal Combustion Engines (1)

Direct energy conversion systems (MHD, Fuel cells, …etc ) – Special types of internal combustion engines : a- Gas engines operating on the principles of spark ignition engines , b- Gas engines operating on the principles of diesel engine ( dual fuel engines and HCCI-engines), c- Multi-fuel engines - Internal combustion engines of special derives : a- Stirling engines , b- Wankel engines c- Gas turbines.
0202464: Automatic Control (2)

0202565: Electro-hydraulic Servo Systems
Hydraulic Basics ( positive displacements pumps, control valves, solenoid valves, accumulator and filters, Actuators, hydraulic motors, hydrostatic transmissions, circuit design ) – Two stage electro hydraulic servovalves: Static and dynamic characteristics - Design of electrohydraulic servo systems applying state space method – Closed loop response of electrohydraulic servo systems – Troubleshooting in fluid control systems- Computer aided design of fluid power systems applying AUTOMATION STUDIO Software.

0202466: Power Plants
Steam power plants ( steam generators and ignition equipments , heat transfer surfaces, steam turbines, auxiliaries and accessories , heat exchangers types and design , steam power cycles , efficiency of steam power plants ) – Gas power plants ( gas plants , compressors , combustion chambers and ignition equipments and systems , gas turbines, open and closed cycles , combined cycles , efficiency of gas power plants) – Diesel power plants ( main components for diesel plants – design of internal combustion plant , auxiliaries and accessories , efficiency of diesel plants ).

0202467: Industrial Process Control
0202468: Waste Energy Recovery

0202469: Steam Turbines
Prerequisite: 0202404 Thermodynamics

0202470: Environmental Engineering
Prerequisites: Fluid Mechanics, Measurements and control
Composition and Structure of the Atmosphere- Air Quality- Sources and Types of Air Pollutants- Engineering Systems for Air Pollution Control- Environmental Impact Assessment - Water Pollution- Water Quality Parameters - Engineering Systems for Water Purification and Industrial Water Treatment.

0202471: Testing and Properties of Materials

0202472: Feasibility Study and Cost Estimation
3- Post-Graduate Diploma Courses

3-1 Diploma in Computer Aided Design and manufacturing

0202501: Numerical Analysis and Programming

**Prerequisites:** Engineering Analysis


0202502: Materials Technology


0202503: Experimental Stress Analysis


**Theory of Photo elasticity:** Behavior of Light, Polarized Light, Plane Polarizers, Wave Plates, Conditioning of Light by a Series Combination of a Linear Polarizer and a Wave Plate, Arrangement of the Optical Elements in a Polarscope, Construction Details of Diffused-light and Lens-type Polariscope, Lens Formulas - The Stress Optic Law in Two Dimensions at Normal Incidence, Effects of a Stressed Model in a Plane Polarscope, Effects of a Stressed Model in a Circular Polarscope (Dark Field – Arrangement), Effects of a Stressed Model in a Circular Polarscope (Light Field – Arrangement B), Fringe Multiplication by Photographic Methods, Fringe Sharpening with Partial Mirrors, Fringe Multiplication with Partial Mirrors.

0202504: Robots and Industrial Automation
Introduction - Robotics in Operations and Processes: material handling and warehousing; assembly of mechanical and electronics products; inspection and testing; maintenance and repair; fabrication and processing; spot, arc, and laser welding; painting and coating - Introduction to the automation of Discrete Dynamic Event Systems - Automation Devices and Systems – Recent Topics.

0202505: Statistical Quality Control with Computer Applications

0202506: Computer Aided Design and Manufacturing (CAD/CAM)
Classification of data and knowledge repository (Functional Design, Basic Design, Detailed Design, M/F construction, Redesign, Recycling, Training, maintenance) Local knowledge and strategic knowledge – Methodologies for software designing – Object-Oriented technology OOT, - Object-Oriented Methodologies – Development of CAM and CAPP systems and Linkage Styles – Applications of CAD systems to different mechanical systems (Hydrodynamic journal bearing, gear box design, die casting, ship building, etc ..).

0202507: Flexible Manufacturing Systems
Prerequisites: Industrial Organization and Factory Planning

0202508: Finite Element Method: Modeling and Simulation
Prerequisites: Stress Analysis, Advanced Engineering Mathematics, General Elasticity and Plasticity Theory and Programming Using FORTRAN or C++.
Fundamentals of Finite element Technique - Applications on bar and beam elements - plain stress and plain strain. Asymmetric shell and disk elements - Three dimensional solid elements - Applications in elasticity field using FE-commercial software packages.

0202509: Computer Aided Design and Analysis of Metal Casting Processes

0202510: Seminar (Computer Aided Design and Manufacturing)
Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of Computer Aided Design and Manufacturing. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202511: Project (Computer Aided Design and Manufacturing)
Students are required to prepare a project to solve a realistic and practical case related to computer aided design and manufacturing CAD/CAM. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
3-2 Diploma in Power Plants

**0202512: Thermal Power Plants**
Overview of the components and systems of modern power plants – Plants working cycles (combined cycle and steam Hg cycle)- Specific steam consumption and heat rate- Load distribution – Condensers - Vacuum pumps - Steam ejectors - Air Heaters types - Contemporary issues.

**0202513: Steam and Gas Turbines**
Introduction (first & second laws of thermodynamics, Flow through nozzles, Critical pressure - Nozzle efficiency - Over and under expansion nozzles) - Advantages of steam turbines (conversion of heat into mechanical work) - Types of steam turbines: Impulse turbines (De Laval stage, Curtis or velocity staged), Parson’s turbine - Turbines and its classification according to: flow arrangement, use and application conditions,…… others) - Velocity diagrams - Principles of governing - Contemporary issues.

**0202514: Hydraulic Power Plants**
**a- Introduction** – The Hydrological Cycle - Advantages and disadvantages of hydroelectric power plants - Site selection for hydroelectric power plants: The preliminary and final investigations (Hydrological topographical and geological investigations), The environmental aspects of site selection, Water pollution and sedimentation effects, Classification of hydroelectric power plants.
**b- Hydraulic turbines:** Types of hydraulic turbines (Impulse turbines, Radial and Mixed flow turbines, Axial reaction turbines) - Draft tube - Cavitation considerations, Turbine selection and performance and control.
**c- Pumps:** introduction, Roto-dynamic pumps (centrifugal pumps, mixed flow pumps, axial pumps) - Positive displacement pumps.

**0202515: Heat Exchangers**
Review of heat exchanger types – Definitions and quantitative relationships for heat exchangers – Analytical solutions to heat exchanger equations – Numerical solution procedures for heat exchanger equations – Charts for mean temperature difference in industrial heat exchanger configurations – Projects: discussing different heat exchangers in power plants (e.g. condensers, evaporators and cooling towers) - Contemporary issues.

**0202516: Electric Power and Control in Power Plants**
**Transmission:** cables and transmission lines, distribution and transmission systems, network configurations, choice of voltage level. **Systems:** single and
three phase, active and reactive power, power factor and power measurement, safety. **Control:** frequency and voltage control and power flow analysis. **Protection:** basic concepts of system faults and system protection, fuses and protective relays, calculation of settings. **Monitoring:** data acquisition, supervisory control functions, user-machine communication, SCADA systems.

**0202517: Risk Analysis and Environmental Control**

A- **Risk Analysis:** Risk definition and accident theory - Importance of risk management-Identification of risks-Methods of system analysis- Summary of risk assessment steps in workplace- Case study (project) - Contemporary issues.

B- **Environmental Control:** Particulate and gaseous pollution – Sources of air pollution- Engineered systems for air pollution control (particulate and gaseous contaminants) – Water quality – Physical and chemical water- quality parameters – Engineered systems for water treatment of power Plants - Contemporary issues.

**0202518: Economics and Management of Power Plants**


**0202519: Non-Conventional Power Plants**

**Introduction-Wind Power Plants** (wind availability, types of wind mills, wind power plant)– **Tidal Power Plants** (components, classification and operation, advantages and limitations)– **Solar Power Plants** (solar collectors and applications, solar pond technology, low, medium and high temperature thermal power generation) – **Geothermal Power Plants** (geothermal energy sources, power estimation, applications, advantages and disadvantages) – **Biogas Plants** (principles and applications, fluidized-bed technology) – **Energy Storage** (hydro, mechanical, thermal and electrical systems) - Contemporary issues.

**0202520: Simulation Packages for Power Plants**

Introduction - Basic process components (connection point, tank, pipe, valve, pump, heat exchanger, turbine, condenser, combination, throttle, heat structure
and miscellaneous)- Combustion reactions and the concentrations of reaction products (natural gas, oil, air and flue gases) - Combination module: connecting different thermal hydraulic modules - Components to be connected to a shaft: (turbine section, generator, compressor and basic pump)- Components boundary condition module – Projects- Contemporary issues.

0202521: Seminar (Power Plants)
Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of power plants. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202522: Project (Power Plants)
Students are required to prepare a project to solve a realistic and practical case related to power plants. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
3-3 Diploma in Refrigeration and Air-conditioning

0202523: Principles of Ventilation and Air Conditioning
Introduction-Physiological principles-Comfort and health - Heat transfer through buildings walls- Air conditioning cooling and heating loads- Air conditioning systems-(All air systems, chilled water systems, Air and water systems)- Duct design and construction-Chilled water pipes sizing-Fans and pumps selection-Application.

0202524: Air Conditioning of Clean Rooms

0202525: Commercial Cooling
Introduction-Food refrigeration commercial freezing methods-Cooling and freezing time- Cooling and freezing loads - Retail food store refrigeration equipments ( compressors, condensers, expansion devices) - Refrigeration control devices - Ice manufacture-Distribution of chilled and frozen foods (Trucks, Trailers and containers, Railroad refrigeration cars, Marine refrigeration, Air transport).

0202526: Solar Energy: Heating and Cooling

0202527: Evaporative Cooling
0202528: **Low Temperature Cooling and Cryogenics**

Introduction - Definitions and distinctions – Cascaded vapor compression systems - Fabrication of dry ice – Gas cooling by expansion – Cycles for air liquefaction – Cryogenic industrial applications – Cryogenic processing – Cryogens: liquid nitrogen, liquid helium, cryogenic fuels: liquid hydrogen, liquid oxygen (as oxidizer) - Cryogenic piping systems – Freezing and chilling systems.

0202529: **Nocturnal Cooling**

Introduction - Radiation heat transfer- Method of calculation of nocturnal cooling rate for covered and uncovered surfaces- Fluid cooling by nocturnal radiation cooling- The factors affecting the nocturnal cooling systems.

0202530: **Seminar (Refrigeration and Air-conditioning)**

Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of Refrigeration and Air-conditioning. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202531: **Project (Refrigeration and Air-conditioning)**

Students are required to prepare a project to solve a realistic and practical case related to refrigeration and air conditioning. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
3-4 Diploma in Metal Cutting and Forming

0202532: Principles of Metal Forming and Applications
Theory of stresses and strain - Basic theory of plasticity - Concept of plastic instability - Bending processes - Rolling processes - Rod and wire drawing processes - Deep drawing; spinning - Non-conventional forming processes.

0202533: Principles of Metal Cutting and Applications
Mechanics of metal cutting - Cutting tool geometry - Cutting process variables - Manufacturing systems and automation - Economics of metal cutting operations.

0202534: Techniques of Plastic Forming
Chemical and physical properties of plastics - Forming processes of plastics - Testing of products quality - Manufacturing economic analysis of plastics.

0202535: Design of Metal Forming Dies

0202536: Engineering Metallurgy of Metals
The crystal structure of metals - The iron /carbon equilibrium diagram - Heat treatment: of alloy steels - Nickel-base corrosion – Resistant alloys - Cast iron; Aluminum and its alloys - Copper and copper – Base alloys - Practice of heat treatment of metals.

0202537: Unconventional Fabrication Techniques
Electrical Discharge Machining (EDM) – Electrochemical Machining (ECM) – Ultrasonic Machining (USM) – Water Jet Machining (WJM) – Economy of unconventional fabrication technique.

0202538: Industrial Measurements
Measurements error – Measurement standardization - Linear measurement - Angular measurement – Measurements in tools gear and thread measurement – Surface roughness measurement – Advanced measurement techniques.
0202539: Computer Aided Forming (CAF)
Computer applications in metal forming – Expert system in manufacturing with computer applications – Advanced manufacturing systems – Languages programming – Integration between industrial and CAF - Data base of CAF – General applications.

0202540: Rolling and Extrusion Processes
Forging and die forging- Rolling of sheets and Sections – Direct, revised , mixed and hydrostatic extrusion – wire drawing with and without lubrication - pipe drawing with and without mandrel - deep drawing – tension forming – Spinning cold forming of sections.

0202541: Forming of Fiber Reinforced Plastics

0202542: Seminar (Metal Cutting and Forming)
Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of Metal Cutting and Forming. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202543: Project (Metal Cutting and Forming)
Students are required to prepare a project to solve a realistic and practical case related to metal forming and machining. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
3-5 Diploma in Turbo-machines and Pipe Networks

0202544: Fluid Dynamics

**Prerequisites:** Thermodynamics (2), Fluid Mechanics


0202545: Measurements and Control

**Prerequisite:** Automatic Control (I)


0202546: Gas Dynamics

**Prerequisites:** Fluid Mechanics (2)

Introduction - Fundamental laws – Wave motion and Mach Number - Isentropic one-dimensional flow through variable area ducts - Normal shock wave – Oblique shock wave – Prandtl-Meyer expansion – Adiabatic and isothermal one-dimensional flows in constant area ducts with friction – Frictionless one-dimensional flow in constant area ducts with heat transfer – Method of characteristics.

0202547: Turbines

Introduction: a- Steam turbines: Types of turbines, Nozzles, Design of flow channels, Two dimensional flow analyses through cascades of blades, Velocity triangles, Types of the axial flow turbines losses and efficiencies, Soderberg's
correlation, Mechanical design Aspects of steam turbines - Radial flow turbine, Turbine performance at varying loads, b– Gas turbines, c– Hydraulic turbines: Pelton, Francis, Kaplan and Tubular turbines.

0202548: Compressors


0202549: Design of Water Supply Pipe Networks

Prerequisites: Engineering Analysis (2), Fluid Mechanics (2)


0202550: Centrifugal Pumps


0202551: Seminar (Turbo-machines and Pipe Networks)

Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of Turbo-machines and Pipe Networks. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202552: Project (Turbo-machines and Pipe Networks)

Students are required to prepare a project to solve a realistic and practical case related to turbo-machines and pipe networks. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
3-6 Diploma in Mechatronics Engineering

0202553: Digital Control

0202554: Industrial Process Control
Pre-requisite: Automatic Control (2)
Process control fundamentals - process characteristics: single and two capacitance process – Identification - Parameters estimation - Industrial transmitters - Two position controllers, P, PI, PD, PID controllers - Closed-loop characteristics and controller design - Controller tuning, basic factors affecting stability - Open-loop method - Closed-loop method, state feedback - Feedback gain matrix - Pole placement method - Industrial application - Level, flow and temperature control process - Design of process control systems applying MATLAB - Virtual control software packages Control Station Package.

0202555: Electro-Hydraulic Systems
Prerequisites: Automatic control (2) - Hydraulic machines – Mathematics - Fluid mechanics (2)

0202556: Mechatronics
Pre-requisite: MT 423 Mechatronics (B)
Introduction to advanced mechatronics systems, Microcontrollers and their advantages, Microcontroller based mechatronics systems, Microcontroller programming, Mechanical components (mechanisms) for mechatronics systems, Electronic components for mechatronics systems, Sensors and measuring devices for mechatronics systems, Case studies.
0202557: Electric Sensors and Measurements Circuits

0202558: Robots and Automation
Prerequisite: MT 421- Automatic Control (2)

0202559: Automatic Control Laboratory
Training on Different industrial process control systems (Control of Level, Flow rate, Pressure, Temperature and Speed of Rotation) – Training on the effect of Different Controllers on Systems’ Response and Stability - Performance Enhancement of Different Control Systems.

0202560: Seminar (Mechatronics Engineering)
Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of Automatic Control of Industrial Processes. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202561: Project (Mechatronics Engineering)
Students are required to prepare a project to solve a realistic and practical case related to automatic control of industrial operations. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
0202562: **Heat Transfer and its Application in Welding and Casting Processes**

0202563: **Industrial Furnaces**
Introduction - Heat transfer in furnaces – Thermal industrial processes (heating, drying, roasting, sintering, melting, coating, heat treatment) – Important components furnaces (heating units or combustors, heat exchangers and furnace walls, materials and products handling) – Thermal design of furnaces - Design requirements according heating methods and process requirements – Temperature control inside furnaces – Pollution control of furnaces emission – Economics of industrial furnaces and optimum design – Some common types of industrial furnaces (induction furnaces, electric arc furnaces, heat treatment furnaces, steel production furnaces, …) - Fluidized bed furnaces – Some applications (melting, heat treatment, sintering, coating).

0202564: **Principles of Metal Casting**
Solidification mechanisms of metals and alloys- Sprucce and vent design – Types and properties of casting media – Design of patterns – Casting techniques – Defects in casting.

0202565: **Advanced Welding Techniques**

0202566: **Advanced Casting Techniques**
Die casting – Continuous casting - Centrifugal casting – Shell Molding – Lost wax method (investment casting).

0202567: **Welding and Casting Inspection and Testing Techniques**
0202568: Welding and Casting Metallurgy

0202569: Industrial and Occupational Safety
Sources of pollution and danger – Engineering systems of control of air pollution – Protection against fires – Industrial safety equipment – Insurance against fire hazards – Dust control systems.

0202570: Heat Treatments

0202571: Applications of Welding Technology in Painting and Rough Surfaces Treatments

0202572: Seminar (Welding and Casting)
Topics are proposed and selected based on the professional experience of the students and recent demanding topics in the field of welding and casting. The selected topics are then distributed among the students to study them and prepare lectures for presentation and discussion in the class under the supervision of the staff member teaching the course according to a schedule which is prepared and announced in advance.

0202573: Project (Welding and Casting):
Students are required to prepare a project to solve a realistic and practical case related to metal casting and welding. They should present a report containing the engineering applicable solutions to the case study in a clearly explained way.
4- Master and Ph.D. Courses Description

4-1 Design and Production Engineering

0202601 : Advanced Engineering Mathematics (1)

**Prerequisites:** MP 221 Engineering Analysis (2)


0202602 : Advanced Engineering Mathematics (2)

**Prerequisites:** 0202601 Advanced Engineering Mathematics (1)

Vector Calculus - Vector differential - Vector integral - Curvilinear coordinate systems - Complex Variables and Functions - Complex algebra - Complex functions - Complex derivatives and analytical functions - Conformal mappings - Schwarz-Christoffel transformations - Complex Integrals and Series (complex integral theorem, Laurent series) - Residue theorem - Analytic Continuation.

0202603 : Applied Electronics and Computations

**Prerequisites :** MP 221 Engineering Analysis (2)


2- **Computations** : Roots of Equations : Method of successive approximations - A modified method of successive approximations - The Newton-Raphson method - Roots of polynomials - Simultaneous equations - Complex roots ; Simultaneous Linear Algebraic Equations : Gauss elimination - Iterative methods of solution - Case study ( Least squares curve fitting ) ; Ordinary Differential Equations : Taylor series solution - Euler method - Improved
Euler method - Modified Euler method - Fourth-order Runge-Kutta method - Predictor corrector methods - Case study (Flight of supersonic aircraft) 
Partial Differential Equations : Introduction and Definitions - Difference equations - Elliptic equations - The solution of elliptic difference equations - Hyperbolic equations - Solution of Hyperbolic difference equations - Parabolic equations - Solution of parabolic difference equations- Case study (Temperature distribution in a square pipe)

0202604 : Vibrations in Mechanical Systems with Computer Applications  
**Prerequisite: MD 321 Mechanical Vibrations**


0202605 : Mechanical Behavior of Engineering Materials (1) 

0202606 : Mechanical Behavior of Engineering Materials (2) 
Introduction to the mechanical behavior of solids emphasizing the relationships between microstructure and mechanical properties - Elastic and plastic properties of materials - The relations between stress, strain, strain rate, and temperature for plastically deformable solids - Theory of plasticity and visco-plasticity - Application of dislocation theory to strengthening mechanisms in crystalline solids - The phenomena of creep, fracture, and fatigue and their controlling mechanisms - Composite materials and its applications.

0202607 : Elasticity and Plasticity  
Introduction to Tensors and Tensors - Stress Tensors - Strain tensors - Ideal behavior of Material (Linear elastic behavior , Linear visco-elastic behavior , Elastic behavior in different directions) - Viscous behavior Material (Laws of iso-viscous flow , Non- linear viscous flow in one and different directions) - Plastic behavior (Plastic behavior , Visco – plastic behavior in one direction) - Theory of plasticity (Plasticity without strain hardening , Plasticity with strain hardening and its hardening values).
0202608 : Design of Metal Forming Dies

0202609 : Modeling and Simulation in Metal Forming Operations

0202610 : Mechanical Properties of Metals

0202611 : Friction, Wear and Lubrication in Metal Forming Operations

0202612 : Heat Treatments

0202613 : Advanced Metal Forming Techniques
0202614 : Operations Management

0202615 : Applied Operations Research
Prerequisites: Operations Research and Statistics
Advanced topics in Linear programming - Parametric linear programming. Integer programming - Non-linear programming: Constrained and unconstrained algorithms - Multi-objective problems - Engineering applications.

0202616 : Statistic and Production Quality Control

0202617 : Fault Diagnosis and Failure Analysis in Mechanical Systems

0202618 : Advanced Topics in Design and Production Engineering:
Topic to be proposed and chosen by the supervisor to comply with the topic of the student thesis or dissertation. The proposed course contents and specification should be presented and discussed within the proper scientific group, then submitted to the department council for approval.
4-2 Mechanical Power Engineering

0202619: Advanced Fluid Mechanics

**Prerequisites:** MP322 Fluid Mechanics

**Equations of Motion of a Compressible Viscous Fluid:**
Fundamental Equations of Motion and Continuity – Viscous Fluid Stresses – Relation Between Stress and Rate of Deformation – The Navier Stokes Equations;

**Exact Solutions of the Navier-Stokes Equations:**
Parallel Flow through Straight Channel and Couette Flow – The Flow Between Two Concentric Rotating Cylinders – Flow in a Pipe, Starting from Rest – Other Exact Solutions;

**Incompressible Boundary layers With Pressure Gradient:**
An Approximate Laminar Boundary Layer Solution for Arbitrary Varying Free Stream Velocity over a Body of Revolution - An Approximate Turbulent Boundary Layer Solution for Arbitrary Varying Free Stream Velocity over a Body of Revolution;

**Turbulent Flow:**
Fundamentals of Turbulent Flow – Mean Motion and Fluctuations – Additional, "Apparent" Turbulent Stresses – Derivation of the Stress Tensor of Apparent Turbulent Friction from the Navier-Stokes Equations – Some Measurements on Fluctuating Turbulent Velocities;

**Theoretical Assumptions for the Calculation of Turbulent Flows:**
Fundamental Equations – Prandtl's Mixing Length Theory – Universal Velocity-Distribution Laws (Von Karman's and Prandtl's Velocity-Distribution Laws);

**Turbulent Flow Through pipes:**

0202620: Fundamentals of Microfluidics

**Prerequisites:** MP322 Fluid Mechanics


0202621: Advanced Automatic Control (1)

**Prerequisite:** MT421 Automatic Control in Mechanical Systems

Introduction to feedback control system - Mathematical modeling of dynamic systems - Transfer functions, steady state errors and error constants - Stability
of closed loop systems - Transient response analysis - Routh’s stability criterion - Control system design using frequency response - Nyquist stability criterion - Control system design by the root locus method - Design of proportional controllers P - Proportional integral PI - Proportional derivative PD and proportional integral derivative PID - Process control (examples of flow and level control systems) - Application using software package MATLAB.

0202622: Engineering System Analysis

0202623: Advanced Thermodynamics (1)
Prerequisite: MP 321 Thermodynamics (2)
Combustion (Practical analysis of combustion products, Dissociation, Power plant thermal efficiency, Air and fuel, Vapor mixtures) - Gas Turbine Cycles (The practical gas turbine cycle, Modification to the basic cycles, Combustion, Additional factors, Combined cycles) - Nozzles and Jet Propulsion (Nozzle shape, Critical pressure ratio, Maximum mass flow, Nozzle off the design pressure, Nozzle efficiency, The steam nozzle, Jet propulsion, The turbojet) - Refrigeration and Heat Pumps (Refrigerating load, Compressor type, Flash chamber, Vapor absorption cycles, Gas cycles, liquefaction of gases, Steam, Jet refrigeration) - The sources, use, and Management of Energy (Source of energy supply and energy demands) – Combined cycles – Combined heat and power (Co-generation, Technology of energy saving).

0202624: Advanced Thermodynamics (2)
Prerequisite: 0202623 Advanced Thermodynamics (1)

0202625: Simulation and Modeling of Mechanical and Electro-mechanical Systems

0202626 : Computational Fluid Dynamics (1)

Prerequisite: Mp 221 Engineering Analysis (2), MP 322 Fluid Mechanics (2)


0202627 : Computational Fluid Dynamics (2)

Prerequisite: Computational Fluid Dynamics (1)


0202628 : Refrigeration and Air conditioning by Absorption and Adsorption


0202629 : Steam Power Plants


0202630 : Radiative Heat Transfer in Dispersed Media

Conduction and Radiation - Combined Convection and Radiation Engineering.

0202631: Fluidized Bed Technology

0202632: Compressors

0202633: Cavitation
Prerequisite: MP 221 Engineering Analysis (2)
Cavitation types and stages – Cavitation in flowing streams – Cavitation on immersed bodies – Effects of cavitation and resulting damages – Effect of wetting surfaces and liquid properties on cavitation inception - effect of liquid and solid impurities on cavitation inception – Effect of cavitation on flow – Flow around hydrofoils and guide vanes with cavitation.

0202634: Cavitation in Hydraulic Machines
Prerequisites: Cavitation – 0202633
0202635 : Theory of Turbo-Machines (1) : Flow Physics  
**Prerequisite:**   *MP 322 Fluid Mechanics (2)*  

0202636 : Theory of Turbo-Machines (2) : Dynamic Performance  
**Prerequisite:**   *Theory of Turbo-Machines-(1) – 0202628*  

0202637: Modeling of Air Pollutants Dispersion  

0202638: Pollutants Measurements and Control  
**Prerequisite:** *MP 322 Fluid Mechanics, Measurements and Control*  
Introduction - Sources and Types of Air Pollutants - Physical, Chemical and Biological Characteristics of Air Pollutants - Measurements and Control of Particulate Contaminants - Measurements and Control of Gaseous pollutants.

0202639: Turbulence Modeling  
**Prerequisite:** *Advanced Fluid Mechanics -0202619*  
0202640 : Air Conditioning of Clean Rooms

0202641 : Advanced Heat Transfer by Conduction

0202642 : Advanced Heat Transfer by Convection

0202643 : Advanced Heat Transfer by Radiation

0202644 : Advanced Topics in Thermal Engineering
Advanced topics in heat exchangers – Advanced topics in thermal power systems – Advanced topics in refrigeration systems – Advanced systems in transport phenomena ( heat transfer, mass transfer ) – Advanced topics in thermal radiation..etc.
One of the above mentioned topics or a different topic is to be chosen by the supervisor to comply with the topic of the student thesis or dissertation. The
proposed course contents and specification should be presented and discussed within the proper scientific group, then submitted to the department council for approval.
4-3 Mechatronics Engineering

**0202645 : Advanced Automatic control (2)**

*Prerequisite:* 0202621 Advanced Automatic Control (1)


**0202646 : Robotics**

*Prerequisite:* MT 421 Automatic Control in Mechanical Systems

Introduction, Spatial descriptions and transformations, Manipulator forward kinematics (Denavit & Hartenberg convention), Inverse Manipulator kinematics, Jacobians velocities and static forces, manipulator dynamics (Newton Euler & Lagrangian equation of motion), Trajectory generation, Manipulator mechanism design, Linear control of robots.

**0202647 : Screw Algebra and Its Applications in Robotics**

Vector Spaces, Basis, dimension and ranks, Linear dependence and independence - Line coordinates, Plucker line coordinates - Screw coordinates, Screw algebra - Instantaneous Kinematics and Static's of bodies in plane and space - Velocity analysis of robots, Screw equation of the end-effector - Acceleration analysis of robots.

**0202648 : Signal Processing**


**0202649 : Intelligent Control**

*Prerequisite:* MT421 Automatic Control (2)

A prelude to control theory, Mathematical models in control, Fuzzy logic for control and system identification, Fuzzy control of mechanical systems, comparisons with PID control, Introduction to neural networks, learning with back propagation algorithm, applications to the control of mechanical systems. In the final exam, the student should develop the necessary code to control some mechanical systems using fuzzy system and compare his results with the performance of PID controller. This is to be done using MATLAB as the
standard software package. At the end of the exam the student should deliver the developed software for the problems in a CD and a hard print of the simulation results.

0202650 : Advanced Mechatronics

**Prerequisite:** MT 423 Mechatronics (B)


0202651 : Advanced Topics in Mechatronics and Robotics:

Topic to be proposed and chosen by the supervisor to comply with the topic of the student thesis or dissertation. The proposed course contents and specification should be presented and discussed within the proper scientific group, then submitted to the department council for approval.
ELECTRICAL ENGINEERING DEPARTMENT
TABLES FOR POSTGRADUATE STUDIES COURSES OF THE ELECTRICAL ENGINEERING DEPARTMENT
1. Qualifying Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Electrical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 15 credit hours from the level of 400 chosen depending on his scientific and professional background from the following table:

Table (3-1):

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<th>Examine Time</th>
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2. Preliminary Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Electrical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 12 credit hours from the level of 400 or above chosen depending on his scientific and professional background from the following table:

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3. Professional Diploma Studies

Include a group of courses for Engineering graduate students. The student studies a number of courses, which he has not studied before, equivalent to 18 credit hours from the level of 450 chosen depending on his undergraduate field of study from the following table:

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4. Post-Graduate Diploma Courses

In this study, 18 credit hours must be selected from the level of 500 or above from the following diplomas:

4.1. Diploma in Electrical Power and Machines Engineering

Table No. (3-4)

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4.2. Diploma in Communications Engineering

Table No. (3-5):

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### 4.3. Diploma in computers & systems Engineering

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4.5. Diploma in Power System Operation and Control

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4- Courses for Master and Ph.D. degrees

The supervisor (s) suggests a number of courses from the following tables that are suitable for the chosen field of specialization of the student, the number of these courses should be equivalent to:

a) MASTER’S IN ENGINEERING DEGREE (M. Eng.)
The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 30 credit hours are requested. In addition, an applied research (6 credit hours) must be done to achieve this degree.

b) MASTER’S OF SCIENCES (M.Sc.) DEGREE
The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 18 credit hours are requested. In addition, a scientific thesis (18 credit hours) must be done to achieve this degree.

c) PH.D. DEGREE COURSES
After the students pass the comprehensive exam, 18 credit hours of level 600 or above must be studied. The proper numbers of credit hours in each semester are not less than 6 credit hours per week. In addition, a scientific thesis (30 credit hours) must be done to achieve this degree.
## 5.1 Electrical Power & Machines Engineering

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5.2. Electronics & communications Engineering

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### 5.3 Computer & Systems Engineering

Table No. (3-12):

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## CON. Table No. (3-12)

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COURSES DESCRIPTION FOR POSTGRADUATE STUDIES
THE ELECTRICAL ENGINEERING DEPARTMENT
### 1. Qualifying Study Courses

**0203401: Electromagnetic Field theory**

**0203402: Electrical Circuits (1)**
Definition of current, voltage, power, and energy – Constant and controlled DC voltage sources – Series and parallel circuits – Circuit analysis of constant DC voltage sources (node voltages and mesh currents) – Electric circuit theories – Capacitance and inductance – Sinusoidal alternating current – Using vectors in electric circuit analysis – Analysis of AC voltage sources circuits – Computation of Power – Resonance circuits – Magnetic circuits

**0203403: Electronics**
Energy levels - Drift and diffusions of carriers in semiconductors – Conductors and their properties - Diode functions: rectifier- Voltage regulator- Varactor-Varistors- Photodiode- Light emitting diode (LED)- Solar cell- Tunnel diode-Schottky diode - Bipolar Junction Transistors BJTs- BJT applications at low frequencies- Junction Field Effect Transistors JFETs- Metal- Oxide-Semiconductor Field Effect Transistors- Basic FET circuit Applications-Switching Devices: Four-layer PNPN devices- (SCR, Bilateral devices, Unjunction (UJT), Programmable (PUT) Transistors- Power Circuits and systems; Classification of output stages- audio power amplifiers- IC power amplifiers- power supplies- Operational amplifiers Regulated power supplies-Monolithic regulators- Introduction to semiconductor device technology.

**0203404: Electrical Circuits (2)**
Operational Amplifier- Response of first order circuits- Response of second order circuits- Three-phase circuits- Mutual inductance- Using Laplace transform in the analysis of electric circuits- Transfer function- Resonance...
circuits- Using Fourier transform in the analysis of electric circuits- Two-port circuits- Using PSpice in circuit analysis.

0203405: Electrical Testing
1- Measurement of unknown resistor (Ohm's Law + Wheatstone Bridge)
2- Verification of Kirchhoff's Law and identifying resistors
3- Verification of circuit theorems for DC voltage sources (7 theorems)
4- RLC circuits
5- Verification of circuit theorems for AC voltage sources (superposition-Thevenin- Reciprocity)
6- Resonance circuits
7- CRT and its use in the oscilloscope
8- Diode and its characteristics
9- Characteristics of Zener diodes
10- LED's
11- Photodiodes and solar cells
12- Using Pspice in electronic circuits

0203406: Electrical machines

0203407: Electrical Measurements

0203408: Engineering Analysis
Fourier series and integrations – Using Laplace and inverse Z transforms to calculate the time response of analog and digital electric circuits.

**0203409: Digital Circuits**

**0203410: Computer Languages**
2. Preliminary Study Courses

0203425: Numerical Analysis & Computation Methods (1)
Solution of equations using computer, algebra of matrices and its use in the solution of equations, reduction of equations techniques, curve fitting, numerical integration and its techniques, interpolation and extrapolation, solution of ordinary and partial differential equations.

0203426: Electronic Circuits (1)

0203427: Analog communication systems
Principles of probability theory and random processes-Elements of Communication Systems- Random Processes of Linear Systems- Modulation theory- Amplitude modulation- Double Side band modulation- single side band modulation- Vestigial modulation- Analysis of Amplitude modulation under the effect of noise- Angle modulation- Frequency modulation- Demodulation

0203428: Electrical power systems
Electrical power system component – Electrical load characteristic- Improvement of load power factor - Overhead transmission line – underground cables ( constriction – types - position of insulated faults )- Normal operation of power system transmission line - HVDC system- Traveling wave – Transient extra voltage – Effect of corona phenomena in high voltage transmission - Mechanical design of overhead transmission line – power system distribution – Power system earthing – The role of communication and computers on power system network.

0203429: Principles of microprocessors
Microprocessors architecture – Microprocessor classifications – Microprocessor families – 8088/8086 microprocessor (Hardware – Instruction set – Addressing modes – Assembly language) – Microprocessor applications in power systems and electric machines – introduction to PLC.

0203430: High voltage engineering
Electric fields and their computation, breakdown of insulating gases, Corona discharges, Breakdown of insulating liquids, Breakdown of insulating solids,
AC, DC and Impulse voltages: Generation and measurements, AC and AC HV testing, Insulation coordination.

0203431: Digital Signal Processing

0203432: Industrial Electronics (1)
Introduction to power diodes, Transistors and thyristors, Rectifier circuits, Turn-off and-on (tiring) circuits for thyristors, Controlled rectifiers, Static switches, Voltage controllers, DC choppers, Un-interruptible power supplies.

0203433: Control of Industrial Operations

0203434: Digital Control
State-space analysis, discretization of continuous-time systems, (iapunov stability analysis of discrete-time systems, controllability), absorbability, design of discrete time system via pole placement, design full ocvler and reduced order observers, polynomial equation approach to control systems design, design of model matching control systems, introduction to optical control.

0203435: Computer System Programming

0203436: Computer Architecture
0203464: Computer Interfacing Circuits

0203438: Optical fibers

0203439: Microwaves Circuits

0203440: Power Systems Protection
3. Professional Diploma Studies

0203450: Theory of digital communication

0203451: Sound Signals Processing

0203452: Digital Signal Processing

0203453: Automatic Control
System representation and system properties (transfer functions, state space), root locus, frequency response, controller design using the root locus and the frequency response using MATLAB applied on some examples, single-input-output systems transfer function, and dynamic performance of the close-loop systems, traxtul method, states feedback, different examples of pen-loop systems with all poles transfer function and others with others zeros/poles transfer function.

0203454: Industrial Electronics (1)
Introduction to power diodes, Transistors and thyristors, Rectifier circuits, Turn-off and-on (tiring) circuits for thyristors, Controlled rectifiers, Static switches, Voltage controllers, DC choppers, Un-interruptible power supplies.

0203455: Antennas and Wave Propagation
Principles of have propagation – Types of antennas: Wire antennas, Aperture antennas, Array antennas, Reflector antennas and lens antennas. Arrays: Linear, Planar, circular and voltage arrays- Calculations of far field parameters of dipole, monopole and loop thin wire antennas- Brief description of behavior of
medium frequency (MF), high frequency (HF), very high frequency (VHF), Ultra high frequency (UHF) and super high frequency (SHF) antennas-
Radiation and propagation of the electromagnetic wave in different mediums-
Fundamental of radar systems- Active microwave devices: Microwave tables and circuits – semiconductor microwave devices and circuits.

**0203456: Electronic Circuits (2)**

**0203457: Digital Circuits**

**0203458: Microprocessors**

**0203459: Industrial Electronics (2)**

**0203460: Control of Industrial Operations**
0203461: Digital Control
State-space analysis, discretization of continuous-time systems, (iapunov stability analysis of discrete-time systems, controllability), absorbability, design of discrete time system via pole placement, design full ovcler and reduced order observers, polynomial equation approach to control systems design, design of model matching control systems, introduction to optical control.

0203462: Computer System Programming

0203463: Computer Architecture

0203464: Computer Interfacing Circuits

0203465: Optical fibers

0203466: Microprocessors
Basic structure of computer hardware – Addressing modes and program sequence – Basic memory operations – Computer instructions and their sequence – Addressing modes – Hardware of the control unit – Software of the control unit – Arithmetic and logic unit – Main memory system – RAM – Virtual memory – Cache memory.
**0203467: Microwaves Circuits**

**0203468: Power system control**
Important of control power system – Control of power system substation – Control study of generators- Control study of feeders- Control system of voltage and AVR – Load Frequency control – Control of connected line between large scale power system – Multi-level control- Construction and operation of different power system stabilizer – Programmable stabilizer – Static VAR compensators- Control system of HVDC- SCADA system control.

**0203469: Power Systems Protection**
4. Post-Graduate Diploma Courses

4.1. Diploma in Electrical Power and Machines Engineering

0203501: Power system analysis (1)
Electrical power system models – Solving equations of electrical power system- Power flow analysis and numeric calculation – Three phase symmetrical faults – symmetrical component – Unsymmetrical faults analysis – Power system stability – Voltage stabilizer and power factor correction - Effect of feeders on power system stability- Study of different control methods on power system.

0203502: Economics of Energy (1)

0203503: Switching and Protection Apparatus (1)
Protective relays in electric power systems, Protection against overcurrent, Differential protection, Distance protection, Carrier current protection, Generator protection, Transformer protection, Busbar protection, Interruption of AC and DC currents, Restriking voltage, Fuses, Air circuit breakers, SF6 circuit breakers, Oil circuit breakers, Vacuum breakers, Digital circuits applications in protective relays, Amplifiers and measuring circuits, Electronic circuits in static relays comparators and level detectors, Static overcurrent relays, Static differential protection, Distance protection using static relays.

0203504: Advanced Electrical Machines (1)
0203505: Variable Speed Drives (1)

0203506: Numerical Analysis & Computational Methods (2)

0203507: Power Systems Analysis (2)

0203508: Economics of Energy (2)
Economic operation of combined thermo power stations and hydro power stations – Effect of open circuiting transmission lines in closed loop power system, and transmission lines in closed loop power system, an transmission losses – loss formula using complex current distribution – Calculation of energy losses in power transformers and methods of their reduction – Incremental fuel costs representation – Power factor and its effect on power system network – Power factor improvement methods.

0203509: High Voltage Engineering (2)
Introduction, Conduction and Breakdown in gases, Conduction and breakdown in insulating liquids, Conduction and breakdown in insulating solids, High voltage generation (DC, AC and impulse) High current generation, HV measurements, High voltage testing.

0203510: Advanced Electrical Machines (2)
speed control of AC motors (polyphase) - Speed control of single phase motors - Rating selection, and maintenance of electrical machinery.

0203511: Special Electrical Machines (1)
Linear motors - Stepper motors - Servo motors- Tachogenerators.

0203512: Project
Students implement (individually or in teams) a practical applied project under the supervision of one or more of faculty members.
4.2. Diploma in Communications Engineering

0203513: Analog & Digital communication Theory (1)

0203514: Antennas and Wave Propagation

0203515: Electronic & Digital Circuits
Principles of operational amplifiers- Linear circuits with operational amplifiers- Differentiating and Integrating circuits- Amplifiers in measuring devices – Practical limitations of operational amplifiers- Determination of Frequency- Popular circuits of oscillators- Crystal oscillators- Tuned amplifiers- Active Fillers- Butterworth and Chebyshev approximations- Analogue mixtures- Variation of amplitude and frequency- Equalizers- characteristics of digital signals- characteristics of digital gates- Digital circuits families- Analogue to Digital and Digital to Analogue converters- Sequential circuits - Transistor - Transistor logic circuits

0203506: Numerical Analysis & Computational Methods (2)

0203516: Electronic Exchangers
0203517: Electronic Measurements
Introduction in measurements techniques – comparison between measurements by using analog devices and digital devices. Digital devices: (vibration measurements – integral circuits to transform the voltage to number of pulses – transform circuits from numbers to digital data – Using decimal point to change measurements range and units. Introduction in measurements techniques of microwave field: (Bolometer and uses in power measurements of microwave – Using Transmission Line Lattice Diagram - Interfacing circuits cards between measured signals and personal computer.

0203518: Electronic Circuits Analysis using Computer

0203519: Electronic Circuits used in Microwaves
Operation theory and applications of capacitive rectifiers – Types of microwave capacitive rectifiers – Applications of capacitive rectifiers: Parametric amplifier, harmonic generators, frequency down conversion and up conversion oscillators – Applications of negative resistance rectifiers in microwave circuits – Shortwave transistors and their applications – Integrated circuits in microwave.

0203520: Theory of Analog and digital communications (2)
Transmission in databases: different methods and probability of error – Effects of noise in AM and PM circuits – Methods of digital modulation – Methods of digital transmission of analog signals.

0203521: Active Filter design

0203522: Microprocessors
0203523: Project
Students implement (individually or in teams) a practical applied project under the supervision of one or more of faculty members.
4.3. Diploma in Computers & Systems Engineering

**0203506: Numerical Analysis & Computational Methods (2)**
Solution of equations using computer, algebra of matrices and its use in the solution of equations, reduction of equations techniques, curve fitting, numerical integration and its techniques, interpolation and extrapolation, solution of ordinary and partial differential equations.

**0203524: Automatic Control**
System representation and system properties (transfer functions, state space), root locus, frequency response, controller design using the root locus and the frequency response using MATLAB applied on some examples, single-input-output systems transfer function, and dynamic performance of the close-loop systems, traxtul method, states feedback, different examples of pen-loop systems with all poles transfer function and others with others zeros/poles transfer function.

**0203525: Computer Architecture**
Number system, Integer and floating-point representation, character codes, Central Processing Unit, ALU, Arithmetic and logic operations, Hardwired and Micro Programmed design concept, Memory, Memory types, address decoding, Peripheral Devices, I/O devices, interrupts, I/O Controllers, DMA

**0203526: Systems Engineering**
Introduction to discrete-time systems: Z-transform-difference equations-defined order systems-Fourier analysis: Fourier transform-linear spectra and Fourier series- discrete Fourier series and fast Fourier transform-continuous-time systems-digital processing of continuous –time signals-Hilbert transform-Laplace transforms-widows-extrapolation and Hilbert transforms

**0203527: Computer Programming and Operation**
Overview of system programs – Sequential equations – Compilers - interpreters – linkers -.Line editors – Debuggers – Operating systems.

**0203528: Industrial Processes Control**
Introduction to process control and Instrumentation -Analog signal conditioning-Digital signal conditioning-Thermal sensors-Mechanical sensors-Optical sensors-Final control-Controller principles-Analog Controllers-Discrete state process control-PID controllers- Industrial networks- SCADA&DCS.
0203529: Microprocessor Applications

0203530: Power Electronics

0203531: Modern Trends in Automatic Control
Time response of control systems, control systems analysis in time domain, time response analysis and state space representation, controllability and absorbability of control systems, control systems stability test using Lubnou criterion, pole placement method, adaptive control systems, control systems design using neural network and fuzzy logic.

0203532: Project
Students implement (individually or in teams) a practical applied project under supervision of one or more of faculty members.
4.4. Diploma in Electronics Engineering

**0203506: Numerical Analysis & Computational Methods (2)**

**0203533: Electronic devices (1)**
Electronic Devices basic theory- terminal functions of p-n junction- two junction devices, unijunction devices, bulk devices, surface devices, thin-film devices, integrated circuits

**0203534: Electronic Circuits (3)**

**0203535: Laser and Applications**
Electromagnetic wave propagation theory, propagation of light and laser beam in optical systems Propagation of Gaussian beam in continuous medium, resonant, optical systems, wave nature of particles Laser generation with resonance and amplification, types of laser, excitation of laser systems, industrial and medical applications of laser

**0203536: Integrated Circuits Technology**
Fabrication processes of integrated circuits, physical and chemical effects in fabrication processes, integrated circuits test and measurement of during fabrication processes, technical properties of integrated circuits, Electrostatic discharge ESD, Yield, Packaging.
0203537: Measurement and Instrumentation
Elements of a measurement system, Instrument types and performance characteristics, Measurement errors, noise, and sensor calibration, overview on test instruments, Intelligent device and smart sensors, Instrumentation computer network, Displays and data recording, Sensor technologies, Measurement of temperature, flow, pressure, level, mass and force, pH measurement, Gas sensing.

0203538: Electronic Devices (2)

0203539: CMOS Analog Integrated Circuits

0203540: Digital Electronic Circuits
Logic circuits: Gate-level design- Design of medium-scale integrated circuits- Design using FPGA, Sequential Circuits: Synchronous and Asynchronous circuits- Logic circuits families- Interfacing circuits.

0203541: Microprocessor
0203542: Digital System Design Using VHDL
Overview on FPGA structures and vendors. Design tools used to implement basic circuits. VHDL, as a programming language, and design examples and implementation. Advanced designs flow, Integrating the FPGA with external peripherals including the analog environment and simple signal processing applications. Projects will be assigned for course evaluation. Introduction to VHDL-AMS.

0203543: Project
Students implement (individually or in teams) a practical applied project under supervision of one or more of faculty members.
4.5. Diploma in Power System Operation and Control

0203544: Power system analysis

0203545: Power System Control
Power system stabilizer – Stabilizer design using MATLAB software packages – Control of generation voltage based on excitation circuit control - Governor speed – Control of isolated network frequency – Control of frequency and power for unified network with multi-area – Optimal control – Economic generation control – SCADA system.

0203546: Harmonics in Power systems

0203547: Filters for Harmonics in Power Systems
Source and adverse effect of harmonics - conventions methods of reductions of harmonics static filter for harmonics – Active series and parallel filter – using of active filter for resonance loads – Harmonic resonance

0203548: Power systems power quality
Definition of Power quality – problems of voltages - index of power quality – improve of load power factor – three phase parallel loads – Harmonics in electrical distribution network

0203549: Stability of Voltage in Power systems
0203550: Stability of Electrical Power Systems

0203551: Flexible AC Transmission Systems (FACTS)
Flexibility of AC transmission systems, FACTS for reactive power compensation, controlled capacitors in cerise, Power regulates.

0203552: HVDC Systems (operation and Control)
HVDC components, Operation of HVDC systems, Bifercation, DC Transmission lines, Control systems, HV DC converters (in series and parallel), harmonics in HVDC systems, Harmonic filters, grounding in HVDC systems.

0203553: Power Electronics

0203506: Numerical Analysis & Computational Methods (2)

0203554: Protection and Switch gear Devices

0203555: Project
Students implement (individually or in teams) a practical applied project under supervision of one or more of faculty members.
### 4.6. Diploma in Industrial Electronic Applications in Power Systems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0203556</td>
<td>Static VAR Compensators</td>
<td>Type and theory of static Var compensation - harmonic due to static Var compensation – Control of compensation – Static Var compensation – Application of static Var compensation networks</td>
</tr>
<tr>
<td>0203557</td>
<td>Power Electronics</td>
<td>DC-DC converters (choppers), DC-AC Inverters, Single-phase and three-phase converters, Electronic transformers using zero-current switching, switching of DC power supplies, Power conditioners, Un-interruptible power supplies.</td>
</tr>
<tr>
<td>0203558</td>
<td>Flexible AC Current Transmission Systems</td>
<td>Flexibility of AC transmission systems, FACTS for reactive power compensation, controlled capacitors in series, Power regulators, Static VAR compensators parallel and series static VAR compensators, Active power filters.</td>
</tr>
<tr>
<td>0203559</td>
<td>Power System Control</td>
<td>Power system stabilizer – Stabilizer design using MATLAB software packages – Control of generation voltage based on excitation circuit control - Governor speed – Control of isolated network frequency – Control of frequency and power for unified network with multi-area – Optimal control – Economic generation control – SCADA system.</td>
</tr>
</tbody>
</table>
0203562: Power System Networks
Short circuit calculation – calculation of power flow – calculation of power system stability.

0203506: Numerical Analysis & Computational Methods (2)

0203563: Speed Control in electrical motors Using industrial electronics
Speed control in dc motor using electronic converters- speed control in Ac motors by voltage control, in stator side, using voltage inverters- Rotor voltage control- control by frequency, voltage and frequency-voltage, frequency and current.

0203564: Project
Students implement (individually or in teams) a practical applied project under supervision of one or more of faculty members.
5- Courses for Master and Ph.D. degrees

5.1. Electrical Power and Machines Engineering

0203601: Electrical power (1)

0203602: High Voltage Engineering (1)
Numerical methods for computing electric field distributions in electric power systems, Computational methods (finite elements, finite differences, charge simulation, successive imaging, Monte Carlo), Overvoltage on HV systems and traveling waves of HV lines, Protection against overvoltage, HV testing.

0203603: Power Systems Networks (1)
Short circuit calculation – calculation of power flow – calculation of power system stability.

0203604: Energy Conversion and Utilization (1)
Conventional methods for energy conversion how methods for energy conversion – Magneto hydrodynamic generator – Thermoionic generator – Nuclear Power stations

0203605: Advanced Electrical machines (2)

0203606: Variable Speed Drives (2)
DC drives – Closed-loop control of DC drives – Closed-loop control of AC drives (Induction and synchronous drives) stepper motor.

0203607: Special Electrical Machine (2)
Synchronous Motors: (Introduction, Principle of operation, current locus, V curves, power angle characteristic, two reaction theory, excitation circuits, methods of starting, applications) - Reluctance Motors: (Introduction, vector diagram, constant Voltage Operation, input current locus, characteristics using variable Frequency Source, maximum power factor, application) - Stepper Motors: (Introduction, principle of operation, motor characteristic and
performance equations, applications) - Linear Induction Motors: (Introduction, principle of operation, vector diagram, equivalent circuit, performance, equation, motor characteristics, motor testing, applications)

0203608: Engineering mathematics (1)
Properties and applications matrices, Uncertainty vector analysis, Laplace transforms, Fourier transforms, Harriky transforms, Walsh transforms.

0203609: Numerical Analysis & Computational Methods (3)

0203610: Advanced Power Electronics (1)
Introduction to the history and applications of power electronics – Bipolar junctions – Thyristors – Components of industrial control circuits – DC motor control circuits – AC motor control circuits – Variable frequency control circuits – Analog and digital transducers – Programmable logic controllers in process control.

0203611: Medium and HV Power Cables:
Cable Characteristics, Materials and Designs, Degradation and failures, Cable Manufacturing, Diagnostics

0203612: Power System Management and Electricity Markets:

0203613: Distributed Generation:
DG Definitions and Standards, DG potential, DG Technologies, Distributed generation applications, Operating Modes, DG interconnection, Interconnection Requirements, Power Quality Issues, Reliability, Protection Issues, Islanding, DG Cost Issues

0203614: Electric Safety and Grounding System Design:
and Standards, Low Voltage Safety Synopsis, Medium and high Voltage Safety Synopsis, Human Factors in Electrical safety, Safety Management and Organizational Structure.

0203615: Electric power materials:

0203616: Electrical Power Systems (2)
Generation planning – Analysis of generation cost forecasting loads - Different generation of Power system – Power system reliability - Effect of generation on environment.

0203617: High Voltage Engineering (2)

0203618: Electrical Power Systems (2)
Security of electrical networks – Calculation of load flows – Stability of networks with multi-machines – Control of Frequency – Control of Speed – Control of Voltages of different lines and bus bars and transformers

0203619: Energy Conversion and Utilization (2)
Thermoelectric generator, The fuel cell – The solar energy – The photo cells, different connections and their types – Wind energy and electric generation by it – Different systems of renewable energy.

0203620: Advanced Electrical Machines (3)
0203621: variable speed motors (3)

0203622: Special electrical machines (3)

0203623: Engineering Mathematics (2)
Interpolation using splice technique, constrained optimization techniques, Estimation of states, linear programming, dynamic programming.

0203624: Stochastic Processes

0203625: Power electronics (2)

0203626: Power quality

0203627: Harmonics in Power Systems Harmonic
0203628: FACTS & HVDC Systems Operation

0203629: Asset Management and Risk Assessment of Power Systems:

0203630: Introduction to Smart Grid:

0203631: Electromagnetic compatibility in power systems:
0203632: Electric Power Transients:
Fundamental notions about electrical transients – simple switching transients – damping – traveling waves on transmission lines – lightning – the protection of the systems and equipments against transient over voltages – computer aids to the calculation of electrical transients – system and circuit parameter values for use the transient calculations – equipment for measuring transients – measuring techniques and surge testing.

0203633: Power Electronics and Applications for Renewable Energy
Introduction and review of power electronics, Sustainable energy technologies as wind energy, solar power, wave energy, fuel cells and hydrogen and gas are described - The description of using power electronics for conversion, control and monitoring of electric energy - Methods for analyzing converters (AC/DC, DC/AC, DC/DC) including resonance converters for design - Selection of converter topologies, power semiconductors and passive elements - Design of switch-mode converters with galvanic isolation specifications - Converters: Choice and analysis of topologies. Steady state transfer functions. Voltages and currents in the circuit - Continuous and discontinuous conduction mode - Isolated converter topologies - Selection of power-semiconductors, passive components and Snubber circuits - Design of magnetic components: Inductors and transformers - Filters: Input and output filters - Control: Choice and design of control and protection circuits (Error-amplifiers, Auxiliary supply, undervoltage - and overvoltage protection, current limit etc.) - Driver circuits PWM-, voltage- and current-mode control - Laboratory Practical considerations w.r.t. construction of - and measurement on switch-mode converters: Integration of wind turbines into power systems, Integration of Photovoltaic system into power systems - Power electronics in the power system is described, like HVDC and FACTS – Revision and summary of the module.

0203634: Power System Networks and Smart Grid
Introduction - The analysis of power systems under normal, steady state operating conditions; a statement of the optimal operation problem and the constraints on possible solutions - The state estimation of power system under steady-state operations with measurement from phasor measurement unit (PMU) - Power system contingency analysis under N-1 security criterion using DC load flow with contingency ranking - Power system stability: transient and small signal stability, low frequency inter-area oscillation, voltage stability and rotor angle stability - The types and causes of power system faults; balanced faults and short circuit levels; symmetric components, sequence impedances and networks; the analysis of unsymmetrical faults. Review of the impact of faults on power system behavior; issues affecting protection scheme characteristics and clearance times; the need for protection redundancy and its implementation.
as local or remote backup; zones of protection and the need for coordination -
Electricity market models; pricing strategies; market for ancillary services; demand side - Microgrid: Renewable Energy Integration towards the smart grid - Using a smart grid to evolve the perfect power system - The smart grid architecture - The Smart Grid: Enabling Demand Response - The Dynamic Energy Systems Concept - Revision and summary of the module.

0203635: Renewable Kinetic Energy Technologies
Placement: wind-atlas, atmospheric boundary layer and turbulence, influence of the terrain and annual wind distribution - Aerodynamics: Two-dimensional aerodynamics and three-dimensional effects - Use of strip theory to determine the energy production for a rotor with a given twist and chord distribution - Control of a wind turbine (stall-, pitch-, and variable speed control) - Structure: Aerodynamic and inertial loads - Computation of the fatigue loads - Grid connections or standalone application as wind diesel or pumps - Electrical conditions: Calculation of electromagnetic components - Generator topologies including geared generators vs. direct drive generators, and converter connection vs. direct grid connection - Review of Hydrodynamics resource: Water turbine types - Conventional hydropower including micro-hydro. Revision

0203636: Photovoltaic Energy Technologies

0203637: Power System digital protection
wide data integration and information extraction- Topology tracking and state estimation- Wide-area disturbance monitoring- Wide-area protection systems (out-of-step, load shedding).
5.2. Electronics & communications Engineering

**0203609: Numerical Analysis & Computational Methods (3)**

**0203638: Quantum Electronics**

**0203639: Semiconductor Devices**
Nanometer CMOS, BiCMOS and SOI Technologies, SiGe, InP, GaAs technologies, Strained Semiconductor, Multigate FETs, Ultra-thin body MOSFET, Short channel effects and Leakage currents in CMOS technology, diode – Varactor – photodiode – Solar cell – light emitting diode- LASER diode – Tunnel diode, High electron mobility transistor(HEMT), noise sources in MOSFET, BJT and resistors.

**0203640: VLSI Test Principles**
The course covers the basics of VLSI test principles and design for testability (DFT) architectures with some details on subjects used in industry, including logic and fault simulation, test generation, logic Built-in-self-test (BIST), test compression, logic fault diagnosis, memory testing, boundary scan and core-based testing and analog and mixed-signal (AMS) testing. Delay testing, and physical failures, soft errors and reliability issues. The course briefly discusses FPGA testing, MEMS testing, high-speed I/O (link) testing, and RF testing.

**0203641: Data Communication Networks (1)**
0203642: Microcomputers Engineering (1)

0203643: Design of Digital Integrated Circuits:

0203644: Digital Signal Processing for communications (1)

0203645: Microwave Theory and Propagation (1)

0203646: Television Engineering (1)

0203647: Laser Applications (1)
0203648: Computer Interfacing Circuits (1)

0203649: Artificial Neural Networks

0203650: Wireless Communications
Wireless channel characterizations – Digital communication in wireless communication systems – Diversity systems – Coding in wireless communication systems – Wireless channel capacity – Multiple input multiple output (MIMO systems) – Code division multiple access (CDMA) – Orthogonal frequency division multiple access (OFDMA) – Advanced topics such as cooperative communication and coding in networks.

0203651: Power Line Communications
Introduction and historical overview of power line communications (PLC) – Transmission line theory – PLC channel characterization – Coupling and injection circuits – Digital transmission techniques for different PLC systems – Transmission protocols for PLC systems – Industrial and international standards on PLC-based networking Technologies – Examples of implemented systems such as PLC smart grid systems, PLC broadband access systems, multimedia PLC systems and DC-PLC systems.

0203652: Information Networks
Overview of computer networks – Application layer services and the most popular protocols : http, smtp, DNS, … – Transport layer services TCP protocol; flow control, congestion control, and error control – Network layer IP protocol, IP addressing, routing famous routing algorithms – Data Link Layer, MAC and LLC sub layers LAN protocols – Ethernet , Token Ring, FDDI LAN and their protocols.

0203653: Sensor Fusion
0203654: Essentials of Cognitive Radio

0203655: Digital System Design Using VHDL
Overview on FPGA structures and vendors. Design tools used to implement basic circuits. VHDL, as a programming language, and design examples and implementation. Advanced designs flow, Integrating the FPGA with external peripherals including the analog environment and simple signal processing applications. Projects will be assigned for course evaluation. Introduction to VHDL-AMS.

0203656: Data Converters:
the course covers the theory and design of digital to analog and analog to digital converter architectures including Nyquist rate and oversampled converters. The course starts by providing the necessary background knowledge to properly understand data converters including the data converter specifications. Then it proceeds to explain the Nyquist rate D/A converters including the resistor, capacitor and current based architectures. Then it explains Nyquist rate A/D converters including Flash, Sub ranging, Folding and Interpolation, time interleaving and pipeline ADCs. The oversampling ADCs including Sigma-Delta converters will also be covered. The course also covers the CMOS-based circuits used in data converters

0203657: Stochastic Processes

0203658: Optoelectronics Devices
0203659: Nanoelectronic Devices
Nanometer MOSFETs- multiple gate field-effect transistor (MuGFET) - Nano-Electro-Mechanical systems (NEMS), Single electron transistor- carbon nano tube- Quantum wire- Quantum Well - Quantum Dots.

0203660: Electronic Measurements (2)

0203661: Design of Electronic Circuits Using Computer (2)

0203662: Microcomputers Engineering (2)

0203663: RF Analog Integrated Circuits
Short channel effects, noise sources and models, Current sources and current mirrors, current and voltage references, Bandgap reference , CMOS Amplifiers, RFIC System Overview, Low Noise Amplifiers, Mixers, Voltage-Controlled-Oscillator, Phase-Locked-Loop, Power Amplifiers.

0203664: Digital signal processing (2)
0203665: Microwave and Wave Propagation Theory (2)
Passive microwave components and devices: Microstrip transmission media and circuit. Microstrip antennas. Microwave generation. Microwave communications systems and subsystems. Detectors used in wireless communication systems. Operating principles for microwave antennas used in modern communications systems propagation principles, models of wave propagation and mobile and cell antenna designs.

0203666: Television engineering (3)

0203667: Laser & Applications (2)

0203668: Computer Interfacing Circuits (2)

0203669: Digital communications (3)
Source coding – Fundamentals of channel coding – Perfect signal receiving in presence of Gaussian noise – Fundamentals of CDMA and OFDMA.

0203670: image and Video coding
Introduction to image signal processing – 2D transformations – Image compression – Image enhancement – Detection of image elements – Introduction to encryption and video signal processing – Motion detection in video sequences.
0203671: Advanced Topics in Wireless Communications

0203672: Space-Time Coding for Wireless Communication
Review of single-input single-output (SISO) antenna and single-input multiple output (SIMO) antenna communication systems – Error probability analysis – Space-Time Trellis Coding (STTC) – Space-Time block coding (STBC) – Multiple-input multiple output (MIMO) information theory – Other MIMO techniques such as spatial multiplexing, BLAST-type schemes, linear dispersion (LD) codes, refined LD codes – Space-time coding for frequency-selective channels - Cooperative (relay-assisted) transmission.

0203673: Advanced Antennas Engineering

0203674: Introduction to Optimization

0203675: Queuing models in Engineering Systems
0203676: Broadband Communication Networks
Fundamentals of broadband communication networks architecture, Switch fabrics, design methodology; traffic management, connection admission control (CAC), usage parameter control (UPC), flow and congestion control; capacity and buffer allocation, service scheduling, performance measures, performance modeling and queuing analysis.

0203677: Information and coding theory
An introduction to information measures, entropy, mutual information and information divergence, noiseless codes and the noiseless coding theorem, channel capacity for discrete and continuous channels, randomly chosen code words, the noisy coding theorem, error rate exponents, computational cut-off rate and its application in digital communications.

0203678: Techniques in Electromagnetic Compatibility
Introduction to electromagnetic compatibility (EMC) and Definitions - EMC Requirements and Regulations - Review of Transmission Lines and EM Theory - Non Ideal Behavior of Circuit Components - Radiated Emission and Susceptibility – Crosstalk - Grounding and Shielding Concepts - Electrostatic Discharge - System Design for EMC

0203679: Design of Wireless RF Systems
Introduction to wireless systems - Noise and distortion in microwave systems - Antennas and propagation - Filter theory and design - Amplifiers - Mixers - Transistor oscillators and frequency synthesizers - Use of RF CAD tools - Microwave systems.

0203680: Optoelectronic Integrated Circuits
Optical Receiver Fundamentals, Integrated Photodiodes, Tranimpedance Amplifiers, Post-Amplifiers, output driver, Optical Transmitter, Laser diodes, Laser drivers, Clock data recovery, Equalizers circuitry

0203681: Low Power Digital Integrated Circuits
Quality Metrics of a Digital Design, Trends in Process Technology, Technology Scaling, Power analysis, Static and dynamic power, Low-power design techniques, Low power combinational logic, Low power Sequential logic, Low power data path, System level considerations.

0203682: Medical Instrumentation
Overview of measurement systems- Instrument types and performance characteristics- Basic sensors and principles- Biopotential- Biopotential
electrodes- Signal conditioning, filters and biopotential amplifiers- Instruments in medical practice- Instruments in the research laboratory.

**0203683: Medical Imaging**
Information content of an image- X-rays imaging and computed tomography (CT) X-rays imaging-Ultrasound imaging- Magnetic resonance imaging (MRI)- Single Photon emission computed tomography (SPET) imaging- Positron emission computed tomography (PET) imaging- Medical image processing and analysis.

**0203684: Medical Signal Processing**
Overview of a medical signal processing system- Fundamental of medical signal characteristics- Signal detection and Modeling- Signal transformation- Signal filtering, smoothing and noise reduction- Adaptive and statistical signal processing-Electrocardiographic (ECG) signal processing- Electroencephalographic (EEG) and Electromyographic signal processing- Processing of signals of auditory and visual systems- Voice and speech signal processing for medical diagnosis.

**0203685: Introduction to MEMS Design**
Introduction to MEMS, Microfabrication Fundamentals, Forces, Mechanics, Microsystem Fabrication Processes, Bulk Micromachining, surface Micromachining, Design Principles, wafer bonding and packaging, MEMS Design Case Studies.
5.3. Computers & Systems Engineering

0203609: Numerical Analysis & Computational Methods (3)

0203686: Advanced Topics in Automatic Control (1)
Review of classical methods of controller design, state space, ideal control, control systems identification, adaptive control, introduction to neural networks and fuzzy logics, intelligent control such as neural networks and fuzzy logic, case study using fuzzy logic, and system identification using MATLAB package.

0203687: Advanced Power Electronics (1)
Introduction to the history and applications of power electronics – Bipolar junctions – Thyristors – Components of industrial control circuits – DC motor control circuits – AC motor control circuits – Variable frequency control circuits – Analog and digital transducers – Programmable logic controllers in process control.

0203688: Operating systems (1)

0203689: Computer Architecture (1)
History of microprocessor architecture – assessing performance - Instruction sets - design of processor datapath and control - handling interrupts and exceptions - design of a simple pipeline - design of the memory hierarchy: cache and virtual memory - mass storage and other peripherals

0203690: Computer Applications (1)
Design and construction of a microprocessor based computer system. Students will learn how a computer operates at the chip level and develop an understanding of the interdependence of hardware and software. Students will develop circuitry and software to control CPU interaction with SRAM, ROM and peripheral chips, as well as reset and boot-up control and interrupt handling.
0203691: Digital Control (1)
State-space analysis, discretization of continuous-time systems, (iapunov stability analysis of discrete-time systems, controllability), absorbability, design of discrete time system via pole placement, design full ovcler and reduced order observers, polynomial equation approach to control systems design, design of model matching control systems, introduction to optical control.

0203692: Switching and Logic Circuits (1)

0203693: Neural Networks (1)

0203694: Fault-Tolerance in Computer Circuits (1)
Techniques for designing and analyzing dependable and fault-tolerant computer-based systems. Topics addressed include: fault, error, and failure cause-and-effect relationships; fault avoidance techniques; fault tolerance techniques, including hardware redundancy, software redundancy, information redundancy, and time redundancy; fault coverage; time-to-failure models and distributions; reliability modeling and evaluation techniques, including fault trees, cut-sets, reliability block diagrams, binary decision diagrams, and Markov models. In addition, availability modeling, safety modeling, and trade-off analysis are presented.

0203695: Artificial Intelligence (1)
Introduction to artificial intelligence-artificial intelligence(AI) systems-artificial intelligence applications-structure of AI systems-presentation-learning-neural networks and its applications in AI systems-Intelligent control-fuzzy logics and AI systems

0203696: Model Predictive Control
Introduction; A basic formulation of predictive control; Solving predictive control problem; Step responses and transfer function formulations; Stability issue in predictive control; Tuning issue in predictive control; Robust predictive control; Case study.
0203697: Neural Computing for Control Engineering
Introduction; System Identification (Linear System Identification; Prediction Error Method); Multilayer Perceptron Networks (Artificial Neurons; Artificial Neural Networks); Neural Networks for System Identification (Performance Learning; Training Multilayer Perceptron Networks (MLP); Back propagation; Levenberg-Marquardt Back propagation; Nonlinear System Identification Using MLP; Case study); Predictive Control Using Neural Networks (Introduction to Predictive Control; Linear Plant Model - Generalized Predictive Control; Nonlinear Plant Model - Approximate Predictive Control; Case study).

0203698: Stochastic Processes

0203699: Advanced Topics in Control (2)

0203700: Advanced Power Electronics (2)
Introduction to process control systems – Types of controllers – Link and matching elements – DC motors – AC motors – Process control – Microprocessor and communication systems – Advanced programming methods of programmable logic controllers and their applications – Robot motion control.

0203701: Operating Systems (2)

0203702: Computer Architecture (2)
0203703: Computer Applications (2)
Microcontroller architecture – Operating systems and drivers – compilers –
interrupts – interfacing – Computer networks – case study: platform
development.

0203704: Digital Control (2)
Discrete equivalents, design using state space methods, pole placement,
estimator design, prediction estimators, integral control and disturbance
estimation, linear quadratic steady, state optimal control multivariable control
design, Kalman filter quantization effects, sample rate selection, system
identification, nonlinear control of discrete time systems.

0203705: Switching and Logic Circuits (2)
Design of logic circuits – FSM – ALU design – Design of programmable
microprocessors – Design of advanced digital circuits – Improvement of circuit
performance using probability theory and statistics.

0203706: Neural Networks (2)
Introduction to neural networks and a review of their kinds – Learning methods
– Circuits of multi-layer neural networks – Networks of radial basis functions –
Self-organizing networks – Simultaneous operations – Neuron dynamics –
Implementation methods of neural network circuits – Case study using
MATLAB.

0203707: Fault -Tolerance in Computer Circuits (2)
Techniques for designing and analyzing computer-based systems. Topics
addressed include: fault, error, and failure cause-and-effect relationships; fault
avoidance techniques; fault tolerance techniques, including hardware
redundancy, software redundancy, information redundancy, and time
redundancy; fault coverage; time-to-failure models and distributions; reliability
modeling and evaluation techniques, including fault trees, cut-sets, reliability
block diagrams, binary decision diagrams, and Markov models. In addition,
availability modeling, safety modeling, and trade-off analysis are presented. The
course will also include a research project and investigation of current topics.
0203708: **Artificial Intelligent (2)**
Introduction to Artificial Intelligence, automated reasoning, visual perception, Understanding Natural Languages, Knowledge Representation, Expert System, Pattern Recognition, Artificial neural network, AI Programming Language

0203709: **Graph Theory**
Introduction to graph theory; Basic concepts in graph theory; Trees and forests; Spanning trees; Fundamental properties of graphs and digraphs; Connectivity and flow; Planar graphs; Graph Coloring; Graph counting; Graph algorithms.

0203710: **Pattern Recognition**
Introduction to Pattern Recognition, Feature Detection, Classification; Review of Probability Theory, Conditional Probability and Bayes Rule; Random Vectors, Expectation, Correlation, Covariance; Decision Theory, ROC Curves, Likelihood Ratio Test; Linear and Quadratic Discriminants, Fisher Discriminant; Training Methods, Maximum Likelihood and Bayesian Parameter Estimation; Linear Discriminant/Perceptron Learning, Optimization by Gradient Descent; Support Vector Machines; K-Nearest-Neighbor Classification; Non-parametric Classification, Density Estimation, Parzen Estimation; Mixture Modeling, Expectation-Maximization; Hidden Markov Models, Viterbi Algorithm, Baum-Welch Algorithm; Bayesian Networks.

0203711: **Linear Matrix Inequalities (LMIs) in Control Systems**
Introduction (LMIs definition and properties; Software and some aspects of linear algebra) - Fundamental issues in optimization (Linear, quadratic and semi-definite programs; Basics of convex analysis: Convex sets, functions, hulls Convex programs and relevance of convexity) - Dissipativity and Nominal Performance (A Tour d’Horizon Quadratic performance; H∞ performance, passivity, H2 performance ; From nominal to robust performance) - Robust Performance (Single-Objective Synthesis: State-feedback, Output-feedback, General framework; Mixed-objective Synthesis; Multi-objective H2/H∞ control; LMI regions) - Robust Stability (Robust stability against time-invariant and time-varying uncertainties; Parameter dependent Lyapunov functions; Semi-infinite LMI problems and relaxations) - Linear fractional representations (Robust stability tests with multipliers; Relations to the structured singular value) - Robust and Linear Parameter-Varying (LPV) synthesis (State-feedback synthesis, estimator synthesis; Linear parametrically-varying controller synthesis) - Case study.
0203712: Machine Learning

0203713: Computer Vision:

0203714: Advanced object-oriented programming
The fundamentals and advanced techniques of object-oriented programming in C++- Object-oriented inheritance techniques- Advanced techniques with functions- Memory and resource management- Namespaces- Run time type information- Templates and generic programming- C++ Template metaprograming- The Standard Template Library (e.g., algorithms, containers and iterators)- Input/output with C++ iostreams library- Exception handling- C++ and Efficiency issues- Effective C++ design guidelines.

0203715: Probabilistic Inference

0203716: Data mining and knowledge discovery
Overview of data mining and description of data mining concepts – The data mining process (CRISP-DM) – Naïve Bayes and nearest neighbor – Decision trees – Mining association rules – Mining time series data – change point discovery – motif discovery – causality analysis – Brief introduction to Graph theory – Mining Graph data – Rough set theory and its applications in data mining.
DEPARTMENT OF MINING AND METALLURGICAL ENGINEERING
TABLES FOR POSTGRADUATE STUDIES COURSES OF
THE MINING AND METALLURGICAL ENGINEERING DEPARTMENT
1. Qualifying Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the mining and Metallurgical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 15 credit hours from the level of 400 chosen depending on his scientific and professional background from the following table:

**Table (4-1)**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Weekly hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Exercises/Lab.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0204401</td>
<td>Engineering Geology</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0204402</td>
<td>Introduction to mining engineering</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td>0204403</td>
<td>Principles of metallurgical engineering</td>
<td>2</td>
<td>2</td>
<td>3</td>
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<tr>
<td>0204404</td>
<td>Rock mechanics</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>0204405</td>
<td>Ore dressing engineering (1)</td>
<td>2</td>
<td>2</td>
<td>3</td>
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2. Preliminary Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the mining and Metallurgical Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 12 credit hours from the level of 400 or above chosen depending on his scientific and professional background from the following table:

**Table (4-2)**

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<td>Computer applications in mining and metallurgy</td>
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<td>0204427</td>
<td>Fundamentals of drilling engineering (1)</td>
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3. Professional Diploma Studies

Include a group of courses for Engineering graduate students. The student studies a number of courses, which he has not studied before, equivalent to 18 credit hours from the level of 450 chosen depending on his undergraduate field of study from the following table:

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4. Post-Graduate Diploma Courses

In this study, 18 credit hours must be selected from the level of 500 or above from the following diplomas:

### 4.1 Surface Mining Engineering Diploma

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### 4.3 Drilling and Prospecting for an Ores Engineering Diploma

#### Table (4-6)

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### 4.4 Environmental Engineering Diploma

#### Table (4-7)

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### 4.5 Rock Mechanics Diploma

#### Table (4-8)

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### 4.6 Ore Dressing Diploma

#### Table (4-9)

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## 4.7 Metallurgy and Engineering Material Diploma

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### 4.8 Engineering Surveying Diploma

#### Table (4-11)

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5. Master Degree Courses- First and Second Stage

MASTER'S IN ENGINEERING DEGREE

Based on the suggestion from the academic advisor, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 30 credit hours are requested. In addition, an applied research (6 credit hours) must be done to achieve this degree.

MASTER'S OF SCIENCES (M.Sc.) DEGREE

Based on the suggestion from the supervision Committee, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 18 credit hours are requested. In addition, a scientific thesis (18 credit hours) must be done to achieve this degree.
## 5.1 Surface and Underground Mining Engineering Technology

### Table (4-12)

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### 5.2 Drilling and Applied Geophysics Engineering

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### 5.3 Rock Mechanics

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### 5.4 Environmental Engineering

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## 5.5 Ore Dressing Engineering

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## 5.6 Metallurgy and Engineering Material

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## 5.7 Engineering Surveying

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## 5.8 Engineering Geology

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6. Ph.D. Degree Courses

After the students pass the comprehensive exam, 18 credit hours (suggested from the supervisory committee) of level 600 or above must be studied. The proper numbers of credit hours in each semester are not less than 6 credit hours per week. In addition, a scientific thesis (30 credit hours) must be done to achieve this degree.
### 6.1 Mining engineering

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<tr>
<td>0204678</td>
<td>Theories of photo elasticity in mining</td>
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<tr>
<td>0204679</td>
<td>Water quality, its pollutants and treatment</td>
<td>2</td>
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<tr>
<td>0204680</td>
<td>Future of drilling operations</td>
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<tr>
<td>0204681</td>
<td>Theory of waves and theories of blasting</td>
<td>2</td>
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<tr>
<td>0204682</td>
<td>Mathematical modeling in environmental engineering (2)</td>
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## 6.2 Ore Dressing Engineering

### Table (4-21)

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Weekly hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
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<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Exercises/Lab.</td>
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<td>0204683</td>
<td>Modeling and simulation of mineral processing operations</td>
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<tr>
<td>0204684</td>
<td>Planning and design of mineral processing plants</td>
<td>2</td>
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<td>0204685</td>
<td>Dewatering and water recycling (2)</td>
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<td>0204686</td>
<td>Waste recycling of ore dressing plants (2)</td>
<td>2</td>
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<tr>
<td>0204687</td>
<td>Methods of ore concentration</td>
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<td>0204688</td>
<td>Advanced studies in crushing and grinding (3)</td>
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<tr>
<td>0204689</td>
<td>Problems of concentration for some Egyptian ores</td>
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<tr>
<td>0204690</td>
<td>Transportation and powder handling</td>
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<tr>
<td>0204691</td>
<td>Selected topics in ore dressing</td>
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### 6.3 Metallurgy and Engineering Materials

**Table (4-22)**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Weekly hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
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<tr>
<td></td>
<td></td>
<td>Lecture</td>
<td>Exercises/Lab.</td>
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<tr>
<td>0204692</td>
<td>Phase Equilibria for Materials</td>
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<tr>
<td>0204693</td>
<td>Materials selection (2)</td>
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<td>0204694</td>
<td>Surface engineering (2)</td>
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<td>0204695</td>
<td>New and advanced materials</td>
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<td>0204696</td>
<td>Electro- metallurgy</td>
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<td>0204697</td>
<td>Materials and Energy recycling</td>
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<tr>
<td>0204698</td>
<td>Grain refinement of metals and alloys</td>
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<td>0204699</td>
<td>Design of metallurgical equipments and plants</td>
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<td>0204700</td>
<td>Engineering alloys</td>
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### 6.4 Geodesy and Tunnels Surveying

**Table (4-23)**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Weekly hours</th>
<th>Credit Hours</th>
<th>Pre-request</th>
<th>Examine Time</th>
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<tr>
<td></td>
<td></td>
<td>Lecture</td>
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<td>Advanced geodesy</td>
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<tr>
<td>0204702</td>
<td>&quot;GPS&quot; geodesy</td>
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<tr>
<td>0204703</td>
<td>Tunnels surveying</td>
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<tr>
<td>0204704</td>
<td>Hydrographic surveying</td>
<td>2</td>
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<tr>
<td>0204705</td>
<td>Advanced topics at surface and underground Surveying for ore extraction.</td>
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</table>
COURSES DESCRIPTION FOR POSTGRADUATE STUDIES
THE MINING AND METALLURGICAL ENGINEERING DEPARTMENT
1. Qualification courses

**0204401: Engineering geology:**
Study of the earth constitution – Morphology of the earth (Geomorphology) – Structural geology and the relationship with the building and foundation – Study the effect of denudation and erosion on the building and foundation – Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

**0204402: Introduction to mining engineering**
Sources and formation of mineral deposits, different prospecting methods for ores- methods of sampling and reserves evaluation. A brief account on mining operations: such as drilling, blasting and fragmentation, tunneling excavation, supporting and ventilation. An introduction to mining methods and mineral deposits.

**0204403: Principles of Metallurgical Engineering**
An introduction to thermodynamics of metals- An introduction to reaction kinetics- Diffusion in solid materials- Principles of drying, calcination, roasting and reduction processes- Melting of materials- Evaporation and distillation processes and their application in extraction and refining of metals and alloys.

**0204404: Rock mechanics**
Introduction to rock mechanics, definitions, analysis of compressions and tensions, Correlation between the principles compressions and tensions, modulus of elasticity, physical and mechanical properties of rocks. Design of mining openings in consolidated and stratified deposits. Applications of rock mechanics for design some mining methods.

**0204405: Ore dressing engineering (1)**
Theory of crushing and grinding and their tools, crushing and grinding energy, industrial and laboratorial screens, grain movements in liquids and hydraulics, size classification for liquids, cyclone, and evaluation of ore dressing operations. Liquids and suspensions are using to make separation Courses
2. Preliminary Study Courses

**0204425: Advanced Mathematics and Statistics (1)**
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

**0204426: Computer Applications in Mining and Metallurgy**
Programming languages and applications in the fields of mining and metallurgy.

**0204427: Fundamentals of drilling engineering (1)**

**0204428: Principles of blasting engineering**
An introduction to blasting theories in rocks, classification of explosives and blasting materials, methods of firing, special methods for blasting in tunnels and mines.

**0204429: Surface mining engineering & quarries(1)**
Advantages and disadvantages of surface mining, comparison between surface and underground mining, an introduction to stages of surface mining, unit operations in surface mining, surface mining development, surface mining systems, material handling, slope stability interrelation with safety, efficiency and stability of working place.

**0204430: Underground mining engineering(1)**
Basic and parametric criteria in the selection, and development of underground mining systems, underground unsupported methods, underground supported methods, underground caving methods. Strata control methods during ore extraction

**0204431: Ore dressing engineering (2)**
Introduction about the importance of ore dressing in mining engineering, operations of size reduction, methods of volumes separation, methods of ore dressing (magnetic, gravity, electric and flotation). Ore dressing presses such as filtration, drying, economics of ore dressing and waste recycle.
0204432: Extraction of Metals (1)
Introduction- Preparation of iron ores (sintering and pelletizing processes)-
Extraction of iron ores using the blast furnace- Continuous processes for
production of steels- Extraction of some nonferrous metals- Principles of
processes used for refining of metals.

0204433: Physical Metallurgy (1)
Atomic structure and atomic bonding and their effect on the general properties
of the material- Classification of engineering materials according to the type of
atomic bonding- Crystal structures of materials- Mechanical properties and their
tests- Types of binary phase diagrams- Fe-Fe₃C phase diagram and its industrial
importance- Some commercial ferrous and nonferrous alloys and their uses.

0204434 Advanced rock mechanics (1)
Introduction – Classification and index properties of rocks – Rock strength and
failure criteria – Initial stresses of rocks and their measurement – Planes of
weakness in rocks – Application of rock mechanics in engineering for
underground openings - Application of rock mechanics to rock slope
engineering - Application of rock mechanics to foundation engineering – Failure
of an-isotropic brittle rocks – Application of rock mechanics to some mining
methods.

0204435: Introduction to blasting Engineering:
Historical introduction about explosives – introduction to factors affecting rock
breakage by explosives - general classification of explosives and blasting agents
– main properties of explosives and blasting agents – main methods of priming
and firing (safety fuse – detonating cord – electric shot firing) – design of bench
blasts – blasting in tunnels and underground mines- blasting in coal.
3. Professional Diploma Studies

0204450: Advanced rock mechanics (2)

0204451: Structural geology(1)
Study of the earth constitution – Morphology of the earth (Geomorphology) - Structural geology and the relationship with the building and foundation - Study the effect of denudation and erosion on the building and foundation - Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

0204452: Surface mining engineering & quarries(2)
Advantages and disadvantages of surface mining, comparison between surface and underground mining, an introduction to stages of surface mining, unit operations in surface mining, surface mining development, surface mining systems, material handling, slope stability interrelation with safety, efficiency and stability of working place.

0204453: Underground mining engineering(2)
Basic and parametric criteria in the selection, and development of underground mining systems, underground unsupported methods, underground supported methods, underground caving methods. Strata control methods during ore extraction

0204454: Fundamentals of drilling engineering(2)

0204455: Ore dressing engineering (3)
Introduction about the importance of ore dressing in mining engineering, operations of size reduction, methods of volumes separation, methods of ore
dressing (magnetic, gravity, electric and flotation). Ore dressing presses such as filtration, drying, economics of ore dressing and waste recycle.

0204456: Introduction to environmental engineering (1)

0204457: Extraction of Metals (2)
Reducing smelting - Extraction of iron ores using the blast furnace- Continuous processes for production of steels (steel making)- Matte smelting- Extraction of copper- Electrolysis of fused salts- Extraction of Aluminum- Principles of refining processes of metals- Arrangement and order of unit processes in the plant (case study of extraction of copper)- Application of the counter current principle in the production processes for increasing their efficiency and reducing the production cost.

0204458: Physical Metallurgy (2)
Revision for atomic structure and atomic bonding- Crystal structures ,their defects and their effects on the properties of the metallic materials- Mechanical properties and their tests- Binary equilibrium phase diagram with industrial importance- Principles of strengthening of single and multiphase alloys-revision for Fe- Fe$_3$C phase diagram- Principles of heat treatment processes of ferrous and nonferrous alloys.

0204459: Ventilation in mines
Selection of optimum methods of mine ventilation, elements of mine ventilation in development stage, calculation of air quality required for coal mines, calculation of required air quantity for metallic mines. Comparison between various methods of ventilation.

0204460: Economics and marketing of ores
Elements of analytical economy- study of the ore economics and their methods of marketing. Ore specifications required for the market. Buying and selling contracts.

0204461: Mining geophysics
Methods of ore prospecting: gravity, magnetic, electric, and seismic and etc. Basic theories and measurement apparatus, research for menials and ores. Applications of geophysics in mining engineering, civil engineering, geology and monument engineering. Laboratories of engineering geophysics.
4. Post-Graduate Diploma Courses

4.1 Surface Mining Engineering diploma

0204501: Advanced mathematics and statistics (2)
Differential equations- Numerical analysis- Design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204502: Design of surface mining and quarries
Development of surface mining methods. Determination of height and slope of high-wall for surface mining. Material handling and controlling up grades of roads. Type of transportation and loading in surface mining. Essay about mine systems and mining methods.

0204503: safety precautions in surface mining

0204504: Slope stability in surface mining
Studying of the engineering and geological considerations in designing of the best angle of slope- Theoretical analysis of stability, and control of slopes.

0204505: Dynamics of the earth constitution(1)

0204506: Well drilling technology (1)
0204507: Blasting Engineering (1): Rock blasting and its application in mining

0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
4.2 Underground Mining Engineering Diploma

0204501: Advanced mathematics and statistics (2)
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204508: ventilation design in mines
Selection of the optimum methods for mine ventilation, elements of mine ventilation in the development stage, determination of the air quality required for coal mines, calculation of the required air quantity for metallic mines and comparison between various ventilation methods.

0204509: Safety Precaution in underground mining
Safety rules in transportation, power, and blasting for underground mining. Lightness and safety factors in underground mining. Studying the acceptable dust concentration and gasses in rather than comfortable temperatures in underground mining.

0204510: Design and supporting of underground mines and tunnels
Studying the methods of the development of the main galleries in underground mines (Design of the vertical, horizontal and inclined openings). Installation of the underground road ways in the difficult conditions- Calculations of the supporting elements in the normal and difficult conditions.

0204511: Physical & Mechanical Properties of Rocks
Specimens preparation for laboratory tests – Compressive, tensile and shear strength tests of rocks– Strength of rocks under biaxial and tri-axial stresses – Static and dynamic elastic constants of rocks – In situ rockmass testing – hydrological (rheological) properties of rocks – The mechanical behavior of jointed rocks-Rockmass classification- The variety of rock properties: Specific weight –Porosity –Natural water content (moisture water content) – Permeability – Swelling index – Slake durability index.

0204512: Design of underground mines (1)
Design of room and pillar methods (for coal and metals)- Design of long wall mining (for Coal)- Design of caving methods (for metals).

0204513: Advanced rock mechanics (2)
Introduction – Classification and index properties of rocks – Rock strength and failure criteria – Initial stresses of rocks and their measurement – Planes of weakness in rocks – Application of rock mechanics in engineering for
underground openings - Application of rock mechanics to rock slope engineering - Application of rock mechanics to foundation engineering – Failure of an-isotropic brittle rocks – Application of rock mechanics to some mining methods.

0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
4.3 Drilling and Prospecting for an Ores Engineering Diploma

0204501: Advanced mathematics and statistics (2)
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204514: Rock mechanics and rock properties:
Physical, mechanical and hydrological (rheological) properties of rocks- Rock resistance and rock failure theories- applications of rock mechanic theories for designing the roadways and galleries in the mines-Application of the rock mechanic theories in different methods of ore extraction.

0204515: Environmental laws

0204516: New Drilling Machines and their Applications

0204517: Industrial safety rules

0204518: Well Logging (1)
Investigating the physical and petro-physical properties of rock formations. Electrical methods, radioactivity, caustic, thermal, caliper, dip meter. Types of sound waves, interpretation and formation evaluation.

0204506: Well drilling technology (1)
Types of boreholes. Methods of borehole drilling. Simple drilling methods (percussion drilling – hand auger drilling – Rotary percussion drilling – Rotary drilling with flush)- Drilling tools and bits- Design of drilling patterns- Determination the distances between boreholes- Factors affecting on drilling bit
wear. Drilling Rigs (types-components and uses). Rotary and percussive drilling rate prediction models.

**0204519: Geological exploration for ores**
Magmatic cycle of mineral differentiation, and sedimentary, organic, evaporates, shore and placer deposits. Surface geological surveys, aerial photography, remote sensing to plot the prospecting guides. Geo-chemical and geostatistical methods for ore reserves estimation and evaluation were applied.

**0204520 Study and classification of ores**
Types and origin of ores-minerals and metallic minerals forming ores-accompanied minerals-sampling preparation of specimens-ore and electronic microscopy of ores-software studies of ores.

**0204521: Geophysical exploration (1)**
Recording the difference in the physical properties of the subsurface due to the presence of ore deposits, geological structures and buried bodies. Natural potential methods are used e.g. (gravity, magnetic, radiometric, geothermal) and external methods e.g. (seismic, electric, electromagnetic...)

**0204522: Selected seminars**
New subjects were related to the nature of studying from the world magazines, may be selected by the lecturer.

**0204552: Project:**
Students are required to prepare a project to solve a realistic and practical case
4.4 Environmental Engineering Diploma

0204501: Advanced mathematics and statistics(2)
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204523: chemistry and physics of air pollution
Physical and chemical properties of atmospheric air – physical processes for suspended material in winds- wind and atmospheric factors- chemical transformations in atmospheric air- dispersion in atoms precision

0204524: thermodynamics
Applications of first and second law of thermodynamics principles application of thermodynamics in measurements related to temperature and pressure and rate of flow- specific temperature….etc

0204525: Pollution from industrial operations(1)
Sources of pollution from industrial operations - measurement of pollution levels- atmospheric conditions and mathematical models for air pollution criteria- engineering methods for air pollution control.

0204526: Industrial ventilation systems
Air conditioning in the industrial sites- weather and design conditions- circles and operations- fans and pumps- design and calculation of the required amount of air in the closed region.

0204527: pollution from surface operations
Sources of pollution from surface works (drilling works- loading-transformation- construction of roads and its preparation- construction and paving works)- blasting and rock fragmentation works – analysis of environmental impacts from surface works- control methods in environmental pollution from surface works- case studies for some projects.

0204555: Industrial Safety:

0204556: Environmental Laws
Bases of Environmental Law- Legislations- Permissible values of Pollutants- Permissible values of Hazardous materials- Environmental aspects- Personal's rights- Responsibilities.
0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
4.5 Rock Mechanics Diploma

0204501: Advanced mathematics and statistics(2)
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204511: Physical & Mechanical Properties of Rocks
Specimens preparation for laboratory tests – Compressive, tensile and shear strength tests of rocks– Strength of rocks under biaxial and tri-axial stresses – Static and dynamic elastic constants of rocks – In situ rockmass testing – hydrological (rheological) properties of rocks – The mechanical behavior of jointed rocks-Rockmass classification- The variety of rock properties: Specific weight –Porosity –Natural water content (moisture water content) – Permeability – Swelling index – Slake durability index.

0204528: Mine Support

0204529: Tunnel Engineering
Introduction – Purpose of tunnels – Classification of tunnels – Geological survey and exploration – Geological factors influencing the location and the design of the tunnels – Analysis of the influencing loads on tunnels and underground structures – Construction and design of tunnels (case of solid and weak grounds) – Ventilation in tunnels – Drainage of tunnels – Tunnel surveying – Service operation and maintenance of tunnels.

0204504: Slope stability in surface mining
Studying of the engineering and geological considerations in designing of the best angle of slope- Theoretical analysis of stability, and control of slopes.

0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
4.6 Ore Dressing Diploma

0204501: Advanced mathematics and statistics (2)
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

0204530: Advanced Studies in Crushing And Grinding (1)
Stages of size reduction-mechanisms of size reduction-crushing and grinding machines-super grinding machines-physical and mechanical properties of rocks affecting the comminution operation. Design and operating factors affecting the comminution operatio. Types of grinding media-consumption of energy in crushing and grinding-particle size distribution of ground products.

0204531: Gravity Separation Methods
The mineralogical examination of the ore-determination of the liberation size and percentage of liberation-the physical & technological properties of different mineralogical component of the ore-the movement of particles in fluid-method of separation using different classification units-method of separation using hydrocyclones-separation methods using the tables units--method of separation using jigs--method of separation using hymphry spiral.

0204532: Physics and Chemical properties of Flotation
Particle surface and its modification – Surface activation- Surface energy of mineral particles –Reaction between water and mineral particles – Water-avid (hydrophilic) and water-repellent (hydrophobic) solids -Reaction between Sulphides minerals and oxygen – Wettability and contact angle – polar minerals-non-polar minerals-surface tension.

0204533: Magnetic and Electrical Separation Methods
Definition of magnetic-classification of the magnetic materials and it's separation methods-classification of the magnetic separators-the response of material to the magnetic separation-the different parameters that affect the magnetic separation process-application on the magnetic separation. Some flow sheets for the minerals concentration use magnetic separation process-the electric separation-the methods of separation using electric separation process. The different parameters that affect the process of the process of electric separation process-applications on the electric separation process-some flow sheets for the minerals concentrations using the electric separation process.
0204534: Froth Flotation
Principles of flotation Anionic collectors- Cationic collectors- Frothers-regulators- The importance of pH- Laboratory flotation testing Pilot plant test work- Basic flotation circuits -Flow sheet design- flotation machines-Control of flotation plants- Typical flotation separations (Flotation of Copper ores-flotation of Lead-Zinc ores- flotation of copper- lead-zinc ores)

0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
4.7 Metallurgy and Engineering Material Diploma

**0204501: Advanced mathematics and statistics(2)**
Differential equations – Numerical analysis- The design methods of the lab and half-industrial experiments (prototype)- Processing lab results and the degree of confidence- Correlation coefficients between designing factors, operating factors and the results- Optimum cases to maximize the product and/or minimize the waste.

**0204535: Manufacturing and Processing of Metals and Alloys**

**0204536: Heat treatment of metals and alloys**

**0204537: Engineering materials**

**0204538: Materials inspection and testing**
0204539: Corrosion and Materials Protection
Theoretical principles of corrosion through thermodynamics and kinetics- Forms of corrosion- Corrosive media- Engineering materials: Metallurgical and non-metallurgical materials- Behavior of the materials in different media- Different methods for protection and corrosion control- Designing- Materials selection- Cathodic and anodic protection- Corrosion testing and monitoring.

0204540: Continuous casting

0204541: Metallurgical Thermodynamics and Reaction Kinetics
Metallurgical thermodynamics: Revision for thermodynamics laws- Use of thermodynamic data- Calculation of the changes of heat content, entropy and free energy of the reaction- Calculation of the equilibrium constant and estimation of the relative concentrations of materials participating in the reaction at any given and constant temperature- Phase rule and determination of the degrees of freedom of metallurgical systems containing one phase or more.
Reaction kinetics: Classification of reactions and types of heterogeneous reactions- Definitions: Reaction rate and order of the reaction- Effect of the concentrations of the reactant materials on the rate and order of the reaction- Effect of temperature on the reaction rate- Determination of the rate controlling step (the slowest step) in the reaction mechanism.

0204542: Manufacturing of Cement

0204543: Welding Technology

**0204544: Transport Phenomena**

**0204545: Physical metallurgy (3)**
Relationship between crystal structure defects and diffusion rate - Mathematical treatments of diffusion in solids under the steady and nonsteady states (Fick's laws) and their industrial applications- Allotropy and phase transformations-solidification of metals and alloys and control of the microstructure- Cold and hot working of metallic materials to control the size (dimensions) and properties- Recrystallization process- Some heat treatment processes for steel-Age hardening of nonferrous alloys and its relationship with their corresponding phase diagrams- Behavior of metallic materials under different environmental or service conditions such as tensile, compressive, repeated and high strain rate loading- High service temperatures and/or corrosive atmospheres.

**0204546: Material and Energy Balance**
Material and Energy Units, pressure types, terms and definitions in the material and energy balances for various processes - an equilibrium the reaction, substance specified the reaction, the proportion of complete reaction - Excess air; its percent and its calculated methods - closed and open processes – strategy of solving the material and energy balance issues, calculation rule and its concept – general equation for material balance, open non-reactive processes – current direct methods for solving balancing problems – solving by indirect current method - the concept of tied factor - how to use the tied factor in solving the problems – recycling the output, how to calculate the recycled quantity - passing and discharging operations in metallurgical and non-metallurgical processes - Multiple and particular examples on metallurgical processes - general equation of energy balance, heat of formation, heat of reaction at standard and non-standard temperatures – heat of combustion - the change in enthalpy - heat of fusion - an overview of the factors related to energy balance for extractive metallurgical processes - energy balance on closed and open systems in reactive and non-reactive chemical reactions.
0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
0204547: Mathematical and Statistical Applications at Plane Surveying
Differential equations Least Squares technique applications- Calculation of Positions and Heights- Computation and representation of observations errors- Statistical models of evaluation.

0204548: Laying and setting out surveying methods
Theodolite - EDM - Total Station- Global positioning system (GPS)

0204549: Traverses plain
- Types of traverses according to form, order, and applications.
- Conventional and accurate measurements.
- Accurate methods of calculation and adjustment.

0204550: Computer applications in surveying
Brief account about programming - Programming of the field observations and processing - Final processing of the observations- representation of the results.

0204551: Advanced topics at engineering geology
Shape and size of the earth – the earth topography - structure geology and engineering structures relationship - geological factors and subsidence-Geotechnical properties of rocks and soil – mineral deposits information.

0204552: Project:
Students are required to prepare a project to solve a realistic and practical case
5. Master Courses Description

5.1 Surface and Underground Mining Engineering Technology

0204601: Dynamics of the earth constitution(2)

0204602: Blasting Engineering (2)- evolution of blasting results

0204603: Transportation and material handling
Different methods of transportation, which, are used in surface mining and quarries. Different methods of loading used in surface mining and quarries-important of material handling plans (suitable transportation methods-suitable loading methods).

0204604: Surface mining technology and quarries (1)
Methods used to rock preparation for ore extraction. Loading units: bulldozers, scrapers and loaders. Single bucket and multi bucket excavators. Loading and transportation that are used in surface mining. Waste dump construction with rail way transport. Controlling of mineral quality in pits. Combined and special pit transport systems.

0204605: Introduction to environmental engineering(2)

0204606: Mathematical modeling for some problems in open cast mines and quarries and their optimum solution
Mathematical introduction- production problems- blending problems-production scheduling and inventory control problems- transportation problems-optimum solutions for most of the previous problems.
0204607: Pollution control engineering

0204608: Novel methods for ores extraction:
Hydraulic mining methods - coal gasification, mining of ore in difficult conditions and in areas prone to rock and gas blasting, mining with minimal labor, basic methods of placer mining.

0204609: Design of collieries:
Rock mass classification, basic methods in roof control, design of long wall mining methods, and design of pillars for log wall mining (chain pillars). Design of room and pillar methods. Design of yield pillars.

0204610: Geology of groundwater (1):
Sources of groundwater- Factors affecting on the Aquifers formation – Chemistry of the groundwater- prospecting on the groundwater – Drilling and methods of extracting for groundwater – Geophysical methods- measured the rocks factor and drawing the geological cross-sections – Study of the movement of groundwater law – Mathematical models of the Aquifers – Study of the groundwater effects on the building, foundation, tunnels and mines.

0204611: Structural geology(2):
Study of the earth constitution – Morphology of the earth (Geomorphology) - Structural geology and the relationship with the building and foundation - Study the effect of denudation and erosion on the building and foundation - Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

0204612: Precaution and safety in dealing with crackers

0204613: Precautions and safety in handling explosives:
Safety in blasting operations (considerations before, during, and after blasting operation), considerations related to primer, electric and non-electric blasting nets, considerations related to explosives magazines and what should be done in storing and handling explosives, licensing regulations in the field of explosives
materials, some related laws, safety precautions in explosive transportation, general hints for shot-firers and main causes of explosives accidents, suggestions for planning a blasting operation.

**0204614: Seminars and Writing a Technical Report:**
Method of writing a technical report and using it in writing a project or thesis (how to – components – how to present) – the instructor allocates subjects in explosives engineering and distributes them to the students – the students will study the project, write a report, present a lecture, and discuss the subject with the rest of the students under the supervision of the instructor.
5.2 Drilling and Applied Geophysics Engineering

0204615: Advanced study in well drilling Engineering

0204616: Advanced rock mechanics (3)
Introduction – Definitions- Stresses and strains analysis- Relationship between the principal stresses and the principal strains- Elasticity coefficients- Physical and mechanical properties of rocks- Failure theory – Design of underground mine openings in igneous and sedimentary rocks- Special applications to design mine roadways.

0204617: Future of well drilling operations
Future perspective of drilling techniques (Safety and health– Productivity). Automatic optimization of rotary drilling-Rock characterization by monitoring- Measurement while drilling (MWD)-Drill productivity evaluation by monitoring-Using drilling parameters for identifying the rock to be drilled-Reducing drilling costs by improvement of drilling patterns. Laser drilling becoming a reality.

0204618: Pollution from surface industrial operations
Pollution sources of civil activities (sanitary works, construction activities, pavement …….. etc.)- Pollution from quarries and material handling- Study on pollutant transport and its effects- Risk assessments and control measures- Study on case studies of some projects.

0204619: Mining Geology and Ground Structures:
Study of the earth constitution – Morphology of the earth (Geomorphology) - Structural geology and the relationship with the building and foundation - Study the effect of denudation and erosion on the building and foundation - Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

0204620: Engineering geophysics:
Geophysical methods for shallow investigation and its applications at engineering projects –exploration of underground water and determination of interfaces-measuring of vibrations and its properties-locate of isothermal lines
around mine opening to reach the best ventilation in mines-detection of caves and archeological using geophysical methods

**0204621: Petroleum Geophysics**
Origin and accumulation of hydrocarbons - Sedimentary basins - Exploration methods, gravity, magnetic, deep seismic. Data acquisition, seismic energy, trmmodation of seismic signals, velocity shooting and analysis - plotting seismic sections - well logging - Reserves estimation

**0204622: Well Drilling technology (2)**

**0204623: Geophysical Exploration (2):**

**Seismic:**
Theory of elasticity and seismic wave spread-properties of seismic waves—sources of seismic waves field work of recording reflection and refraction data-interpretation of seismic field data.

**Electric:**
5.3 Rock Mechanics

0204611: Structural geology(2):
Study of the earth constitution – Morphology of the earth (Geomorphology) – Structural geology and the relationship with the building and foundation - Study the effect of denudation and erosion on the building and foundation - Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

0204616: Advanced rock mechanics (3)
Introduction – Definitions- Stresses and strains analysis- Relationship between the principal stresses and the principal strains- Elasticity coefficients- Physical and mechanical properties of rocks- Failure theory – Design of underground mine openings in igneous and sedimentary rocks- Special applications to design mine roadways.

0204622: Well Drilling technology (2)
Types of bore holes, methods of bore hole drilling, simple drilling methods (percussion drilling-hand auger drilling-rotary percussion drilling-rotary drilling)-drilling tools and bits-design of drilling patterns-determination of distances between boreholes. Factors affecting on drilling bit wear. Drilling rigs(types-components and uses).rotary and drilling rate prediction models)

0204624: Theories of Photo elasticity and their applications in mining:

0204625: Models and Engineering Similitude:
Dimensional analysis and modeling- Principles of governing the design and operation of models for solution of engineering problems – analogies – Finite element.
5.4 Environmental Engineering

0204626: Waste recycle and treatment
Types of solid waste – formation rate of waste – waste collection, manufacturing and material recovery – waste recycle and reuse – planning and management of solid and liquid wastes- removing and handling of solid wastes.

0204627: Water quality and treatment

0204628: Air pollution

0204629: Air pollution control in surface operations

0204630: Pollution from industrial operations (2)
Sources of pollution from surface works (drilling works- loading-transformation- construction of roads and its preparation- construction and paving works)- blastiong and rock fragmentation works – analysis of environmental impacts from surface works- control methods in environmental pollution from surface works- case studies for some projects.

0204706: Environmental Sampling & Analysis
Devices for environmental indicators and their theories - Methods of measurement – air sampling and analyses – water sampling and analysis – noise measurements – soil sampling methods and analyses – sampling of Industrial and domestic wastewater – Optimum number of samples to be collected for specific objectives and confidence levels and quality - Methods of sample analysis according to the standard methods.

0204707: Industrial Safety (1)
Risk Assessment and Management – Methods of Risk Assessment - Hazard recognition - Hazard control and Prevention - Code of Labor and related

0204708: GIS in Environmental Engineering
What is GIS – using spatial data – Data input to GIS – Using GIS in environmental data exploration – Relation between environmental data and its geographical location – Modeling the environmental measurements – Spatial modeling of environmental data – Modeling water streams - Determine sources of contaminations using DEM

0204709: Environmental Impacts on Materials
Importance and principles of corrosion study - Corrosion types of materials - Forms of corrosion. Atmospheric corrosion and high Temperature corrosion - Corrosion testing and monitoring - Materials selection for Corrosive media - Modification of Environment for corrosion control - Corrosion control and Protection Methods

0204710: Marine and Oceanic Pollution
What is Marine environment - Sources of marine pollution - Hazards of marine pollution Methods and measures of preventing and controlling marine pollution - Oil spill methods and control (chemical dispersion, in-situ burning, shoreline clean-up, treatment of recovered oil, disposal of oil and oil debris). International laws and regulations for marine environmental protection - Clean-up cost analysis
5.5 Ore Dressing Engineering

0204631: Flow sheets for some ore concentration
- Different methods for flow sheet units arrangement and its classification.
- Flow sheet calculation and its units determination of the recovery and grades of each element.
- Flow sheet for iron ores concentration.
- Flow sheet for phosphate ores concentration.
- Flow sheet for lead & zinc ores concentration.
- Flow sheet for talc ores concentration.
- Flow sheet for gold ores concentration.
- Flow sheet for sand, gravel, limestone & construction material concentration.

0204632: Dewatering and recycling of water (1)
An introduction to solid liquid separation process - Sedimentation process and different types of thickeners - Comparison between thinkers and clarifiers - Calculations of thickener area - Filtration process and different types of filters - Thermal drying process - Different types of furnaces - Enhancing dewatering process by using natural and chemical aids - Industrial waste water treatment and re-circulation-recycling of mineral processing plants water.

0204633: Unit operations in Mineral processing
An Introduction to Unit operations in mineral processing plants - apparatus of taking the samples - crushing and grinding operations - methods of powder transportation - methods of store and handling the powder - solid liquid separation operations (thickening, filtration, thermal drying) - flotation-gravity concentration magnetic separation-size enlargement operations (sintering, pelletizing) calcinations-roasting-dissolution.

0204634: Design and Planning of mineral processing plants
Economics of mineral processing operations – plant layout - Calculation numbers of different mineral processing units (screens, crushers & mills, classifiers, hydro-cyclone, jigs, tables, Humphrey spirals, Flotation cells, thickeners, and filters) - Flow sheet organization of processing some ores – Computer in mineral processing – Selection of equipment – Site location of the plant – Case study of mineral processing plant.

0204635: Recycling of ore dressing plants waste (1)
Solid and liquid waste of ore dressing plants - waste of coal preparation - waste of mineral and non-mineral ores concentration - selection the suitable place and
calculation its capacity for the solid and liquid waste of the ore dressing plants-positive uses of the wastes-effect of the waste on the surrounding environment.

**0204636: Different methods of ores concentration**
The mineralogical compositions for ores and its using in the chosen of concentration methods-study of the movement of particles in the fluids—the methods of separations using the hydrocyclone apparatus &the different operational & constructional parameters that affect the separation process—the separation using concentrating tables and different parameters that affect at the improvement of the separation process—the separation by the jigging apparatus-the Humphrey spiral apparatus—an introduction to the magnetism—the classification of the minerals according its ability to magnetism—the magnetic separators &the operating parameters that affect it-application on the magnetic separators—the classification of the magnetic separators &the operating parameters that affect on it—application on the magnetic separators-classification of the ores according to its acceptance &loose of electrons-the electric separators apparatus-application about the electric &magnetic separators to the ores.

**0204637: Advanced studies in crushing and grinding (2)**

**0204638: Froth Flotation and its applications**
Reagents used in flotation and their functions-laboratory and pilot plant test in flotation-different apparatus of flotation-industrial flotation circuits—flow sheets of flotation processes-application of flotation on some complex ores-some recent application of flotation (deinking,............etc)—effect of flotation reagents on pollution(soil, agriculture, underground water,............. etc)

**0204439: Advanced mathematics and statistics (3):**
5.6 Metallurgy and Engineering Materials

0204640: Failure of Materials During Service (1)
Design and materials selection- Deformation of the engineering materials- Failure analysis during service and its relation with design and production- Important factors related to materials selection and using the mechanical properties- Fracture mechanics.

0204641: Materials Selection (1)
Revision for the main classes of engineering materials (metallic materials, ceramics and polymers) and their general properties- Criteria for the selection/use of metallic materials- Criteria for selection/use of ceramics- Criteria for selection/use of polymers- Effect of surface conditions on the materials and their failure- Economics of materials (prices of raw materials, relative production costs and costs of forming and finishing processes/operations)- Methods of materials selection and evaluation- use of computer for selection and evaluation of materials.

0204642: Surface Engineering (1)
Definitions, terminology and important of surface changes- Mechanical changes- Chemical changes- Some methods of surface changes: Leaser, ion implantation- Surface coatings: Surface cleaning- Mechanical finishing- Chemical and electrochemical painting- Another methods of metal coating- Coating with non-metals- Cleaning and finishing of nonferrous metals.

0204643: Powder Metallurgy
Introduction- Powder production- Powder characterization- Powder treatment- Powder compaction and shaping- Sintering theory and types- Sintering technology- Testing and quality control of PM materials and products - Special applications for metallic powders.

0204644: Electric and Magnetic Materials (1)
0204645: Composite Materials (1)
Introduction- History and types of the composite materials- Fiber reinforcement-
Fiber properties- Matrix properties- Fiber matrix interface- Fiber structure-
composite materials systems: Metal matrix composites- Polymer matrix
composite- Ceramic matrix composite- Composite materials calculations: Fiber
diameter estimation- Volume fraction- Density- Elastic modulus- Strength-
Thermal expansion- Fracture - Fatigue.

0204646: Physical Metallurgy (4)
Solidification process of metals and alloys- Factors affecting the morphology of
the solid/ liquid interface during solidification and the factors affecting
microstructure and mechanical properties after solidification- Phase rule- Review
of binary phase alloy systems and examples for commercial alloys- Ternary
equilibrium phase diagrams and examples for commercial alloys- Interpretation
of the alloy microstructure from the corresponding phase diagram- Thermal
forming processes and concurrent heat treatment- Types of surface treatments
(mechanical, laser, chemical coating , anodizing oxidation, electroplating …
etc)- Codes, standard specifications and applications/uses for some commercial
ferrous and nonferrous alloys.

0204647: Ceramics and Glasses
Identification of the general types of glasses and ceramics and the advanced
engineering types of glasses- Different manufacturing processes- High
temperature applications- New trends in manufacturing and applications.

0204648: Melting and Solidification Technology
Different methods for melting- Reactions in the molten state- Dynamics of the
melt- mould and solidification shrinkage- Accuracy of pouring- Structure,
defects, and properties of the final product.

0204649: Ferrous and Non-ferrous Unit Processes
Unit processes for extraction- Purification processes- Production processes
includes (hydro- pyro- and electro metallurgy)- Ladle metallurgy- Mathematical
treatment and modeling for some processes and computer applications.

0204650: Material and Energy Balance
Material and Energy Units- pressure types- Terms and definitions in the material
and energy balances for various processes- an equilibrium the reaction,
substance specified the reaction, the proportion of complete reaction - Excess
air; its percent and its calculated methods - Closed and open processes- Strategy
of solving the material and energy balance issues- Calculation rule and its
concept- General equation for material balance- Open non-reactive processes-
Direct current methods for solving balancing problems- Solving by indirect
current method- Concept of tied factor - How to use the tied factor in solving the
problems- Recycling the output- How to calculate the recycled quantity- Passing
and discharging operations in metallurgical and non-metallurgical processes-
Multiple and particular examples on metallurgical processes- General equation
of energy balance- Heat of formation- Heat of reaction at standard and non-
standard temperatures- Heat of combustion- Change in enthalpy- Heat of fusion
- Overview of the factors related to energy balance for extractive metallurgical
processes- Energy balance on closed and open systems in reactive and non-
reactive chemical reactions.
5.7 Engineering Surveying

0204651: Advanced mathematics and applied statistics
High orders differential equations - Mathematical statistical models – observations processing and confidence degrees - optimum conditions of statistical tests.

0204652: Total station surveying
Principles of distances and directions measurement - using of surveying applications on the instrument - estimating the coordinates and heights and its evaluation –graphical and digital representation of the results.

0204653: Global position system
Coordinate systems - satellites orbits- preplanning for observing - field techniques of observations - instrumentation- error sources, processing and accuracy.

0204654: An introduction to Geographic Information System
Basic map concept- storing geographic information- design of the data base- automation of data processing - digitizing map.

0204655: Photogrammetric surveying and remote sensing
An introduction to Photogrammetric surveying and remote sensing - applications at surface and underground – Photo-processing and analysis – features extraction and maps update.

0204656: Surveying applications at surface and underground for ores extraction
Surveying workings for geological and geophysical purposes - ore reserve calculations - connecting surface surveying with underground surveying - continuous laying out with continuous stopping - measurements and calculations required for different underground surveying.

0204657: Computer applications at mapping
Study the surveying programs such as Liscad, Geosurvey as well as AutoCAD application for mapping – field observations and processing programming – final adjustment of observations and mapping.
5.8 Engineering Geology

0204611: Structural Geology (2):
Study of the earth constitution – Morphology of the earth (Geomorphology) - Structural geology and the relationship with the building and foundation - Study the effect of denudation and erosion on the building and foundation - Geological history and effect of the geological period on the morphology of the earth – Formation of the mineral deposits.

0204658: Geology of Sedimentary Rocks
Methods of forming sedimentary rocks-vertical and horizontal succession-classification of rock units-sedimentary basins-fauna and clastics characterizing sediments-sedimentary ores-thin sections of sedimentary rocks

0204659: Geology of Igneous and Metamorphic Rocks
Methods of forming igneous and metamorphic rocks-mineralogy of igneous and metamorphic rocks-definition of igneous and metamorphic rocks from sections –metamorphism and alteration degrees phases of minerals change due to metamorphism.

0204660: Geotechnical Properties of Rocks and Soils
Physical properties(moisture content-density-porosity-permeability-atterberg limits) and measuring methods-mechanical properties(compression, tension, shear and bending, strengths-abrasion-cutability-durability-drilling) and measuring methods-relationships between parameters.

0204661: System of Photographs Analysis Using Computer
System components – analysis program and units of transfer and treatment of photographs- mathematical method using program for measurement treatment – constituents of rocks an ores- statistics associated with the program and applications.

0204662: Ground Surface Morphology
Arial photographs and treatment of base maps- drainage system and its modeling in maps ground surface topography using geographic information system in modeling ground topography – effect of site geology on topography-effect of structure geology on topography.

0204663: Geotechnical Applications
Foundation in different types of soils-roads in different geological sites-tunnels and effect of geology on tunnels-dams and reservoirs in relation with the different geological sits-different types of rocks or minerals causing pollution or used in filtration.
0204664: X-ray applications
Analysis system of rocks, soil components and raw materials by using X-rays-
Preparation of test samples- Processing the results of the analysis- Identify the
components and the percentage of each- The methods to identify the major
components and impurities.

0204665: Statistical and mathematical analysis
Mathematical and statistical methods for treatments of results- programming and
using prepared programs for treatment of data and results- applications of using
mathematical and statistical treatment and programs in treating results and
geological studies.

0204666: Programming and preparation of computer programs
The suitable (appropriate) methods to prepare the computer program for data
processing and results- Steps to set up the computer program (code) –Prepared
programs in advance to fit the required processing data analysis in the fields of
geotechnical and engineering geology.
6. Ph.D. Courses

6.1 Mining engineering

0204667: Dynamics of the earth constitution (3)
tectonics – Rotation and roundness of the earth – Precession and tides forces –
Gravity and magnetic field of the earth – Earthquakes – Study of the interior
earth constitution – Mechanics and dynamics of the fault and bedding rocks –
Radioactive and radio-meter of the earth – Hydrodynamics of the fluid material.

0204668: Surface mining technology and quarries (2)
Surface mining systems- Surface mining methods- strip mining for thin and
medium thick deposits- terrace mining for thick deposits- conical mining
methods for irregular deposits extended in the direction of dip- different
stripping ratios- Surface mining economics- Surface mining terminology-
methods of opening up a deposit in surface mining.

0204669: Introduction to environmental engineering(3)
Environmental impact – Air quality – water quality – air pollution – Noise

0204670: pollution control engineering
Measurements of pollutants – meteorological factors and its effects of pollution
control – engineering control measure of air pollutants – air pollution control
strategies – factors affecting the selection of air pollution control methods –
design approach for particulates and gaseous pollutants.

0204671: Geology of mines and ground structure
Primary structures-secondary structures-effect of geological structures on the
geomorphology-effect of geologic structures on engineering structures on the
engineering structures and projects-geologic structures accompanied with plate
tectonics.

0204672: Geology of groundwater (2)
Sources of groundwater- Factors affecting on the Aquifers formation –
Chemistry of the groundwater- prospecting on the groundwater – Drilling and
methods of extracting for groundwater – Geophysical methods- measured the
rocks factor and drawing the geological cross-sections – Study of the movement
of groundwater law – Mathematical models of the Aquifers – Study of the
groundwater effects on the building, foundation, tunnels and mines.
0204673: Well logging (2)
Investigating the physical and petro-physical properties of rock formations. Electrical methods, radioactivity, caustic, thermal, caliper, dip meter. Types of sound waves, interpretation and formation evaluation.

0204674: Petroleum geophysics
Origin and accumulation of hydrocarbons - Sedimentary basins - Exploration methods, gravity, magnetic, deep seismic. Data acquisition, seismic energy, field layout design - Analogue recording - Digital recording - Data processing - modification of seismic signals, velocity shooting and analysis - plotting seismic sections - well logging - Reserves estimation.

0204675: Well Drilling technology (3)

0204676: Special methods for ores extraction
An introduction to Special methods of ore extraction, Hydraulic mining, underground coal gasification, mining of placer deposit, mining coal in difficult conditions.

0204677: Design of underground mining (2)
Rock mass classification, design of long wall mining method for coal, design of room and pillar- mining elements for coal and metals, design of caving methods for metal mining.

0204678: Theories of photo elasticity in mining
0204679: Water quality, its pollutants and treatment

0204680: Future of drilling operations
Future perspective of drilling techniques (Safety and health– Productivity). Automatic optimization of rotary drilling-Rock characterization by monitoring- Measurement while drilling (MWD)-Drill productivity evaluation by monitoring-Using drilling parameters for identifying the rock to be drilled- Reducing drilling costs by improvement of drilling patterns. Laser drilling becoming a reality.

0204681: Theory of Waves and Theories of blasting

0204682: Mathematical modeling in environmental engineering(2)
Mathematical modeling and simulation in environmental engineering – principles of pollutants dispersion – mathematical modeling of pollutants dispersion – solution of multivariate mathematical modeling – computer application for mathematical modeling in environmental engineering – numerical and statistical models for pollution prediction – case studies to apply the models in air and water pollutants.
6.2 Ore Dressing Engineering

0204683: Modeling and simulation of mineral processing operations
Mathematical modeling constitution and hypothesis- Famous modeling in ore dressing (material equilibrium model, single element model, probability model…etc.)- Application of the different models on the size reduction processes- modeling of solid liquid and suspensions flow- modeling of flotation processes - modeling of the water recycle operation.

0204684: Planning and design of mineral processing plants
Economics of mineral processing operations – plant layout- Calculation numbers of different mineral processing units (screens, crushers& mills, classifiers, hydro-cyclone, jigs, tables, Humphrey spirals, Flotation cells, thickeners, and filters) - Flow sheet organization of processing some ores – Computer in mineral processing – Selection of equipment – Site location of the plant — Case study of mineral processing plant.

0204685: Dewatering and water recycling (2)
An introduction to solid liquid separation process-Sedimentation process and different types of thickeners-Comparison between thinkers and clarifiers-Calculations of thickener area-Filtration process and different types of filters-Thermal drying process-Different types of furnaces- Enhancing dewatering process by using natural and chemical aids-Industrial waste water treatment and re-circulation-recycling of mineral processing plants water.

0204686: Waste recycling of ore dressing plants(2)
Solid and liquid waste of the ore dressing process- waste of coal dressing- waste of the mineral and non-mineral ore concentration- selection the suitable place and calculation its capacity for the solid and liquid waste of the ore dressing process- positive uses of the wastes- effect of the waste on the environment.

0204687: Methods of ore concentration
The mineralogical compositions for ores and its using in the chosen of concentration methods-study of the movement of particles in the fluids –the methods of separations using the hydrocyclone apparatus &the different operational & constructional parameters that affect the separation process –the separation using concentrating tables and different parameters that affect at the improvement of the separation process –the separation by the jiggling apparatus-the Humphrey spiral apparatus –an introduction to the magnetism-the classification of the minerals according its ability to magnetism-the magnetic separators &the operating parameters that affect it-application on the magnetic
separators-the classification of the magnetic separators & the operating parameters that affect on it – application on the magnetic separators-classification of the ores according to its acceptance & loose of electrons-the electric separators apparatus-application about the electric & magnetic separators to the ores.

0204688: Advanced studies in crushing and grinding (3)
Importance of size reduction operations in several industries, especially in mineral processing – stages of size reduction – wet and dry grinding graphical representation of the comminuted products - Energy and size reduction - theories of comminution - Bond standard test and its relative abbreviated methods-open and closed circuits and their calculations-different types of tumbling mills-grinding media (their composition and wear) – Preheating as an aid for comminution operation – chemical additives as aids to comminution operation.

0204689: Problems of concentration for some Egyptian ores
Some flow sheets for concentration of Egyptian mineral compositions of the Egyptian ores. selection of its concentration method- concentration of the Egyptian phosphate ore, iron ore, ilmenite ore, tale ores, manganese ores, lead zinc ores - gold ores, rare earth minerals ores, nepheline syenite ores, barite ores, ceramic ores and chromite ores.

0204690: Transportation and powder handling
Methods of powders Preparation - technical and mechanical properties of powders-mixtures of fine powders-homogeneity of powder mixtures-methods of powders transportation (open belt conveyors) slurry transportations (pipe lines transportation)-pneumatic transportation-storing of powders.

0204691: Selected topics in ore dressing
Student should be select one of the following subjects:

- Concentration of phosphate ore:
  Comparison between Arab countries and world phosphate ores from the concentration point of view - Mineralogical composition of each region phosphate ore and its effect on the selection of concentration method - Chemical characteristics of each ore - Adjustment of ore qualities - Methods of ore concentration - Flow sheets of ore beneficiation and concentration - Industrial uses of phosphate ore.

- Preparation and Washing:
  Comparison between Egyptian’s and world’s coal from the beneficiation point of view – Mineralogical composition of each region coal and it is effect on the methods of coal beneficiation – Chemical composition of each coal region – Adjustment of coal qualities – Methods of coal beneficiation – Coal industrial uses.
• Iron Ore Concentration:
  Comparison between iron ore in Arab countries and world from the concentration point of view – Mineralogical composition of each iron ore region and it’s reflection on the selection of concentration method - Adjustment of ore qualities - Methods of ore concentration – Flow sheets of iron ore concentration- industrial uses of iron ore.

• Gold Ore Concentration:
  Comparison between Arab world and the world gold ores from the concentration point of view – Mineralogical composition of the gold ore and its effect on the selection of concentration method - Adjustment of ore qualities – Flow sheets of gold ore concentration- industrial uses of gold ore.
6.3 Metallurgy and Material Engineering

0204692: Phase Equilibria for Materials
Revision of phase rule and some concepts (tie rule)- Revisions of solid / liquid equilibria in the binary alloy systems- Study of solid–liquid equilibria in the ternary alloy systems- Determination of the nature of the mono-variant reaction (liquid + 2 solid phases) and invariant reactions (liquid + 3 solid phases) in the ternary alloy systems- Determination of solidification sequences and prediction of the microstructures in the ternary alloys isothermal sections- Drawing the projection of liquids and solidus surfaces on the triangle of composition- Alloys and vertical (sections) in the phase diagram of ternary alloy systems- Calculation of the relative amounts of different phases in a given ternary alloy at a certain temperature at equilibrium- Design of experimental techniques for determination the solid-liquid equilibria (precipitation of solid phase, thermal analysis and electromagnetic phase separation).

0204693: Materials Selection (2)
Industrial applications and some case studies- Programs for materials selection- Programs for materials selection for corrosion protection- Design, materials selection and evaluation of the materials.

0204694: Surface Engineering (2)
Industrial applications and some case studies- New trends in technology of surface engineering- Studying the relationship between the corrosion and different types of surface changes.

0204695: New and Advanced Materials
Materials and their diversity of properties and uses- Need for new materials in various fields- Spacecraft technology- Natural and bio-technology- Electronics, information and other fields techniques- some case studies of new materials (engineering ceramic materials at high temperature)- Composites materials- Some types of plastics- Materials with high cooling rate, etc.- some case studies of composite materials (green composites).

0204696: Electro-metallurgy
Thermodynamics and kinetics of electrochemical systems- Electrolysis- Electrolytic production cells- Production cells and refining cells- Case Study (aluminum production cells) - Electrolysis in aqueous media and molten salts with applied examples- Transfer processes in the electrochemical reactor- Some aspects of the design.
0204697: Materials and Energy Recycling
General principles for the management of waste- Recovery and recycling- Dealing with the losses from gases- Liquid substances, solutions and solid materials- Energy conservation and recovery of heat losses- On the initial design of the recovery units- Some case studies- Recovery of aluminum- Recovery of ferrous materials, etc.

0204698: Grain Refinement of Metals and Alloys
Introduction: Industrial importance of grain refining- Revision of diffusion in solids, solidification process, solid/liquid morphology …etc.- Grain refining from the liquid state during solidification using mechanical, ultrasound, electromagnetic methods / techniques- Grain refining from the liquid state by adding grain refining master alloys into the melt before pouring or casting- Grain refining from the solid state by applying cold working and recrystallization annealing- Grain refining of steel by austenitizing process and suitable cooling(normalizing process)- Mechanisms of grain refining methods- Application of grain refining for Al, Zn, Mg alloys- Poisoning of grain refining of Al alloys containing Zr or Cr by Al-Ti-B grain refiner.

0204699: Design of Metallurgical Equipments and Plants
Material and energy balance- Processes flow diagram- Piping and instrument measurement- Cost estimation and economic evaluation- Constriction materials- characterization and design of the instruments and the equipments- Mechanical design- Energy saving and heat loss recovery- Safety; risks and waste minimization- Consideration on the plant place- Case studies.

0204700: Engineering Alloys
6.4 Geodesy and tunnels surveying

0204701: Advanced geodesy
Mathematical models and observations equations- two-dimensional models for positioning on the spherical - one-dimensional model for positioning the elevations- three-dimensional and integrated models of positioning.

0204702: “GPS” geodesy
Theory of the satellites movement - Engineering models of satellites orbits – ellipsoidal and geoidal representation of positions – maps projection – geodetic and ground coordinates – reference surfaces for heights – world and Egyptian coordinates systems.

0204703: Tunnels surveying
Preliminary survey on each side of the proposed alignment – plan (map) contour and positioning of reference and control points - transferring position and height into underground - underground surveying and control workings of positions and heights.

0204704: Hydrographic surveying

0204705: Advanced topics at surface and underground surveying for ore extraction
Surveying workings for tunnels driving – measurements for driving of wells – subsidence and displacement measurements – surveying for water and air lines – measurements of underground connections.
ARCHITECTURAL ENGINEERING DEPARTMENT
TABLES FOR POSTGRADUATE STUDIES COURSES OF THE ARCHITECTURAL ENGINEERING DEPARTMENT
1. Qualifying Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of the Architectural Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 15 credit hours from the level of 400 chosen depending on his scientific and professional background from the following table:

Table (5-1)

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<th>Pre-request</th>
<th>Examine Time</th>
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2. Preliminary Study Courses

Include a group of courses for graduate students of disciplines other than Engineering who are willing to increase their technical effectiveness and scientific background in one of The Architectural Engineering Fields. The student studies a number of courses, which he has not studied before, equivalent to 12 credit hours from the level of 400 or above chosen depending on his scientific and professional background from the following table:

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3. Professional Diploma Studies

Include a group of courses for Engineering graduate students. The student studies a number of courses, which he has not studied before, equivalent to 18 credit hours from the level of 450 chosen depending on his undergraduate field of study from the following table:

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4. Post-Graduate Diploma Courses

In this study, 18 credit hours must be selected from the level of 500 or above from the following diplomas:

### 4-1 Diploma in Architectural Design

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5. Master Degree Courses- First and Second Stage

MASTER'S IN ENGINEERING DEGREE

Based on the suggestion from the academic advisor, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 30 credit hours are requested. In addition, an applied research (6 credit hours) must be done to achieve this degree.

MASTER'S OF SCIENCES (M.Sc.) DEGREE

Based on the suggestion from the supervision Committee, the relevant department will select courses for the students from level 600 or above. The proper number of hours in each semester not less than 6 credit hours per week and totaling at least 18 credit hours are requested. In addition, a scientific thesis (18 credit hours) must be done to achieve this degree.
### 5-1 Architectural Design (First Stage)

**Table (5-6)**

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### 5-2 Urban Planning (First Stage)

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## 5-3 Architectural Design (Second Stage)

### Table (5-8)

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### Table (5-9) 5-4 Urban Planning (Second Stage)

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6. Ph.D. Degree Courses

After the students pass the comprehensive exam, 18 credit hours (suggested from the supervisory committee) of level 600 or above must be studied. The proper numbers of credit hours in each semester are not less than 6 credit hours per week. In addition, a scientific thesis (30 credit hours) must be done to achieve this degree.
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6-2 Urban Planning

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COURSES DESCRIPTION FOR POSTGRADUATE STUDIES
THE ARCHITECTURAL ENGINEERING DEPARTMENT
1. Qualification courses

0205401: Building Construction:
Full understanding of building construction process and other related techniques. The study includes:
- Methods of building construction.
- Bearing walls system.
- Skeleton Buildings system.
- Brick and masonry works.
- Proofing materials.
- Floors.
- Stairs.
- Study of executive process of different construction steps both theoretically and applicably in projects sites.

0205402: Shade, Shadow and Perspective:
- The shading of architectural compositions in 2D and 3D drawings.
- The shade of the point, line, surface and masses in architectural compositions.
- The Perspective: Definitions, Perspective types (interior and exterior), visual angles
- The perspective types of drawing.

0205403: History and Theory of Architecture (1):
General view on architecture and analyzing its situation between art and science. Studying methods of expression in architecture and an over view on the architectural profession. This will be through:
- Arising and evolution of architecture.
- Factors influencing the architecture (function, construction, environment, form and economy).
- Elements of building.
- Functional relationships.
- Studying architecture and art in the pre-history period.
- Studying the ancient Egyptian architecture through the way they were constructing their buildings such as the pyramids, temples and other buildings.
- Studying the architecture of west Asia through their buildings that express their believes.
- Studying Greek and Roman architecture through their temples and public buildings.
0205404: History and Theories of City Planning:
- Studying the city throughout different sequential eras (The Paleolithic era, the ancient Egyptian ages, the Mesopotamian civilization, the ancient Greek ages, the Roman ages, the Medieval ages, the Islamic State, the Renaissance age, the Baroque (Peruke) age).
- Then a study of the modern city planning theories, recognizing the comprehensive planning's studies and carrying out field study for an urban site or a small city.

0205405: Building Physics (Acoustics, lighting, Air conditioning):
- The definition of sound waves.
- Characteristics and properties of sound.
- Acoustical design of enclosure.
- Principles of noise control.
- Electric lighting, electric lighting calculations and wiring.
- Air conditioning systems, methods, requirements, and demands.

0205406: Visual Training and Color Theory:
- Development of artistic treatments in architectural design.
- Studying proportions, relative relationships for planes and objects.
- Studying the techniques of Freehand drawings for pictures and 3d models.
- Fundamentals of visual design.
- Theory of colors.
- Training for using different types of color sources.
- Color functions in architectural design.

0205407: Environmental Studies:
Achieving environmental efficiency for buildings by studying building and it's surrounding climatological environment, through:
- Climatic regions.
- Solar movement and angles.
- Solar radiation and it's influences.
- Shading and shading devices.
- Thermal comfort and achieving it inside buildings.
- Natural ventilation and lighting.

0205408: Architectural Terms:
The course introduces words and terms used in the architectural field (i.e. Design, construction, planning and other architectural fields), the student will be asked to perform translation and discussion activities, to prepare subjects that include all terms to be needed by students, practitioners architectural design and planning.
0205409: Architectural Drawing and Design Principles:
Understanding the architectural design process and the ability to provide architectural spaces to be suitable for day life user activities. That would be done through projects that help students to gain practical experience in the design process, projects focused on the study and design of the space, with taking in consideration the formation, construction and cultural content expressed by the space. The study includes:
- Drawing of architectural forms.
- A study of the building design elements and the elements of internal furniture and dimensions.
- The study of classical architectural formations (Pharaonic - Greek - Romanic - Islamic)

0205410: Computer:
Informing students about computer technologies in Architecture, the most recent developments in that field, the role of computer in the development and enhancement of the architectural product. That comes through the following items:
- The study of computer components (Hardware)
- The importance of computer in the field of Architecture.
- Ready-made computer software packages related to architectural work.
2. Preliminary Study Courses

0205401: Building Construction:
Full understanding of building construction process and other related techniques. The study includes:
- Methods of building construction.
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- Brick and masonry works.
- Proofing materials.
- Floors.
- Stairs.
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- The perspective types of drawing.

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- Elements of building.
- Functional relationships.
- Studying architecture and art in the pre-history period.
- Studying the ancient Egyptian architecture through the way they were constructing their buildings such as the pyramids, temples and other buildings.
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- Studying Greek and Roman architecture through their temples and public buildings.
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- Drawing of architectural forms.
- A study of the building design elements and the elements of internal furniture and dimensions.
- The study of classical architectural formations (Pharaonic - Greek - Romanic - Islamic)

0205425 Basics of Building Economics:
- Concepts and principles of building economics.
- Building projects.
- The design factors which affect construction economics.
- Costs of the main building elements.
- Some of the design factors which affect the building economics.
- The Cash-Flow of financing building projects.

0205426 Site Management:
- Implementation phases of Engineering projects.
- Site preparation.
- Technical administrative office supervising the site.
- Controlling the construction operations.
- Incentive systems.
- Modern site management methods.
- Time and cost.
- Site Safety.
- Technical problems in architectural projects.
- Performance Evaluation and follow-up of projects implementation.
- Contracts management.
- Site preparation and planning.
- Site operating systems (Stores – equipment – labor).
- Technical reports.

0205427 Site Analysis:
- Different sites analysis.
- Clarifying the elements of strength, weakness, opportunities, and threats (SWOT) for every site.
- Geographic, climatic and economic effects.
• Approach and accessibility methods.
• Soil studies, pollutants, Surrounding activities and their effects.
• Forbidden and allowed activities.
• Other factors that affect the site.

0205428 Research Methods and Methodologies in Architecture:
• Research methods and methodology.
• Fields of architectural and urban planning research.
• Architectural and urban planning research between theory and practice.

0205429 Computer Skills:
Getting acquainted to different computer skills and various applications in the field of Architecture and planning through:
• Demonstrating the common computer software used in the field of "Office publishing".

0205430 Communication Skills:
• An introduction to the basic principles and methods of oral communication with emphasis on improving speaking and listening skills in the context of small group discussion.
• Focus on the impact that communication has on the interaction between individuals in settings including groups.
• Students are expected to demonstrate and apply these skills through individual and group presentations and activities.
3. Professional Diploma Studies

**0205425 Basics of Building Economics:**
- Concepts and principles of building economics.
- Building projects.
- The design factors which affect construction economics.
- Costs of the main building elements.
- Some of the design factors which affect the building economics.
- The Cash-Flow of financing building projects.

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- Focus on the impact that communication has on the interaction between individuals in settings including groups.
- Students are expected to demonstrate and apply these skills through individual and group presentations and activities.

**0205450 Architectural Design (1):**
- Study of Architectural Projects composed of multiple attached and separated buildings, focusing on how to solve the circulation problems, building compositions, interior and exterior spaces.
- Type of Projects: A primary school, child home, hotel…etc.

**0205451 Executive Drawings:**
- Studying the process of buildings construction and process of preparing the complete working drawings for a certain building.
- Studying the interior drain works and around the building.
- Interior electrical works for the building.
- Determine the layout of the building.
- Studying the process of the drawing of construction sheets.
- Design the models of wooden doors and windows and their details.
0205452 Construction Contracts, Quantities, and Specifications:
- Preparing the bill of quantities.
- Arrangement of general conditions and clauses.
- Definition of the methods of measurement for permanent and temporary works.
- Study of specifications of all parts of the building.

0205453 Systems of Building Services:
- Studying methods of supplying different services to buildings.
- Design principals, criteria and requirements.
- Stages of building implementation.
- Feasibility studies.
- Air Conditioning and Ventilation.
- Cooling & heating.
- Hygienic and sewage installations.
- Fire abatement.
- Garbage Collection.
- Computer and internet and other services.

0205454 Human Studies in Architecture:
The subject aims to define the human values, which should be available in urbanizing process, achieving the social and human behaviour balance, as social intimate, civic culture and values of the community, customs and traditions. Religious values and laws. - The application of this subject on real projects and evaluate it due to the human studies and examining the suitability to human life.

0205455 Housing Problems in Developing Countries:
- Analysis of the recent situations of housing in the developing countries and the relation with the social, economic and political circumstances.
- The different approaches for dealing with the housing problems in the developing countries.
- Unplanned extensions.
- Types of appropriate housing coping with the current circumstances.
- Theoretical and practical experiments in dealing with housing problem.
- The role of self-help approach in the housing problem.

0205456 Human Settlements:
- An introduction to planning.
- Town, village and rural areas.
- Towns in the old and medieval eras.
- Contemporary town.
- Function, size and distribution of towns.
• Town region.
• Internal structure of town.
• Development of town planning in the Modern era.
• Main stages of urban planning, studies needed, steps and outputs of each stage.
• Foreign experiences in local planning.
• Egyptian experience in local planning.

0205457 History and Theory of Architecture (2):
Studying internal spaces and its elements, its components and circulation. The outdoor space, nature and site. Masses and its arrangement in space and site. The surrounding circumstances affecting architecture. The historical and architectural evolution for the previous elements in the following eras:
• The early Christian architecture represented in churches and public buildings.
• The Byzantine architecture represented in churches and public buildings.
• Renaissance architecture represented in churches and public buildings.
• Islamic architecture during its different periods (Ayoubi, Mamluki and ottoman) represented in mosques and public buildings.

0205458 Urban Design:
• An introduction to urban design.
• Urban spaces and their components.
• Masses and spaces and their elements.
• Urban activities and their impacts.
• Feelings inside urban space.
• Theory of perception.
• Visual sequence.
• Visual elements of the city structure and their hierarchy.
• Interrelation between the city image at day and at night.
• The sky line and the ground line.
• How to design an urban space.
• Values and concepts.
• Interrelation between indoor and outdoor spaces.
• Urban design and visual arts.

0205459 Building Law:
• An introduction to planning legislation in Egypt.
• Urban Planning law.
• Building law.
• Industrial Building law.
• Public Building Law (Educational and Health Care).
• Architectural Profession’s law.
• Legislations affecting urban development.
• Law and agriculture land protection.
• Law and monuments’ protection.
• Compulsory Purchase Law.
• Local Administration Law.
• Environment Protection Law.

0205460 Management of Building Projects:
• Management definition.
• Types of building projects.
• The main members participating in building projects.
• The main tasks of managing building projects.
• The role of project manager during the project stages.
• The problems which face the project management.
• The personal and administrative skills of the project manager and their effect on motivating the workers at building project.
• Site development.
• Controlling construction processes.
• Methods and criteria of performance rates.
• Incentives methods at work.

0205461 Geography of Towns:
• Establishment and development of Towns.
• Functions of towns.
• Size and distribution of towns.
• Towns’ locations and the impact of geographic factors on its location distribution.
• City Region.
• Towns’ growth and related problems.

0205462 Restoration of Monumental Buildings:
• A theoretical introduction to the architectural restoration science.
• Levels of restoration in monumental buildings.
• Materials used in different restoration types.
• Technical methods used in restoration works.
• Concepts of restoration works.
4. Post-Graduate Diploma Courses

4-1 Diploma in Architectural Design

0205460 Management of Building Projects:
- Management definition.
- Types of building projects.
- The main members participating in building projects.
- The main tasks of managing building projects.
- The role of project manager during the project stages.
- The problems which face the project management.
- The personal and administrative skills of the project manager and their effect on motivating the workers at building project.
- Site development.
- Controlling construction processes.
- Methods and criteria of performance rates.
- Incentives methods at work.

0205500 Statistics and Operation Programs (1):
- The role of Statistics and Operation Programs in Planning and Architectural fields.
- Statistical Definitions.
- Statistical Graphics and Representation.
- The linear formulas
- Theoretical studies on the role of Statistics in field surveys.
- The identification of some Statistical Operation Programs and Statistical Graphics and Representation.

0205501 Infrastructure Networks Design:
- Design principles and systems of infrastructure networks in buildings.
- Studying the infrastructure networks in buildings according to present technology development, (Electric networks, internet, water supply, waste drainage, cooling, heating, etc).
- Problems and defects of buildings infrastructure networks in Egypt.
- A future vision for the development of infrastructure networks in accordance with technological development and physical capabilities of institutions and individuals.
0205502 Architectural Design (1):
- Design Methods.
- Design Process.
- Design Approaches.
- Architectural Patterns.
- The role of computer applications in design development.

0205503 Environmental Design:
- Enhancement and developing environmental design and planning skills, with emphasis on the tools and techniques to support architectural and planning form generation processes.
- The influence of ecological factors on site and city planning to introduce solar and natural energy & pollution control studies together with integrated systems in and around buildings.
- Environmental levels and settings review.
- Climatic regions in Egypt: Features, design and development recommendations.
- Integrated environmental design.
- Energy conservation principles.
- Comfort indicators and human needs.

0205504 Information Technology and Architecture:
- History of interrelationship between information technology and architectural theory and practice.
- How to install information technology in the built environment.
- Opportunities and challenges of information technology.
- Examples and case studies.

0205505 Climate and Environmental Engineering:
- Studying the relationship between climate and environment.
- Sun and thermal environment.
- Climatic elements and thermal comfort criteria and indices.
- Natural lighting environment and visual comfort.
- The acoustical environment and acoustical pollution.
- Comfort and noise indices.
- Acoustical design and noise control.
- Environmental resources, the renewable energy and energy conservation.
- Ecological systems.
- A healthy environment and waste recycling.
0205506 Methods of Color Selection in Architecture:
- An introduction to color science.
- Color theories.
- Colors in architecture throughout history.
- Factors affecting the color selection in architecture.
- Methods of color selection in interior and exterior.
- Analyzing and evaluating color selections in architecture.

0205507 History and Theories of Contemporary Architecture:
- The most important architectural trends in the world since 1970 till now and the reflection of such trends on the architectural thought in the Arab countries and Egypt in particular.

0205508 Design of Residential Sites:
- History of residential sites design evolution.
- Analysis of internal composition and the outer form of housing units.
- Study of the patterns and trends of current planning for the design of residential sites.
- Factors influencing the design and planning of residential sites.
- Laws and regulations governing the design of residential sites.
- Rates of the design and planning of residential areas.
- Residential sites planning and design considerations.
- Design alternatives of residential sites and methods of evaluation.
- Local and international case studies.

0205509 Design of Special Buildings:
- Types of buildings according to their activities (sport - cultural - social - art).
- Users and community requirements from the activity and its architecture reward.
- Principles of site planning at thy city level.
- Design criteria of such buildings.
- Requirements of the activities inside and outside the space.
- General design of the layout, and vision angles.
- Special requirements.
- Disabled requirements.
- The building as a symbol in the local, national and international context.
- Suitable structural systems and its economics.
- The environmental effect on the design of special buildings.
0205510 Technical Installations:
- Designing halls used for speech (e.g. lecture theatres, classrooms, courtrooms, etc.)
- Designing principles of those types of buildings.
- Studying and analysing some examples of each type.
- Clarifying the advantages and disadvantages in acoustical design.
- The principles of using computers in acoustics, and its application.
- The use of sound reinforcement systems, application, problems and its solvability.
- Basics of halls air conditioning. - Air conditioning systems. - Air conditioning calculations.

0205511 Executive Working Design and Architectural Details:
- Preparing working design for some elements of a distinctive project (e.g. hotel- conference hall - theater-…).
- Making decoration details of walls and ceilings.
- Using modern elements and materials in finishing.
- Studying architectural details of external facades.
- Studying architectural internal details of walls, ceilings, floors, different types of staircases, partitions, special designs of doors, windows, and furniture.
- Architectural details of some construction methods.
- Landscape working details design and drawing.

0205512 The Architectural Details of Historical Buildings:
- Components of historical building.
- Types and forms of the architectural details and their places in historical buildings.
- The different historical styles of architectural details.
- The traditional construction techniques and materials of the architectural details.
- Different technical methods of surveying and documenting of the architectural details.
- Preparing the detailed drawings of the architectural details.
- Restoration methods of the historical architectural details.
- An applied project for practicing the surveying and preparing the detailed drawings for the architectural details of a historical building.

0205513 An Application of Conservation Project:
- Historical studies needed for the building that should be preserved.
- Preparation of the analytical drawings.
- Specifying the original details of the building.
• Identifying the conservation problems and the suitable function of the building.
• Preparing the restoration project and identifying the conservation decisions.
• Historical, urban and architectural studies for the site that deserves to be preserved.
• Inventory of the architectural heritages in the site.
• Identifying the conservation problems in the site.
• Identifying the proposed functions for reusing.
• Preparing the conservation project and identifying the conservation decisions.
4-2 Diploma in Urban Planning

0205461 Geography of Towns:
- Establishment and development of Towns.
- Functions of towns.
- Size and distribution of towns.
- Towns’ locations and the impact of geographic factors on its location distribution.
- City Region.
- Towns' growth and related problems.

0205500 Statistics and Operation Programs (1):
- The role of Statistics and Operation Programs in Planning and Architectural fields.
- Statistical Definitions.
- Statistical Graphics and Representation.
- The linear formulas
- Theoretical studies on the role of Statistics in field surveys.
- The identification of some Statistical Operation Programs and Statistical Graphics and Representation.

0205501 Infrastructure Networks Design:
- Design principles and systems of infrastructure networks in buildings.
- Studying the infrastructure networks in buildings according to present technology development, (Electric networks, internet, water supply, waste drainage, cooling, heating, etc).
- Problems and defects of buildings infrastructure networks in Egypt.
- A future vision for the development of infrastructure networks in accordance with technological development and physical capabilities of institutions and individuals.

0205525 Housing in Developed and Developing Countries:
- The concept of housing.
- Features of housing problem.
- Indications of problem in the housing sector.
- Housing problems in developing countries and their experience to solve it.
- Experiments of other developed countries and the assistance of international organizations to solve housing problems.

0205526 Urban Development Law and Legislation:
- An introduction to Law studies.
- Definition of Planning Law.
• Fields of Planning legislation in Egypt.
• Building and demolition law.
• Spatial Planning law.
• Legislations affecting urban development (e.g. law of agricultural land protection, law of monuments’ protection, Compulsory Purchase law, local Administration Law, Environment Protection Law).
• Suggestions for development of Planning law in Egypt.

**0205527 Principles and Theories of Urban Planning:**
• Definition of Urban Planning, its levels, and its relationship with the management of urban development.
• Spatial and sectorial planning.
• The main methodologies of planning.
• The emergence of human settlements.
• Town planning in the ancient and medieval eras.
• The evolution of town planning in the modern age.
• The main stages of urban planning, the requested and essential studies, the sequence and outputs for each stage.
• Egyptian experience of local planning.
• The concept of Land-use planning.
• Descriptive theories (theory of domains with corporate center - theory of sectors – multi nucleus theory).
• Explanatory theories (the classical theory of land-use, the theory of transportation effect on Land-use, the theory of social values).

**0205528 Rural Housing:**
• Rural housing and its historical development.
• Contemporary rural housing and its types.
• Development of traditional rural housing.
• Development of mixed rural housing.
• Development of rural/urban housing.
• Building material and technologies in rural housing.
• Factors affecting contemporary rural housing.
• Values in contemporary rural housing.
• Studying an existing rural housing area and its characteristics, problems and possibilities, suggested solutions including upgrading, rehabilitation, demolition and replacement, stopping urban growth on agricultural lands.
• Studying the existing housing stock of a specific area.
• Housing needs and programs of housing supply.

**0205529 Environmental Planning:**
• Basic environmental components.
• Conservation of ecological systems.
• Definition of environmental planning as a basic tool to achieve a comprehensive, sustainable, permanent economical and sociological development.
• The importance of sustainable development and its realization means.
• Creation of horizontal environmental consciousness and deepening it vertically.
• An approach to study renewable energy types and glorification of its benefits.

0205530 Urban Design:
• An introduction to urban design.
• Urban spaces and their components.
• Masses and spaces and their elements.
• Urban activities and their impacts.
• Feelings inside urban space.
• Theory of perception.
• Visual sequence.
• Visual elements of the city structure and their hierarchy.
• Interrelation between the city image at day and at night.
• The sky line and the ground line.
• How to design an urban space.
• Values and concepts.
• Interrelation between indoor and outdoor spaces.
• Urban design and visual arts.

0205531 Planning of Residential Sites:
• History of residential sites design evolution.
• Analysis of internal composition and the outer form of housing units.
• Study of the patterns and trends of current planning for the design of residential sites.
• Factors influencing the design and planning of residential sites.
• Laws and regulations governing the design of residential sites.
• Rates of the design and planning of residential areas.
• Residential sites planning and design considerations.
• Design alternatives of residential sites and methods of evaluation.
• Local and international case studies.

0205532 Planning of Industrial Centers, Transportation and Traffic:
• Definition of industrial basic concepts.
• Classification of the industries and selection of appropriate locations.
• Planning and design principles of industrial centers (e.g. streets parks and blocks, utilities, etc.).
• Main factors that determine the location of manufacturing on local and regional level.
• Study of national and International industrial centers and cities.
• Planning principles of transportation, traffic, and roads network on the national, regional, and local levels.
• Studying the hierarchy of roads and pedestrians networks planning.
• Distribution of movement paths and parking areas.
• Applications of using mathematical models and computer to calculate traffic trips and traffic density.
• Preparing plans and implementation methods of road networks.

**0205533 Management of the Urban Design Process:**
• The importance of setting a system to manage the urban design process (Design - Implementation) due to the problem of doubling the cost of building construction after completion compared with the estimated cost.
• Conceptual definition of achievement and delivery of construction projects.
• Analysis of some systems of completion and delivery of large construction projects in developed countries in order to benefit from the advantages of methods which used to control the costs and time of achieving projects.

**0205534 Development of Historical Sites in Egyptian Cities:**
• The historical development of Egyptian city.
• Egyptian city in the Pre-historic ages.
• City in the medieval ages.
• Modern age and getting out from the city wall of the medieval ages.
• Changes that occurred in the historical sites after the July Revolution in 1952.
• The pressures of urban transformations upon the historical districts as a result of the economic changes in the 1970's.
• The problems that face the historical districts at the present.

**0205535 Housing:**
• Housing Concept.
• Housing and existing realities.
• Housing providers and their roles and problems facing each provider.
• Housing types and patterns (analyzing positive and negative aspects).
• Appropriate housing strategies and the role of each sector.

**0205536 Environmental Pollution:**
• Environmental systems components.
• Environmental pollution areas.
• Principles of environmental pollutants Classification.
• Health, sociological and economical pollution influences.
• Pollution control methodologies and the role of individuals, governments and international Organizations.
• Role of architects and planners in environmental pollution control.
### 5 Master Courses Description

#### 5-1 Architectural Design (First Stage)

**0205600 Research Methods and Methodologies in Architecture:**
- Research methods and methodology.
- Fields of architectural and urban planning research.
- Architectural and urban planning research between theory and practice.

**0205601 Statistics and Operation Programs (2):**
- The role of Statistics and Operation Programs in Planning, Architecture and Construction project management.
- Statistical Applications in Architecture.
- Questionnaire Design and Surveys.
- Application of some Statistical Operation Programs and Statistical Graphics and Representation.

**0205602 Solving Architectural and Urban Problems:**
- Recognizing the architectural problem.
- Methods of documenting the problem.
- Analyzing the architectural problem.
- Technical reports for analyzing problems.
- Ways of solving architectural problems.
- Scientific research and solving architectural problems.
- Obstacles of applying solving – post solving evaluation.

**0205603 Laws and Legislations of Urbanization and Architecture:**
- An introduction to Law studies.
- Definition of Urbanization and Architecture Laws.
- Organizing Frameworks for Architectural works and related authorities and laws.
- Official authorities responsible for the preparation of Master plans.
- Laws of architectural designs and implementations.
- Urban Planning law and its executive decree.
- Theoretical vision and practical applications of the management of projects and architectural institutions.
- Local reality and its problems.
0205604 Theories, Concepts and Techniques of Conservation and Restoration:
- Reasons for evolution of conservation science.
- Development of conservation theories all over the world until the early of 20th century.
- The modern conservation theories in the second half of the 20th century and the declaration of Venice Charter, Amsterdam declaration and the emergence of the concept of historical centers and sites' conservation.
- The emergence of international committees and Nairobi Decisions.
- Concepts and definitions of conservation.
- Terms of conservation and restoration.
- Methodologies and Techniques of conservation and restoration.
- Using the traditional construction techniques and materials in restoration.
- Techniques of conservation and restoration used for load-bearing buildings.
- Methods of conservation and restoration of traditional materials.
- Applications and examples.

0205605 The Organizational Structure and Legislative Framework of Conservation:
- Laws which organize the conservation works of historical sites and buildings in Egypt.
- Institutions related to conservation works and their responsibilities.
- The role of NGO's in conservation works.
- Teaching conservation and restoration in educational institutes.
- The socio-economic structure of the historical sites in Egypt.
- Participation and interaction between residents of historical sites and institutions responsible of conservation.
- Comparative examples from different countries.

0205606 Architectural Design (2):
- Design methods.
- Design process.
- Design approaches.
- Design program.
- Evaluation process.
- Design presentation and communication.
0205607 Interior Design:
- History of Interior design.
- Imaging of Interior design.
- Components of Interior space.
- Industrial design of furniture.
- Materials and its structure, color and psychological factors.
- Aesthetics of interior space.
- Contemporary trends of interior design.
- Public and private interior design and requirements of environmental design.
- Suggestion of interior and exterior space.
- Studies and researches.

0205608 Architectural Design Trends:
- Architectural design international trends.
- Architectural design national trends.

0205609 Architecture of Hot Arid Zones:
- Different climatic zones.
- Characteristics and influences of climate on the natural and built environments.
- Architectural responses to climate.
- Building shape, orientation, materials, construction.
- Architectural details and architectural design solutions.
- The role of computer in systematic climatic design process.
- Application on the hot arid environments.

0205610 Low Energy Architecture:
- Low energy buildings.
- Principles of energy conservation in buildings.
- Low energy building design techniques.
- Energy consumption in buildings in different countries.
- Examples of low energy building design methods.
- Projects in hot arid regions.
- Computer programs for low energy buildings.

0205611 Advanced Management of Building Projects:
- Studying the delivery systems of large building projects.
- Analysis of methodologies or systems of the large building projects delivery at some developed countries in comparing with the Egyptian system.
0205612 Architectural Design Methods and Approaches:
- History of design approaches.
- Design methods.
- Design process.
- Impacts on design product.

0205613 Intelligent Architecture:
- Perspectives on intelligent architecture.
- Intelligent architecture technologies and installations.
- Environmental, economic, functional, political, and social impacts.
- Capabilities of application in Egypt.
- Examples and case studies.

0205614 Environmental Control:
- Principles of evaluation of environmental performance during the design process using specific tools and techniques.
- The principles of environmental control in architecture.
- Climatic control and the design process.
- Thermal performance of buildings and architectural features.
- Energy conscious design.
- Natural ventilation & air flow in and around buildings.
- Natural lighting & energy.
- Computer aided design and applications.
5-2. Urban Planning (First Stage)

**0205600 Research Methods and Methodologies in Architecture:**
- Research methods and methodology.
- Fields of architectural and urban planning research.
- Architectural and urban planning research between theory and practice.

**0205601 Statistics and Operation Programs (2):**
- The role of Statistics and Operation Programs in Planning, Architecture and Construction project management.
- Statistical Applications in Architecture.
- Questionnaire Design and Surveys.
- Application of some Statistical Operation Programs and Statistical Graphics and Representation.

**0205602 Solving Architectural and Urban Problems:**
- Recognizing the architectural problem.
- Methods of documenting the problem.
- Analyzing the architectural problem.
- Technical reports for analyzing problems.
- Ways of solving architectural problems.
- Scientific research and solving architectural problems.
- Obstacles of applying solving – post solving evaluation.

**0205603 Laws and Legislations of Urbanization and Architecture:**
- An introduction to Law studies.
- Definition of Urbanization and Architecture Laws.
- Organizing Frameworks for Architectural works and related authorities and laws.
- Official authorities responsible for the preparation of Master plans.
- Laws of architectural designs and implementations.
- Urban Planning law and its executive decree.
- Theoretical vision and practical applications of the management of projects and architectural institutions.
- Local reality and its problems.

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- Reasons for evolution of conservation science.
- Development of conservation theories all over the world until the early of 20th century.
The modern conservation theories in the second half of the 20th century and the declaration of Venice Charter, Amsterdam declaration and the emergence of the concept of historical centers and sites' conservation.

The emergence of international committees and Nairobi Decisions.

Concepts and definitions of conservation.

Terms of conservation and restoration.

Methodologies and Techniques of conservation and restoration.

Using the traditional construction techniques and materials in restoration.

Techniques of conservation and restoration used for load-bearing buildings.

Methods of conservation and restoration of traditional materials.

Applications and examples.

0205605 The Organizational Structure and Legislative Framework of Conservation:

- Laws which organize the conservation works of historical sites and buildings in Egypt.
- Institutions related to conservation works and their responsibilities.
- The role of NGO's in conservation works.
- Teaching conservation and restoration in educational institutes.
- The socio-economic structure of the historical sites in Egypt.
- Participation and interaction between residents of historical sites and institutions responsible of conservation.
- Comparative examples from different countries.

0205616 Geographic Information Systems:

- Fundamentals of classification and establishment of information and databases.
- Classification of main data of urban planning process.
- The importance of utilizing Geographic Information Systems (GIS) in urban planning.
- Study of the conversion process of urban planning data and information into digital data.
- The process of building the Geographic Information Systems (GIS) Database.
- Applied study for conversion process of maps and paper data into digital data in GIS data-base.

0205617 Urban Sociology:

- A study investigating the relationship between Sociology and Urbanization in terms of the impact of design on social relations within the family, then the relationship between urban fabric and strengthening social relations among the society.
Establishment of different social patterns through the planning process.

The phenomenon of urbanism and migration from countryside to the city and its impact on the urban behavior of the community.

0205618 Systems, Policies and Economics of Housing:
- The concept of housing.
- Features of housing problems.
- Elements of house production.
- Types of organizations responsible for providing houses.
- Estimation of housing sector requirements.
- Housing policies.
- An introduction to housing problem.
- The concept of economy in housing (for the architect, the contractor, the user, and the country).
- Factors affecting the economics of housing buildings (Architectural, constructional).

0205619 Urban Sociology and Economics:
- Origin of urban settlements and their components.
- Meeting the essential human needs.
- Studying the urban architectural elements and the importance of each element for human beings.
- Calculating infrastructure economics and how to differentiate between them.

0205620 Housing development:
- The concept of housing.
- Housing problems implications.
- Development of existing housing stock (theory, methodologies, and applications).
- New housing constructions (theory, methodologies, and applications).

0205621 Planning of Commercial Centers:
- Types of commercial centers at the city level.
- Planning standards for commercial centers.
- Study of the traditional city centers (City downtown).
- The impact of the digital revolution on the design and planning of commercial centers.
- Dimensions of reciprocal relationships for commercial centers with transportation and road network.

0205622 Rural Planning:
- Philosophy and theories of rural planning, and researches in that field.
• The economic view for rural planning.
• Planning of infrastructure.
• Developing the rural areas through studies, researches, site works and administration.
• Future extensions and their effect on the national economy.

0205623 Land Use Planning:
Techniques and procedures for urban growth management and effective land use control. Presentation of the most important experiences and best practices in urban planning. Fundamentals of land use planning and systems of urban development management. Presentation of tools, models and techniques used at the local, regional and national levels that are related to land use types in the urban environment, activities sites and urban form. Appropriate limits and ratios in order to achieve a balance between the various uses. Land use planning utilization and future directions of urban growth in the Egyptian towns.

0205624 Transportation, Traffic and Roads' Networks Planning:
• Planning principles of transportation, traffic, and roads network on the national, regional, and local levels.
• Studying the hierarchy of roads and pedestrians networks planning.
• Distribution of movement paths and parking areas.
• Applications of using mathematical models and computer to calculate traffic trips and traffic density.
• Preparing plans and implementation methods of road networks.
5-3 Architectural Design (Second Stage)

**0205630 Documentation of Urban and Architectural Heritage:**
- Definition of documentation.
- Documentation stages (before and after the conservation works).
- Historical resources used in documentation.
- Documentation with photographs.
- Drawings needed for documentation.
- Documentation of historical buildings.

**0205631 Evaluation Methodologies of Historical sites and Buildings:**
- Types of urban and architectural heritages.
- Movable and immovable heritage.
- Types of historical sites.
- Evaluation criteria of urban and historical heritages.
- Methodologies used all over the world to evaluate heritage.
- Present status of evaluation process of urban and architectural heritages in Egypt.

**0205632 International Experiences in Conservation and Restoration:**
- Studying the international experiences of the urban and architectural conservation projects.
- Analyzing the experiences of Islamic and Arab countries in conservation projects.
- Comparative analysis between Egyptian and international heritages to find out solutions for similar problems.

**0205633 Environmental Compatible Architectural Design:**
- Environment and environmental components.
- Principles of Environmental architecture.
- Concepts and determinants of ecological design.
- Environmental factors influencing the architectural design.
- Standards of environmental compatible architectural design.
- The architecture of Hassan Fathy and its compatibility with the environment.

**0205634 Management and Methods of Modern Building Construction:**
- Site preparation and management.
- Administrative body and its duties.
- Using modern technology in construction process.
- Administrative control.
- Site organizational and administrative structure.
• Controlling construction processes.
• Setting implementation program.
• Elements of work items cost and factors of cost reduction.
• Performance rates and criteria.
• Studying performance methods and work incentives.
• Studying modern building construction methods, building technology, shell construction and tents, prefabrication systems, different prefabrication methods, box units.
• The importance of studying modern building construction methods and relationship with the development of architectural designs.
• Analysis of methodologies or systems of Large-scale projects construction and delivery in some developed countries compared to Egyptian methodology.

0205635 Building Technology and Modern Construction Systems:
• Definitions of technology.
• Technology transfer and adaptation.
• Historical development for building technology.
• Modern building technology and modern construction systems.
• Compatible technology.
• Building technology and its relation to the actual situation.

0205636 Executive Drawings and Design of Landscape Elements:
• Landscape elements and integration of space elements.
• Working details of site elements and components.
• Working details of landscape elements (e.g. flower boxes, fountains, shades, canopies,...).

0205637 Human Considerations in Outdoor Design:
• How could designer deals with human behavior through design of: living, working, society, learning, shopping, health care, and public indoor and outdoor places.

0205638 Landscape Architecture:
• The definition of landscape architecture process, design, treatment of the sites.
• The definition of site and its determinants, function, components.
• Urban architectural vocabulary to landscape architecture.
• Stages of site landscaping process, and how to test.
• Landscape architecture as a cultural thought and human and social formation.
0205639 History of Contemporary and Advanced Architecture:
- Modern Architecture.
- Late Modern Architecture.
- Post Modern Architecture.
- Intelligent Architecture.
- Sustainable Architecture.

0205640 Garden Design:
- Glossary and Identifications.
- The Architectural Components of the garden.
- Courts and Gardens: Architectural Types and Styles.
- European gardens: Italian, French, English, Spanish gardens.
- Arabic and Muslim gardens.
- Japanese gardens.
- Typical characteristics, Evolutions, and the garden prototype.
- The Visual and Conceptual studies of garden design.

0205641 Elements and Methods Dealing with the Natural environment:
- Natural environment definition, its components and environmental systems.
- The factors affecting degradation of the natural environment.
- The recycling concept as a solution to preserve the natural environment.
- The renewal energy uses and its economies and disadvantages.
- Sustainable concept definition and its impact on preserving the natural environment.
- Environmental education.
5-4 Urban Planning (Second Stage)

0205630 Documentation of Urban and Architectural Heritage:
- Definition of documentation.
- Documentation stages (before and after the conservation works).
- Historical resources used in documentation.
- Documentation with photographs.
- Drawings needed for documentation.
- Documentation of historical buildings.

0205631 Evaluation Methodologies of Historical sites and Buildings:
- Types of urban and architectural heritages.
- Movable and immovable heritage.
- Types of historical sites.
- Evaluation criteria of urban and historical heritages.
- Methodologies used all over the world to evaluate heritage.
- Present status of evaluation process of urban and architectural heritages in Egypt.

0205632 International Experiences in Conservation and Restoration:
- Studying the international experiences of the urban and architectural conservation projects.
- Analyzing the experiences of Islamic and Arab countries in conservation projects.
- Comparative analysis between Egyptian and international heritages to find out solutions for similar problems.

0205646 Urban and Regional Planning:
- Development of Planning theories.
- Function, size and distribution of towns.
- Town region and internal structure of town.
- Development of town planning in the Modern era.
- Main stages of urban planning.
- Studies, steps and outputs of each stage.
- Foreign and Egyptian experiences in local planning.
- Computer application in urban planning.

0205647 Planning of Services Centers:
- Determination of Services Centers.
- Types and levels of Services Centers.
- The hierarchy in Services Centers (Size & Distribution)
• Planning standards for Services centers.
• The reciprocal relationships for Services centers with the transportation systems, road network and parking areas.
• The impact of the information and communication technology on the size and distribution of Services Centers.

0205648 Housing Management:
• Definition of housing management.
• The relationship between housing development management, spatial planning, and planning of social and economic aspects.
• Urban development principles.
• General and specific data needed for housing management.
• Problems and objectives of housing development.
• Types of tools used to achieve housing development objectives.
• Follow-up and evaluation of housing development.
• Housing management in Egypt.
• Housing policies and systems in developing and developed countries.
• Point of view of international institutions in housing development.
• New directions in housing development.

0205649 The Approach of Self-help Efforts in the Housing Field:
• The concept of Self-help efforts approach in the housing field.
• Advantages and disadvantages of the approach of self-help.
• National and international ideas and thoughts in this field.
• Directed self-help and their role in solving the housing problem.
• The role of undirected self-help.
• Local and international applications and models of some self-help projects.
• The role of international organizations in supporting the self-help effort.

0205650 Environmental Design for Urban Spaces:
• Components of outdoor spaces, outdoor determinants, land use and influencing factors.
• Design consideration of outdoor spaces.
• Analyzing historical and modern examples of outdoor spaces design.
• Spaces in architectural groups and sites, and their components.
• Vertical determinants (facades, walls,……).  
• Strong, mid and weak determinants. (Roofs, covers, shades, pergolas).
• Floors (passage, green areas, water surfaces)
• Activity areas.
• Furniture elements (plants, water, functional elements, service elements, environmental elements, stairs,……).
• Accessories (land marks, traffic signs,..... etc).
• Spiritual components (activity, size, tolerance, design pattern, character).
• Gardens styles.
• Visual image of space design and site assorting in architectural groups and the general visual sequence.
• The superior vision of sites and architectural groups.

0205651 Planning of Desert Areas:
• The most important natural and environmental determinants of the desert.
• The most important available resources in desert areas (development opportunities).
• The most important planning and design principles and basics of desert areas with taking in consideration the environmental appropriateness for building in these desert areas.

0205652 Planning of Industrial Centers:
• Definition of industrial basic concepts.
• Classification of the industries and selection of appropriate locations.
• Planning and design principles of industrial centers (e.g. streets parks and blocks, utilities, etc.).
• Main factors that determine the location of manufacturing on local and regional level.
• Study of national and international industrial centers and cities.

0205653 Houses Prefabrication:
• The concept of prefabrication technology.
• Types of building prefabrication.
• Prefabricated elements.
• Architectural design using prefabricated elements for houses.
• Methods of assembly of prefabricated elements.
• Finishing of prefabricated elements.
• Road design and its effects on prefabrication of housing.
• Advantages, disadvantages and feasibility study of using prefabricated houses in Egypt.

0205654 Economics of Urban Planning:
• Industrial land uses and the related theories (The lowest cost theory, the market theory, highest benefit theory).
• The linkages among knowledge economy and techno- poles, urban and regional planning.
• The digital revolution, presence economy and expected impacts on urban planning.
6. Ph.D. Courses

6-1 Architectural Design

0205631 Evaluation Methodologies of Historical sites and Buildings:
- Types of urban and architectural heritages.
- Movable and immovable heritage.
- Types of historical sites.
- Evaluation criteria of urban and historical heritages.
- Methodologies used all over the world to evaluate heritage.
- Present status of evaluation process of urban and architectural heritages in Egypt.

0205634 Management and Methods of Modern Building Construction:
- Site preparation and management.
- Administrative body and its duties.
- Using modern technology in construction process.
- Administrative control.
- Site organizational and administrative structure.
- Controlling construction processes.
- Setting implementation program.
- Elements of work items cost and factors of cost reduction.
- Performance rates and criteria.
- Studying performance methods and work incentives.
- Studying modern building construction methods, building technology, shell construction and tents, prefabrication systems, different prefabrication methods, box units.
- The importance of studying modern building construction methods and relationship with the development of architectural designs.
- Analysis of methodologies or systems of Large-scale projects construction and delivery in some developed countries compared to Egyptian methodology.

0205635 Building Technology and Modern Construction Systems:
- Definitions of technology.
- Technology transfer and adaptation.
- Historical development for building technology.
- Modern building technology and modern construction systems.
- Compatible technology.
- Building technology and its relation to the actual situation.
0205660 Advanced Scientific Research Methodologies:
Basic research methods and experimental methods in research areas:
- Field survey
- Case study design
- Comparisons of different methods
- Application of techniques in the selection of sample
- Data collection
- Analytical tools

0205661 Aesthetics of Architecture and the Built Environment:
- General principles of Aesthetics.
- Characteristics of architecture and Urbanization.
- The architectural aesthetics theories.
- Prettiness sources in architecture and Urbanization.
- Aesthetical characteristics of architecture and Urbanization.
- Subjective aesthetics and its sources.
- Objective aesthetics and its sources.
- Aesthetical evaluation of architecture and Urbanization.

0205662 Visual Design of the City:
- Human Optical Properties.
- The Visual Illusions.
- The Perception and Set (Expectation).
- The Visual Composition of Architectural Masses, groups and the City.
- Normal, Opposite, Elevated and gradual Visual Sequence.
- The Characteristics of Overview the City composition.
- The Approach Axes and the focal point of visual activities.

0205663 Architectural Criticism:
- The course objective is to help the student to Review, analyze and evaluate architectural work from different points of view.
- The course introduces concepts, types, tools, methods, Examples, application and case studies of architectural criticism.
- The course also discusses the relation between criticism and creativity.

0205664 Noise Control Methods:
- Noise Sources.
- Noise Control by law and awareness.
- Engineering noise control by means of: control of noise source, control in the sound path, control at receiver.
- Sound barriers and evaluating its efficiency.
- Natural barriers.
- Sound Insulation.
- Structure-born sound.
- The positive noise control.

**0205665 Principles and Applications of Intelligent Buildings:**
- Intelligent buildings: definitions, proposals and viewpoints.
- Generations of intelligent buildings: Origin and development.
- Classification of intelligent buildings.
- Installations of intelligent buildings.
- Design principles of intelligent buildings.
- Examples and case studies.

**0205666 Architectural Computer Programming:**
- Trends of using Computer programming for aiding architectural design process.
- Methods of programming.
- Programming language and its use.
- Programming inside drafting software and uses of “LISP” Language.
- Possibilities of “Visual Basic” programming environment.
- Drawing and coloring commands in VB.
- Components of DXF files and how to use in programs.
- Reading, writing and analyzing different file types.
- Using data bases in applications.

**0205667 Environmental Evaluation of Architectural and Urban Projects:**
- The concept of Environmental Evaluation of plans, programs, and projects.
- The relationship between development plans and environmental impacts of architectural and urban projects.
- Environmental Information Systems.
- Worldwide methodologies used in Environmental Evaluation of projects.
- Integrated Environmental Management of new and established projects.
- Procedures of Environmental Evaluation Process of projects in Egypt.
- Case studies.

**0205668 Psychology and Sociology in Architecture:**
- The interrelationships between Psychological factors and Architecture.
- The interrelationships between the individual and society.
- Role of society in adapting suitable circumstances for its citizens.
- Urban and social problems.
- Influence of urbanization on society.
- Methods of controlling the human behavior.
• Social relationships in rural and urban areas.
• Developing social relationships.

0205669 Renewable Energy Techniques:
• Environmental resources and renewable Energy (solar, wind, water energy, etc).
• Environmental systems.
• Healthy environment.
• Energy efficient design.
• Renewable energy techniques and methods in Egypt, its influence on architectural and urban shaping.
• Architectural and urban application of renewable energy and energy conservation.

0205670 Sustainable Energy in Buildings
• Energy use in buildings - Principles of energy-efficient building design.
• How it could evolve towards a more sustainable - Low carbon energy future.
• The main sources of energy today.
• The meanings of energy conversion, and the associated technologies and resultant carbon emissions.
• Established renewable technologies (wind, solar).
• Basic methods for calculation of energy output, together with issues around output profiles, storage options and impact on the electricity grid.
• Calculation methods for passive cooling - Indoor thermal comfort - Indoor air quality in order to decrease energy for cooling.
6-2 Urban Planning

**0205646 Urban and Regional Planning:**
- Development of Planning theories.
- Function, size and distribution of towns.
- Town region and internal structure of town.
- Development of town planning in the Modern era.
- Main stages of urban planning.
- Studies, steps and outputs of each stage.
- Foreign and Egyptian experiences in local planning.
- Computer application in urban planning.

**0205648 Housing Management:**
- Definition of housing management.
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- Types of tools used to achieve housing development objectives.
- Follow-up and evaluation of housing development.
- Housing management in Egypt.
- Housing policies and systems in developing and developed countries.
- Point of view of international institutions in housing development.
- New directions in housing development.

**0205651 Planning of Desert Areas:**
- The most important natural and environmental determinants of the desert.
- The most important available resources in desert areas (development opportunities).
- The most important planning and design principles and basics of desert areas with taking in consideration the environmental appropriateness for building in these desert areas.

**0205680 Planning of Tourist Areas:**
- Resource analysis of tourist sites.
- Definition of tourism patterns and trends for the distribution of tourism patterns.
- Data analysis for the demand of tourism resources and the definition of the types of tourist facilities.
- Determining land uses at tourist sites.
- Planning and design requirements of the tourist facilities.
0205681 Conservation of Historical Areas:
- Conservation concepts of historical areas.
- Properties of historical areas.
- Theoretical approaches to deal with the historical areas.
- Analysis of the methods of dealing with the historical areas.
- Examples of realistic projects clarifying methodology, methods and means of the established conservation.

0205682 Renewable Energy and Urbanization:
- Traditional energy and its problems.
- The renewable energy (its resources, kinds, advantages).
- Today and future application of renewable energy.
- Principles of energy conservation and their reflection on urbanization.
- Application of renewable energy systems on urbanization.
- Model analysis.

0205683 Urban Development Management:
- Definition of urban development management and its relation with sector and spatial planning.
- Urban development principles.
- General and specific data needed for urban management.
- Problems and objectives of urban development.
- Types of tools used to achieve urban development objectives.
- Follow-up and evaluation of urban development.
- Urban development management in Egypt.
- Urban policies and systems in developing and developed countries.
- International institutions point of view in housing development.
- New directions in urban development.

0205684 Systems, Policies and Economics of Housing:
- The concept of housing.
- Features of housing problems.
- Elements of house production.
- Types of organizations responsible for providing houses.
- Estimation of housing sector requirements.
- Housing policies.
- An introduction to housing problem.
- The concept of economy in housing (for the architect, the contractor, the user, and the country).
- Factors affecting the economics of housing buildings (Architectural, constructional).
**0205685 Urban Renewal:**
- Study of urban renewal within its historic and institutional contexts, with emphasis on selected physical and socio-economic aspects, highly relevant to city redevelopment.
- Concepts, general ideas, and historical background, development of urban renewal through methods and techniques taking into account effective planning, design principles, socio-economic characteristics and legal dimensions (such as subsidies, property expropriation, right transfer, and public participation).
- Critical evaluation of landmark case studies of urban renewal.

**0205686 Recent Approaches in Town Planning:**
- Recognizing the different approaches and visions regarding the design of future cities.
- Identifying the concepts and principles of the new urbanism theory.
- Identifying the concepts and principles of the smart growth paradigm.
- Identifying the concepts and principles of knowledge cities.
- Identifying the concepts and principles of green cities.
- Identifying the concepts and principles of walkable and car-free cities.