Unified Regulations for Bachelor Programs with Credit Hours System

Faculty of Engineering – Mansoura University

2020

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Chapter One:

Regulations

First: Introduction

Due to the great scientific development and the collaboration among many majors within one faculty or across many faculties in the university, the university's strategy has headed towards introducing many new programs based on a combination of different majors that adhere to technological changes, scientific development and meet labor market needs. Besides, these programs were designed based on the credit hour system in order to be compatible with National Authority of Quality Assurance and Education Accreditation Standards, the governing standards for an educational product in line with international educational standards, the Academic Standards *NARS2018* and the Engineering Sector Reference Framework 2020 which provides flexibility for learners, and facilitates adopting study plans that correspond to the above mentioned changing attributes.

Second: General Rules

Article [1]: Granting Academic Degrees

Based on Faculty of Engineering Council request, Mansoura University grants a bachelor's degree in one of the following majors:

1. Biomedical Engineering
2. Communication and Computer Engineering
3. Mechatronics Engineering
4. Building and Construction Engineering
5. Chemical and Environmental Engineering
6. Renewable and Sustainable energy Engineering
7. Infrastructure and Environmental Engineering

Students are stipulated to complete the academic requirements necessary for one of these programs to obtain a B.Sc. degree in the required major. Study in these programs should take place in English within each specialization scope based on the credit hour system. Further, students should be aware of the requirements and regulations of each program and should be responsible for achieving them.

Article [2]: The Program Study System

The study system used in these programs is the American system of credit hours within the context of one semester.

Article [3]: The Credit Hour Standard According to the Reference Framework 2020

1. With regard to theoretical lectures:

One credit hour is calculated for everyone hour per week lecture during one semester.

2. For practical lessons and practical exercises:

One credit hour is calculated for each 2-3-hour workshop or exercises per semester.

Article [4]: The Academic Council

The Program Management Academic Council shall be formed by a decision from the University President based upon the Faculty Council nomination for two-year-period headed by Faculty Dean and the membership of:

1. Vice Dean of Education and Student Affairs.
2. Heads of Scientific Departments concerned with the program.
3. Program Executive Director.
4. Professor or assistant professor from the specialized scientific departments nominated by the Dean after taking the opinion of the Head of the department and it is permissible in special cases to include two lecturers at most to the membership of the council.
5. Two experienced members either internal or external.

The academic council of the program will perform all the duties of the faculty scientific departments with respect to education and students' affairs. Further, the academic council shall observe the following criteria with regard to assigning teaching duties to staff members:

1. Scientific departments nominations based on their specialty.
2. Students' surveys on the previous times the course was taught.
3. The program management opinion according to performance evaluation and follow-up.

Article [5]: The Program Executive Director

For each program, an executive director shall be appointed by the University President, after a nomination by the Faculty Dean provided that he is one of the faculty members specialized in the field(s) of the program with associate / full professorship degree, for a minimum of two calendar years, renewable under the same conditions of the first appointment.

The executive director of the program shall perform the following tasks:

1. Implementing the program's internal regulation.
2. Coordination between the scientific departments in assigning teaching duties to faculty members.
3. Supervising students' academic registration.
4. Supervising the administrative work by the program staff.
5. Supervising the regularity of academic counseling in the program.
6. Following up the educational process regularity in accordance with the approved study schedules.
7. Supervising and regulating end-of-term and mid-term exams (if any).
8. Supervising field training and forming partnerships with distinguished training authorities.
9. Carrying out the secretariat of the council in the subcommittee of the academic council.
10. Organizing and supervising the program scientific conference.
11. Preparing the forms related to the financial duties in the program and submitting them to the higher management of the college.
12. Overseeing the development of the program's infrastructure, including runways, lecture halls, exercise halls, school laboratories and equipment.
13. Supervising the fulfillment of all quality assurance requirements in accordance with the standards of the National Authority for Accreditation and Quality Assurance of Education.
14. Preparing the annual self-study for the program to be presented to the Project Management Unit in the Ministry of Higher Education and Scientific Research.

Article [6]: Programs Coordinator for Digital Transformation

A programs coordinator for digital transformation is appointed by the Dean of the faculty after a nomination by the Faculty Vice Dean of student affairs (if three or more programs are available in the faculty) from the (associate) professors at the faculty having experience working with the credit hours' system and the programs for a period of two years' renewable with the same conditions of the first appointment.

The programs coordinator for digital transformation duties are:

1. Reviewing and auditing student registrations for all programs after approval of the relevant councils.

2. Reviewing the control works and fulfilling the final control stages after approval of the relevant councils.
3. Supervising the financial page follow-up for program students.
4. Reviewing the quality assurance work in the programs.

Article [7]: Registration Requirements and Entry Requirements

The student's registration for the bachelor's degree in these programs is required in addition to the general conditions stipulated in the executive regulations (Article 75) of the Universities Organizing Law as follows:

1. The student meets the admission requirements determined by the Supreme Council of Universities.
2. The student must have a high school completion certificate or its equivalent where major is in Mathematics.
3. The student fulfills the internal rules approved by the Faculty Board regarding the admission of students to these programs.

Article [8]: Transfer Conditions (change of course) and Re-enrollment

If the transfer is within the faculty, the transfer can occur before the start of the main semesters via approved rules by the faculty council and applied by the faculty representative for education and students affairs; while if the transfer is from another faculty within the university or from another university, the transfer is only through the central remittance office. At the beginning of the academic year, a student budget is made according to Table (1).

Table (1): The Symbol and Grade Corresponding to Assessment Obtained Degree by the Student when Converting from the Semester System to the Credit Hour System.

The percentage obtained by the student	Number of points	Estimate
Less than 50% (Failed)	00.0	F
40% to less than 50% (successful by clemency rules)	1.00	D
50% to less than 55%	1.00	D
55% to less than 60%	1.30	D+
60% to less than 65%	1.70	C-
65% to less than 68%	2.00	C
68% to less than 71%	2.30	C-
71% to less than 75%	2.70	B+
75% to less than 80%	3.00	B
80% to less than 85%	3.30	B+
85% to less than 90%	3.70	A-
90% to less than 95%	4.00	A
95% to 100%	4.00	A+

1. Transferring students who wish to enroll in one of the accredited programs specializations must have completed level (000) courses with an average grade of no less than 2,00 (maximum grade 4,00), and according to the rules determined by the faculty council and approved by the university council, based on the available capacity of the program.
2. Students who are transferred from the regular stream may be admitted to the same faculty, according to conditions determined by the Faculty Council and approved by the University Council based on the program's available capacity.
3. Students who have already spent two years in five years studying colleges outside of Faculty of Engineering, Mansoura University, and wish to join the program should submit a case statement from the faculty in which they were enrolled stating the degrees they have obtained and whether they have obtained credit hours or not.
4. It is permissible to accept international students who have obtained a high school diploma or its equivalent in every academic year according to the order of their degrees according to the nominations received by the Faculty from the General Administration of International Students. Then, the faculty council undertakes a proposal in exchange for the cost of educational services other than the university fees prescribed for these students.
5. Students, who have previously left studying in the program for a period of up to four semesters at a maximum and who have already received high estimates in the period they spent, may re-register for the program if they wish to do so, after the approval of the relevant academic council and in accordance with the rules for regular study [11].

Article [9]: Obtaining the Degree Requirements

In order for the student to obtain a bachelor's degree in the aforementioned programs, Article [1]:

1. The student must successfully pass at least (160 credit hours).
2. The student must pass the graduation project.
3. The student must pass courses where the evaluation is Pass / Fail and does not count towards the student GPA such as summer training.
4. The distribution of subjects that are included in the study program for graduation requirements should be as follows:

Table (2) Distribution of the program hours to graduation requirements

Specialized Groups	Min %	Max%
University Requirements	8%	-
Faculty Requirements	20%	-
General Major Requirements	35%	-
Accurate Specialization Requirements	-	28%

Taking into account that the academic plans for each program achieve the courses and the indicative proportions set by the National Authority for Quality Assurance of Education, which includes the following curricula:

1. Social and Human Sciences
2. Business Administration
3. Mathematics and Basic Sciences
4. Engineering culture
5. Basic Engineering Sciences
6. Engineering and design applications
7. Project and field training

Article [10] Participating Scientific Departments

The academic council supervises, for each program, teaching of all the courses of the subprograms that follow it, including humanities, Arabic language and technical reports. The scientific departments assign teaching duties of the various courses after being approved by the faculty council. Teaching should be conducted through the following scientific departments, each in the scope of its major:

1. Electronics and Communications Engineering Department.
2. Computer Engineering and Control Systems Department.
3. Production Engineering and Mechanical Design Department.
4. Electrical Engineering Department.
5. power mechanical engineering Department.
6. Mathematics and Engineering Physics Department.
7. Structural Engineering Department - Public Works Department - Irrigation and Hydraulics Department.
8. Architecture Department.
9. External departments in the field of anatomy, physiology and public health from the Faculty of Medicine.
10. External departments in the field of organic chemistry, biochemistry, Microbiology and Pharmaceutical procedures from Faculty of Pharmacy.

11. External departments in the field of languages - Faculty of Education or Faculty of Arts – English Major.
12. External departments of the Faculty of Commerce in the field of management and marketing.
13. External departments of the Faculty of Law in the field of legislation and administration laws.

The academic council of the program administration approves the faculty members nominated by the concerned departments, and these nominations are presented to the faculty council for approval such that the language of study for all courses is English.

Article [11]: Study Duration and its Dates

The duration of the study in the program is ten main semesters for all students, and the student may finish studying the program in nine semesters (when the student has successfully passed 160 credit hours). The academic year is divided into two main semesters, each ending with an exam, according to the content stated in the curriculum schedules appended to this regulation.

The academic year is divided into three semesters:

1. The first semester: Autumn semester (main semester): It starts at the beginning of the university academic year for a period of 14 teaching weeks.
2. The second semester: Spring semester (main semester): It starts after the mid-year vacation of the university for a period of 14 teaching weeks.
3. Summer semester: It starts in July for a period of 7 teaching weeks doubling the course contact hours.

Enrolment and Registration take place before the start of each semester.

Article [12]: Study Regulations

All students enrolled in the program must adhere to the following university rules:

1. Tuition Fees

Registration fees and educational services are paid at the start of registration, and the faculty council determines the fees required for registration and educational services after they have been approved by the university council.

2. Payment Rules

The student is not allowed to register at the next level or know his result unless all tuition fees are paid to the lower level. Upon graduation, the student does not receive his papers and certificates indicating that the degree was awarded unless all the late tuition fees have been paid in full.

3. Attendance

The course professor records the attendance of students at the start of each theoretical lecture, or an exercise / practical workshop in a record prepared for that by the Student Affairs of the program, taking into account the following:

A. The absence limit allowed for the students without an acceptable excuse is 25% of the total hours of the tutorials and labs of the course, and the course professor shall notify the Student Affairs Department to warn the student twice, the first warning is after the student exceeds the absence rate of 10% of the course hours, and the second warning is after exceeding the absence rate of 20%. Then, the student's case is presented to the academic council to take measures needed to prevent him from entering the course exam.

B. If the student's absence rate exceeds 25% and the student's absence without an approved excuse is accredited from the academic council of the program, the student will score a deprived grade in the course and the result of a "deprived" grade will be included in the calculation of the student's semester grade and the overall GPA.

4. Partial Discontinuation Condition

Students must notify the academic advisor assigned to them by the academic council when they have stopped their studies for more than a week, and if the discontinuation is a result of illness, a "being sick declaration" must be submitted from an accredited governmental hospital or medical center that is approved by the university's medical administration within the specified times. If the student does not take the exam as a result of the illness, a "being sick declaration" must be introduced within the stipulated timings. In addition, a "being sick declaration" approved by the medical administration of the university must be introduced by whom the

student's affairs will be notified of the expected absence period for the student.

5. **Enrollment Stoppage**

In case that the student stops his enrollment in one of the new programs, the student shall pay the related administrative fees.

6. **Address Change**

The student must notify the faculty administration of any change in his postal address.

7. **Demurrage**

If the student is late in paying the fees, the decisions approved by the College Board and the University Council in this regard will be applied.

Article [13]: Academic Registration and Academic Load

1. **Registration**

The academic council of the program announces the dates of registration in the academic curricula through the approved academic agenda. Students should review their choices with the academic advisors assigned to them according to the instructions written in the program's guide announced on the program's website on the official university website. Registration will not be allowed after the specified date, and if the defaulters are allowed to register, this will be accompanied by a delay fine after being submitted to the academic council.

2. **Advertising**

Information on registration steps is announced in advance of each semester (Academic Agenda).

3. **Academic Load Per Semester**

The minimum and maximum number of credit hours a student is allowed to register in one semester is determined as follows:

Table (3): The Maximum Registration

No	Student's GPA	Maximum Registration
1	**GPA<2**	Up to 14 Credit hours
2	**2≤GPA<3**	Up to 18 Credit hours
3	**3≤GPA**	Up to 21 Credit hours

A. The minimum number of hours a student is allowed to register in **Fall** and **Spring** semesters is 12 credit hours, except for graduation or stumbling cases (under academic observation) based on the approval of the Academic Council.

B. Students may register some courses in the summer semester with a maximum of two courses and up to 3 courses in case of graduating in the

summer semester. In all cases, graduation projects may not be registered during the summer semester.

Article [14]: The Academic Adviser

The academic council of the program appoints an academic advisor from the teaching staff, at the rate of an academic advisor per 25 students, to guide students in their study trajectory and help them choose the academic courses. Further, he or she determines the number of credit hours they can register according to their circumstances, abilities and academic readiness, and help them solve encountered problems during the study. Besides, he or she supervises the students' study programs, monitoring their progress and monitoring their performance as part of the educational process.

1. The academic advisor meets with his/her students periodically to avoid students being exposed to academic warning.
2. No administrative procedures are taken for any student except through the academic advisor and with his written approval.
3. Each academic advisor determines a time period in his study schedule every week, and a report of this meeting is prepared and submitted to the program management.
4. Students must obtain the approval of the academic advisor assigned to them in choosing a study trajectory before registering for courses in each semester and in the summer semester.

Article [15]: Addition, Deletion and Retraction

1. After registration, the student may add or delete one of the courses in ways and steps that are approved by the academic council of the program.
2. The student may, after the approval of the academic advisor, unregister one or more courses until the end of the fourth week of study only, without violating the academic load stipulated in Article [13].
3. After the approval of the academic advisor, the student may withdraw from studying any course until the end of the tenth week of the start of registration for the autumn or spring semester (third week of the summer semester). This course is recorded in the student's academic record with a grade of W "withdrawn", provided that the student has not exceeded the percentage of absence prescribed before withdrawal, provided that the withdrawal does not violate the academic load stipulated in Article [13].
4. Re-registration

   The student is allowed to re-register in the study course in which he previously obtained an estimate of **F**, and he is allowed to attend the course

and repeat the exam in accordance with the financial regulations that specify that, where the maximum allowed estimate is **B +**.

5. Elective Courses

   In case that the student registers an elective course and fails and registers the same course again, the student gets the maximum grade of B +, while in the case of changing the elective course, the student gets the newly obtained degree.

Article [16]: Projects

1. Students prepare 2-3 projects in specific topics related to local industries and service to the surrounding community, to be determined by the Academic Council and during the last two academic years according to what is found in the special tables of the program curricula, and under the supervision of faculty members who to prepare, supervise and discuss projects.
2. The last project, called the Graduation Project, is prepared in the last semester, culminating in what the student has studied during the university years.
3. It is permissible that the Academic Council decide to allocate an additional period for the graduation project that begins after the completion of the last semester exam for a period of one month, and at the end of the period allocated to any of the projects the student submits a scientific report on the subject of the project and discusses it.
4. The student cannot obtain a bachelor's degree unless he successfully performs all the prescribed projects.

Article [17]: Practical and Field Training

The program includes a training system during the summer vacation for students transferred to levels 200, 300 and 400 and under the supervision of faculty members, as follows:

1. **Practical Training**: students transferred to level 200 will perform a practical training within the faculty or in specialized training centers and units within the faculty for a period of two weeks with a total number of hours of not less than 60 hours. The student should get a practical training completion certificate.
2. **Field Training**: students transferred to level 300 and those to level 400 perform field training within specialized sectors outside the faculty for a period of four weeks with a total number of hours of at least 120 hours. The

student must obtain a certificate from the training authority stating his attendance and obtained the required experience.

3. The faculty is responsible for obtaining training opportunities for students, and students may get training opportunities for themselves, but after faculty council approval is obtained.
4. It is permissible to train students abroad based upon the program academic council approval. The student does not obtain a bachelor's degree unless he has successfully completed both practical and field training.
5. In all training cases, the student is given a Pass/Fail estimate only and his grade is not added to the total grade, but a Pass grade is required to obtain the course degree. The student who reaches level 400 without successfully completing his training can repeat the training any number of times until he passes the training.

The college should provide training opportunities for students in each major through cooperation protocols with companies or through its industrial advisory board.

Article [18]: Optional Courses

The student is not allowed to register at any of the elective courses unless he is at the planned level and to achieve all the requirements of the pre-requisites, and in all cases the academic advisor must review the registration of the students and remove any wrong registration.

Article [19]: Courses Registration Synchronization

Fourth level students and students subject to dismissal can register a course in conjunction with the previous prerequisite for the course after obtaining the approval of the program academic council if the following conditions are met:

1. The student has previously studied this prerequisite and received an **F** grade.
2. This registration does not violate the registration rules according to the GPA.

Article [20]: The Evaluation System

1. Each course is evaluated from (100) one hundred marks.
2. The student is evaluated in theoretical and practical courses based upon the following elements:
   A. In the case of decisions that include only a theoretical study, the evaluation is as follows:

Table (4) Distribution of degrees for courses that include theoretical study only

Evaluation		Degree
Semester works	Mid-term exam	20%
	Short exams	30%
	Assignments (report)	
	Presentation and discussions	
Semester Exam (Written)		50%

B. In the case of study courses that include a theoretical and practical study, the evaluation is as follows:

Table (5) Distribution **of degrees for courses that include theoretical and practical study**

Evaluation		Degree
Semester works	Mid-term exam	20%
	Short exams	20%
	Assignments (report)	
	Presentation and discussions	
Practical Exam		10%
Semester Exam (Written)		50%

C. In the case of the Project Course, 50% of the degree is allocated to periodic follow-up, 50% for oral discussion.

D. For a student to succeed in any course, he or she must obtain at least 60% of the total score and must have obtained at least 40% of the final written examination score.

Article [21]: Degrees and Grades Digital and Symbolic Significance

A. The degrees obtained by the student in each course are estimated as shown in the following table:

Table (6) Table of numerical and symbolic implications of degrees and grades

The Student's Obtained %	Equivalent Degrees Range					Points No	Grade
From 97% or more	97	98	99	100	--	4,00	A+
93% to less than 97%	**93**	**94**	**95**	**96**	-	**4.00**	**A**
89% to less than 93%	**89**	**90**	**91**	**92**	-	**3.70**	**A-**
84% to less than 89%	**84**	**85**	**86**	**87**	**88**	**3.30**	**B+**
80% to less than 84%	**80**	**81**	**82**	**83**	-	**3.00**	**B**
76% to less than 80%	**76**	**77**	**78**	**79**	-	**2.70**	**B-**
73% to less than 76%	**73**	**74**	**75**	-	-	**2.30**	**C+**
70% to less than 73%	**70**	**71**	**72**	-	-	**2.0**	**C**
67% to less than 70%	**67**	**68**	**69**	-	-	**1.7**	**C-**
64% to less than 67%	**64**	**65**	**66**	-	-	**1.3**	**D+**
60% to less than 64%	**60**	**61**	**62**	**63**	-	**1.0**	**D**
Less than 60%						**0.0**	**F**

B. The course grade is calculated by multiplying the number of credit hours for the course by the number of assessment points (according to Table 6) that the student obtained in this course.

C. The following grades do not fall within the calculation of the average estimate, Table No. (7).

Table (7): Grades Completion

W	Formal Drop out
AU	listener
I	Incomplete
F	Unsuccessful
P	successful

a. Semester GPA:

For each course, the total score of the course is equal to the multiplication of both the number of credit hours of the course and the number of course points.

The semester average = the total points for the courses in which the student scored in the semester divided by the number of credit hours for these courses.

$$Semester\ GPA = \frac{Number of Points}{Number of Graded\ Hours} = \frac{\sum_{i=1}^{N} Grade_i \times Hours_i}{\sum_{i=1}^{N} Hours_i}$$

b. Cumulative GPA

The GPA is calculated as follows:

GPA = the sum of the points for the courses divided by the total number of hours for the courses

$$Comulative\ GPA = \frac{Number\ of\ Points}{Number\ of\ Graded\ Hours} = \frac{\sum_{i=1}^{N} Grade_i \times Hours_i}{\sum_{i=1}^{N} Hours_i}$$

c. Total Cumulative Calculation

The total cumulative is calculated as follows for the number of N courses:

For each course the total equivalent of the course scores is calculated equal to the number of credit hours for the course multiplied by the course score.

Cumulative total percentage is equal to the equivalent of the course grades divided by the total number of hours for the courses:

$$Cumulated\ Marks\ \% = \frac{Equivelent\ Accumulated\ Marks}{Number\ of\ Graded\ Hours}$$
$$= \frac{\sum_{i=1}^{N} Mark_i \times Hours_i}{\sum_{i=1}^{N} Hours_i} \times 100$$

d. Requirements Condition are met

For enrollment in courses requiring other courses as pre-requisites, the student's grade in the pre-requisites should not be less than D.

Article [22]: Graduation Students Grades

The grades obtained by the student upon graduation are granted according to the following schedule:

Table (8) Estimates Granted upon Graduation from the Program with Credit Hours System

The student's obtained percentage	Equivalent Degrees Range	Estimate	Equivalent grade
97% or more	**4.00**	**A+**	Excellent
93% to less than 97%	**4.00**	**A**	
89% to less than 93%	**3.70**	**A-**	
84% to less than 89%	**3.30**	**B+**	Very good
80% to less than 84%	**3.00**	**B**	
76% to less than 80%	**2.70**	**B-**	
73% to less than 76%	**2.30**	**C+**	Good
70% to less than 73%	**2.0**	**C**	

Article [23]: Honors Grade

1. Mansoura University grants a certificate of excellence to students who have obtained an average rating of 3.6 or more in previous semesters, provided that they have not failed any course during the study, and this distinction is recorded in the student's academic record.
2. Upon graduation, the student is awarded the honor degree if he obtains an average grade of 3.3 or more in all major semesters without failing any course.

Article [24]: Grades Statement

Students who obtain a degree or who drop out from the program have the right to obtain a statement of grades for their academic record, and this statement cannot be obtained during the period of exams, registration, or the date of graduation, and grades data are not given when tuition fees are not paid.

Article [25]: Academic Warning, Transferring and Dismissals

1. The student is warned academically if he obtains a GPA of less than 2 at the end of the second semester of his enrollment in the study or any other semester after that.
2. The student who is academically warned is placed under academic supervision and is not allowed to register more than 12 credit hours, and the monitoring is stopped if the GPA improves and exceeds the GPA 2.
3. A student who is academically dismissed shall be dismissed from credit hour programs if his cumulative GPA falls below 2.00 for six consecutive main semesters.
4. If the student does not meet the requirements for graduation during the maximum period of study, which is ten years, he will be dismissed.
5. The Faculty Council may consider the possibility of granting a student, subject to dismissal due to his inability to raise his cumulative GPA to at least 2.00 at least, one and last chance of two main semesters to raise his cumulative GPA to 2.00 and fulfil graduation requirements, if he has at least successfully completed 80% of the credit hours required for graduation.
6. A student who registers for 17 or more credit hours is considered a regular student, and the student's position in the study is defined according to Table No. (9).

Table (9): The Student's Position Based upon the Number of Credit Hours Passed

Academic level	Defining the student's Place in the study system	The number of credit hours the student has successfully passed	
		<	>=
1	**Freshman**	**32**	**0**
2	**Sophomore**	**64**	**32**
3	**Junior**	**112**	**64**
4	**Senior**	**160**	**112**

Article [26]: Graduation and Obtaining the Degree

For the student to obtain a bachelor's degree:

1. The student must have completed at least 160 credit hours in all programs and 163 credit hours in the Building and Construction Engineering Programs in studying the courses with a grade of no less than **D**.
2. His average grade should not be less than C or more in the cumulative average, and this means that he will obtain at least a cumulative average of 2.00 / 4.00.
3. The student fulfills all program requirements.
4. Immediately after these conditions are fulfilled, the student's condition will be transferred to a graduate and he may not register any other courses under any of the above items.

Article [27]: Transferring Students -to and from- the Program System

After approval of the academic council for the program and the Mansoura University Council, it is permissible to transfer students to and from the program with the accredited engineering faculties provided that a clearing is made between the courses studied by the student and the courses that he must study and succeed in, and to complete the clearing process the degrees equivalent to the grades specified in the credit hour system are used as shown in Table (1). Table (10) is used to calculate grades when converting from the credit hour system to faculties that do not use the credit hour system.

Table (10): Equivalence of Estimates when Converting from the Credit Hour System to the Two-Semester System

Credit Hour System		The Semester System	
Number of points	Estimate	Equivalent Estimate	Equivalent Percentage
4.00	**A +**	**Excellent**	**99%**
4.00	**A**		**95%**
3.70	**A-**		**91%**
3.30	**B+**	**Very Good**	**86%**
3.00	**B**		**82%**
2.70	**B-**	**Good**	**78%**
2.30	**C+**		**75%**
2.0	**C**		**72%**
1.7	**C-**	**Passed**	**69%**
1.3	**D+**		**66%**
1.0	**D**		**62%**
0.0	**F**	**Failed**	**Less than 60%**

Article [28]: Appointing Graduates of the Program as a Demonstrators (Teaching Assistants)

1. Teaching assistants from the graduates of the program are appointed via a decision from the University President upon the request of the Faculty Council in accordance with Article (**133**) of Law No. **49** of **1972** regarding the organization of universities and without violating the application of Articles **135** and **136** of the same law.
2. The Faculty Council distributes teaching assistants newly graduated from the programs to the faculty scientific departments corresponding to their majors and based upon the previously presented annual plan of scientific departments

Article [29]: The Listening System

It is permissible to accept listening students in any of the courses if there are vacant places provided that the listening student cannot perform the exam, or obtain credit hours for joining this course, or can he obtain an attendance statement for the course from the faculty. They may register late after completing the registration for regular students.

Article [30]: The Improvement System

1. The student is allowed to improve in (5) subjects to raise the GPA during the study period, provided that the student gets the last grade, and it is not permissible to drop out from the course after the end of the official period in which withdrawal is permitted without an academic impact (the fourth week of the main semesters). As the expiration of this period entails the removal of the first estimate.
2. If the student has completed his studies in the program and his GPA is less than 2, he may improve any of the previously studied subjects until he reaches the required minimum of the GPA.
3. The student may not improve a failed course.

Article [31]: Disciplinary Rules

Students who are enrolled in the program are subject to the disciplinary system outlined in the University Regulatory Law and its executive regulations.

Article [32]: Electronic Administration

The university designs or contracts with an information administration system for the program to automate the work of the program with a credit hour system. The following conditions are required in this program:

1. Course registration.
2. Adding and removing courses.
3. Academic Advising.
4. program administration work in achieving the rules governing the program.
5. Grades control work.
6. Study work and exams.
7. Financial benefits.
8. Student affairs work.
9. Statement of the situation.
10. Student performance reports.
11. Record the absence of students.
12. E-exams.
13. Communication with students

Taking into account the preservation of confidentiality of data and its recall, ease of use for the student, faculty member and administrative team, and the availability of technical support.

Article [33]: Incomplete Courses

If a student request not to attend the final exam where he shows compulsive reasons why not to attend, is accepted by the academic council of the program and the faculty council, within two days at most from the final examination date, the course is considered incomplete with an estimate (I) in this course provided that he has obtained at least 60% of the coursework degree or he has been deprived of entering the final exam, in which case he will have the opportunity to take the final exam in the next semester and at the date determined by the faculty council, which is usually in the first week of the next academic semester directly. The degree of the semester work obtained by the student during the semester is added to the final theoretical exam degree which is conducted by the student.

Article [34]: Appeals for the Results of the Courses

The student can appeal to review the grades of the course within a week of announcing the result, after paying the fees determined in accordance with the overall regulations associated with this matter.

Article [35]: Implementing the Provisions of the Law Regulating Universities

The provisions of these regulations apply from the academic year following the date of their issuance to new students admitted to the faculty at the level (000) of those programs, and these regulations do not apply retroactively to any student in the faculty.

Article [36]: General Rules

1. The rules of the Universities Regulatory Law, its executive regulations, the internal regulations of the college, and other university regulations are applied in the absence of a text in these regulations.
2. The student is subject to the general system of the university and the college, and the rules of dismissal from the university, opportunities for re-enrollment, acceptable excuses for not taking the exam, stopping the academic registration, and all the rules, laws and regulations regarding student discipline as stipulated in the Universities Organization Law and its implementing regulations are applied to him/her.
3. The faculty is permitted to add to the list of elective courses with the approval of the Faculty Board and without the need to return to the Engineering Sector Committee.
4. The Faculty Council agrees to change the scientific content of the course in a manner that does not conflict with the course name and objectives.

Third: Transitional Rules

Article [37]: Transitional Rules

1. The provisions of these regulations shall be applied to new preparatory year students and those covered by the decisions of the University Council that regulate the enrollment of students in the credit hour programs, starting from the academic year following the issuance of the ministerial decision related to this regulation, and then applied sequentially to the remaining academic years.
2. When the provisions of these regulations are applied to any academic year, work shall apply to the remaining students for repetition, re-enrollment and applicants for the examination from abroad, and the College Board shall adjust the status of these students in the light of this regulation and the previous one.

Chapter Five:

A B. Sc. Program in Building and Construction Engineering (BCE) with Credit Hours System

1. Program Definition

Rapid changes have occurred regarding the needs of the local market in Egypt and the surrounding countries, and this is evident in the engineering fields in general and building and construction work in particular. So you find that the graduate (for example) has a reasonable knowledge of the construction aspects and a severe shortage in the field of finishing works, or (on the contrary) a reasonable knowledge of the finishing works and a severe shortage in the construction field. For instance, the student of the Department of Structural Engineering studies only one or two at most of the architectural engineering courses, and at the same time the student of the Department of Architectural Engineering studies only superficial courses of concrete and steel structures and building foundations.

In fact, the architect cannot fulfill the requirements of quality, sufficiency and economics unless he is reasonably familiar with construction theories. Likewise, the structural engineer is required to consider the architectural aspects of the design in order to preserve the aesthetic aspects and achieve the purpose for which the building is built. Therefore, the market is in need of an engineer with reasonable knowledge of the structural and architectural aspects to achieve safety, sufficiency and beauty of the building, in addition to this the old and modern construction methods and appropriate selection of them for the project as well as its economics and its implementation program and evaluation of the implementation stages.

The Building and Construction Engineering program qualifies a student to obtain a new Bachelor's degree in engineering. The study is based on the credit hours system and the primary language of study in the program is English. As the fields of engineering accommodate many subjects, a number of elective courses are designed to cover all areas of engineering related to the major. The program offers a number of necessary (compulsory) courses at the first three levels to provide students with the basics required to study in the program. At the end of the third and fourth levels, the student chooses a number of elective courses and basic design courses .

The program links between three main specializations, including close links, and depends on a number of common core courses. These specializations are:

- **Structural Engineering**
- **Construction Engineering, including construction project management**
- **Architecture**

It was taken into account that the list of courses includes compulsory courses common among the three disciplines that the student needs to graduate as a building and construction engineer. At the same time, a number of optional courses were added, the student can choose a direction to focus on or distribute his interests in more than one direction

2. Basic Information

2.1 Program Vision

Excellence in the field of building and construction engineering at the local and regional levels.

2.2 Message of the Program

Preparing a distinguished graduate in the field of building and construction engineering through an advanced educational process that accompanies the local and regional labor market and community service.

2.3 Program's Objectives

A. **Providing prepared and trained professionals in the field of building and construction engineering based on the standards of the National Authority for Quality Assurance and Accreditation of Education.**

B. **Contribute to raising the professional competence and forming a generation of distinguished engineers and qualified researchers in the field of building and construction engineering.**

C. **Building bridges linking what is taking place in the developed world of research and advanced technology and practical reality.**

D. **Develop a sense of citizenship, support team spirit, respect time and act as a way of life and progress.**

E. **Participate in achieving the development plan, putting science at its service to develop the society scientifically and culturally, and providing environmental services to new urban communities.**

F. **Developing human capabilities to meet the needs of new societies, including building and construction engineers.**

2.4 Program Graduate Attributes

Based on NARS 2018, 2nd Edition Engineering National Standards and as stated in the reference framework, Jan. 2020, a graduate of the Building and Construction Engineering Program must be able to acquire the following general skills:

A. **Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations,**

B. **Apply analytic critical and systemic thinking to identify, diagnose, and solve engineering problems with a wide range of complexity and variation,**

C. **Behave professionally and adhere to engineering ethics and standards,**

D. **Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance,**

E. **Recognize his/her role in promoting the engineering field and contribute to the development of the profession and the community,**

F. **Value the importance of the environment, both physical and natural, and work to promote sustainability principles,**

G. **Use techniques, skills, and modern engineering tools necessary for engineering practice,**

H. **Assume full responsibility for own learning and self-development, engage in lifelong learning and demonstrate the capacity to engage in post- graduate and research studies,**

I. **Communicate effectively using different modes, tools, and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner, and**

J. **Demonstrate leadership qualities, business administration, and entrepreneurial skills.**

2.5 Graduate Competencies in Accordance with the National Academic Standards

According to NARS 2018, a graduate must be able to:

A1: Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

A2: Develop and conduct appropriate experimentation and/or simulation, analyze, and interpret data, assess, and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

A3: Apply engineering design processes to produce cost-effective solutions that meet specified needs with consideration for global, cultural, social, economical, environmental, ethical, and other aspects as appropriate to the discipline and within the principles and contexts of sustainable design and development.

A4: Utilize contemporary technologies, codes of practice, and standards, quality guidelines, health and safety requirements, environmental issues and risk management principles.

A5: Practice research techniques and methods of investigation as an inherent part of learning.

A6: Plan, supervise, and monitor implementation of engineering projects, taking into consideration other trades requirements.

A7: Function efficiently as an individual and as a member of multi-disciplinary and multicultural teams.

A8: Communicate effectively – graphically, verbally and in writing – with a range of audiences using contemporary tools .

A9: Use creative, innovative, and flexible thinking and acquire entrepreneurial and leadership skills to anticipate and respond to new situations.

A10: Acquire and apply new knowledge; and practice self, lifelong and other learning strategies

In addition to the competencies of most engineering programs, the engineering BCE program has some special competencies, which are as follows:

B1: Select appropriate and sustainable technologies for construction of buildings and infrastructures; using either numerical techniques or physical measurements and/or testing by applying a full range of civil engineering concepts and techniques of: Structural Analysis and Mechanics, Properties and Strength of Materials, Surveying, Soil Mechanics, Hydrology and Fluid Mechanics.

B2: Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures; and at least three of the following civil engineering topics: Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Irrigation, Water Resources and Harbors; or any other emerging field relevant to the discipline.

B3: Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials; and assess environmental impacts of projects.

B4: Deal with biddings, contracts and financial issues including project insurance and guarantees

D1: Produce designs that meet building users' requirements through understanding the relationship between people and buildings, and between buildings and their environment; and the need to relate buildings and the spaces between them to human needs and scale.

The Program Courses in Line with the Required Competencies

Level	Couse Code	Corse Name	Competencies as Per NARS 2018													
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
000	BAS011	Calculus (1) (Math. 1)	X														
	BAS021	Mechanics (1)	X														
	BAS031	Physics (1)	X	X													
	BAS041	Principles of Engineering Chemistry	X	X													
	PDE052	Engineering Drawing	X														
	UNR061	English Language (1)								X							
	BAS012	Calculus (2) (Math. 2)	X														
	BAS022	Mechanics (2)	X														
	BAS032	Physics (2)	X	X													
	IHE101	Civil Drawing	X														
	PDE051	Principles of Manufacturing Engineering	X		X	X											
	UNR062	English Language (2)								X							
100	STE103	Properties and Strength of Materials		X									X				
	STE101	Structural Analysis (1)											X				
	BAS113	Differential Equations (Math. 3)	X														
	BAS115	Statistics and Probability Theory	X														
	ARC101	Architectural Construction, Technical and Sanitary Installations															X
	ENG111	Technical Reports Writing								X							
	STE102	Building Construction Materials											X				
	ELE151	Electric Powers and Machines												X			
	BAS114	Special Functions (Math. 4)	X														
	PWE101	Plane Surveying											X				

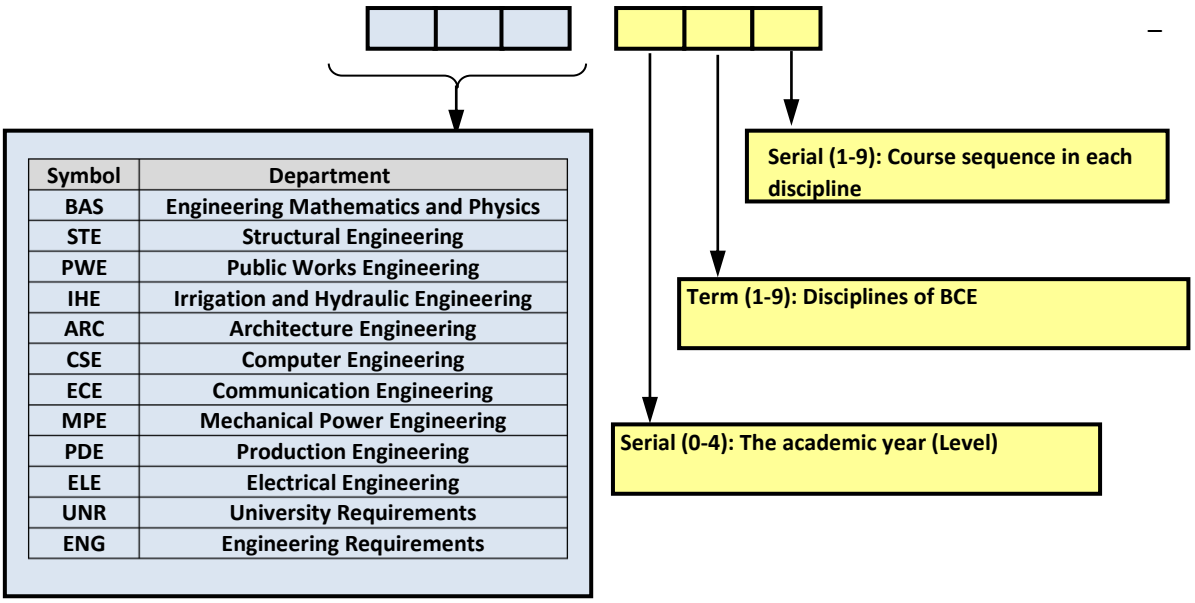
Level	Couse Code	Corse Name	Competencies as Per NARS 2018													
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
	ARC102	Architectural Design (1)															X
	ARC103	Architecture Theory (1)															X
	UNR171	History of Technology Engineering			X												
200	STE205	Concrete Technology											X				
	STE206	Construction Economics														X	
	STE202	Structural Analysis (2)					X						X				
	BAS215	Numerical Analysis (Math. 5)	X														
	STE204	Engineering Geology and Soil Mechanics											X				
	UNR241	Communication and Presentation Skills								X							
	STE207	Construction Methods and Equipment												X			
	STE203	Reinforced Concrete (1)				X	X							X			
	ARC203	Shop Drawings											X	X			
	PWE201	Traffic Planning and Traffic Engineering												X			
	IHE201	Hydraulics											X				
	UNR281	Law and Human Rights			X												
	ENG412	Projects Management													X		
	STE201	Field Training (1) (Summer Semester)						X	X	X	X	X					
300	STE315	Specifications and Quantities														X	
	STE305	Steel Structures (1)				X	X							X			
	STE302	Structural Analysis (3)					X						X				
	STE303	Reinforced Concrete (2)				X	X							X			
	STE3XX	Elective (1)															
	STE3XX	Elective (2)															
	STE306	Steel Structures (2)				X	X							X			
	STE307	Foundations (1)												X			
	STE304	Reinforced Concrete (3)												X			
	STE308	Construction Project Management													X		
	STE316	Contracts and Laws in Construction														X	
	STE301	Field Training (2) (Summer Semester)						X	X	X	X	X					
	STE309	Studies in the Field of Structural Engineering					X	X							X		
	STE310	Design of Masonry Structures												X			
	STE311	Sustainable Construction			X												
	STE312	Inspection and Maintenance of Structures												X	X		X
	STE313	Quality Control and Confirmation in Structures				X									X		

Level	Couse Code	Corse Name	Competencies as Per NARS 2018														
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
	ARC301	Architectural Design (2)															X
	ARC302	Environmental control and Climate change			X	X											X
	ARC303	Building Information Modeling													X		X
	IHE302	Irrigation and Drainage Engineering												X			
	IHE303	Design of water structures												X			
	PWE302	Topographic Surveying											X				
	PWE303	Maps and Geographic Information Systems											X				
400	STE401	Graduation Project (1)						X	X	X	X	X					
	STE403	Finite Element Method					X						X				
	STE405	Foundations (2)												X			
	PWE401	Sanitary Engineering (1)												X			
	PWE402	Highway Engineering												X			
	STE406	Project Evaluation													X		
	STE402	Graduation Project (2)						X	X	X	X	X					
	STE404	Modern Construction Materials											X				
	STE4YY	Elective (3)															
	STE4YY	Elective (4)															
	UNR 471	Marketing														X	
	UNR461	Ethics and Morals of the Profession			X												
	STE407	Reinforced Concrete (4)												X			
	STE408	Steel Structures (3)												X			
	STE409	Structural Dynamics											X				
	STE410	Analysis and Design of Tall Buildings											X				
	STE411	Shell Structures Design											X				
	STE412	Prestressed Concrete												X			
	STE413	Strut-and-Tie Modeling Method											X				
	STE414	Composite Structural Elements Design												X			
	STE415	Rehabilitation and Strengthening of Concrete Structures												X			
	STE416	Soil Excavated Retaining Systems												X			
	PWE403	Sanitary Engineering (2)												X			
	STE417	Management of Construction Information Systems													X		
	STE418	Monitoring Construction Projects													X		
	STE419	Risk Management in Construction Projects				X									X		

Level	Couse Code	Corse Name	Competencies as Per NARS 2018													
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	D1
	STE420	Computer Applications in Structural Engineering					X						X				
	IHE401	Port Engineering												X			
	ARC401	Architectural Design (3)															X
	ARC402	Architectural Design (4)															X
	ARC403	Architectural Construction (2)															X
	ARC404	Architecture Theory (2)															X

3. Courses Coding System

Courses are coded according to Figure 1, and the course is related to the scientific section that presents it. The first part of the course code is the code of the scientific department, and the second part of the course code consists of three numbers; the first of which represents the level, while the second number represents the specialization number within the scientific department. The third number is a series of courses in the exact specialization in the same study year. Not all of these letters indicate the majors in which the degree is given, some of which represent university requirements, engineering requirements, or specialized courses.



Symbol	Department
BAS	Engineering Mathematics and Physics
STE	Structural Engineering
PWE	Public Works Engineering
IHE	Irrigation and Hydraulic Engineering
ARC	Architecture Engineering
CSE	Computer Engineering
ECE	Communication Engineering
MPE	Mechanical Power Engineering
PDE	Production Engineering
ELE	Electrical Engineering
UNR	University Requirements
ENG	Engineering Requirements

Figure (1): Courses Coding System

Course code refers to the semester in which this course is usually given, but these dates are subject to change, as not all courses are taught every year. Before the start of each semester, students 'affairs in the college display a table of the courses that will be taught in this semester and their teaching dates and those who are responsible for teaching.

4. The Structure and Contents of the Building and Construction Engineering Program

The structure of the Building and Construction Engineering program consists of 163 credit hours distributed as follows:

4.1 University Requirements

The main purpose of university education is not only to prepare students for successful careers but also to provide them with the knowledge and skills necessary to develop a rational and successful personal identity. Moreover, Mansoura University assists students in gaining an appreciation of the natural and cultural environments in which they live and their roles in society and community services. University requirements in undergraduate programs consist of 13 credit hours (7.975% of the total 163 credit hours), which are fulfilled by completing seven (7) courses which are shown in Table (1).

Table (1) Compulsory Courses as UNIVERSITY Requirements
(13 Credit Hours = 7.975% of the total 163)

Code	Course Name	Credit	Total SWL	Marks Distribution			
				Mid Term	semester Works	Lab	Final Term
UNR061	English (1)	2	5	20	30	--	50
UNR062	English (2)	2	5	20	30	--	50
UNR171	History of Engineering and Technology	1	2	20	30	--	50
UNR281	Law and Human Rights	2	4	20	30	--	50
UNR241	Communication and Presentation Skills	2	5	20	30	--	50
UNR461	Ethics and Morals of The Profession	2	4	20	30	--	50
UNR471	Marketing	2	4	20	30	--	50
Total		**13**	**29**				

4.2 Faculty Requirements

The college requirements provide students with the knowledge and skills necessary to develop a successful engineer. The core of the college is applied to all credit hour programs. The standard requirement of the core courses in the college includes basic knowledge courses for all engineering graduates such as mathematics, physics, mechanics, engineering drawing, design, manufacturing, and chemistry. The college requirements for the Bachelor of Engineering and Construction Engineering program consist of 45 credit hours (27.607 % of the total 163 credit hours), which are completed by completing sixteen (16) mandatory courses, as listed in Table (2).

Table (2) Compulsory Courses as FACULTY Requirements
(45 Credit Hours = 27.607% of the total 163)

Code	Course Name	Prerequisite	Credit	Total SWL	Marks Distribution			
					Mid Term	semester Works	Lab	Final Term
BAS011	Calculus (1) (Math. 1)	Not applied	3	8	20	30	--	50
BAS021	Mechanics (1)	Not applied	3	8	20	30	--	50
BAS012	Calculus (2) (Math. 2)	BAS011	3	8	20	30	--	50
BAS022	Mechanics (2)	BAS021	3	8	20	30	--	50
BAS031	Physics (1)	Not applied	3	9	20	20	10	50
BAS032	Physics (2)	BAS031	3	9	20	20	10	50
BAS041	Principles of Engineering Chemistry	Not applied	3	9	20	20	10	50
PDE051	Principles of Manufacturing Engineering	Not applied	3	8	20	20	10	50
PDE052	Engineering Drawing	Not applied	3	10	20	30	--	50
ENG111	Technical Reports Writing	UNR062	2	6	20	30	--	50
BAS113	Differential Equations (Math. 3)	BAS012	3	8	20	30	--	50
BAS114	Special Functions (Math. 4)	BAS113	3	8	20	30	--	50
BAS115	Statistics and Probability Theory	BAS012	2	6	20	30	--	50
ELE151	Electrical Power and Machines	BAS032	3	8	20	30	--	50
BAS215	Numerical Analysis (Math. 5)	BAS114	3	8	20	30	--	50
ENG412	Project Management	Not applied	2	6	20	30	--	50
Total			45	127				

4.3 Requirements for General and Specific Specialization Courses

The requirements for the general specialization and the exact major in the Building and Construction Engineering program for the undergraduate degree consist of 105 Credit hours (64.417% of the total 163 credit hours), which are fulfilled by completing 34 mandatory courses equivalent to 87 credit hours, 4 elective courses equivalent to 12 credit hours, field training and graduation projects equivalent to 6 credit hours as shown in Tables (3a) and (3b):

Table (3a) Compulsory Courses as a Requirement for GENERAL and SPECIFIC Specialization (87 Credit Hours = 53.374% from163)

Course Code	Course Name	Credit Hours	Prerequisite	Total SWL	Marks Distribution			
					Mid Term	semester Works	Lab	Final Term
STE101	Structural Analysis (1)	3	BAS021	9	20	30	--	50
STE103	Properties and Strength of Materials	3	BAS031 + BAS021	8	20	20	10	50
STE202	Structural Analysis (2)	3	STE101	9	20	30	-	50
STE302	Structural Analysis (3)	3	STE202	9	20	30	-	50
STE203	Reinforced Concrete (1)	3	STE202 + STE205	9	20	30	-	50
STE303	Reinforced Concrete (2)	3	STE203	9	20	30	-	50
STE304	Reinforced Concrete (3)	3	STE303 +STE302	9	20	30	-	50
STE305	Steel Structures (1)	3	STE202	9	20	30	-	50
STE306	Steel Structures (2)	3	STE305	9	20	30	-	50
STE204	Engineering Geology and Soil Mechanics	3	STE101	9	20	30	-	50
STE307	Foundations (1)	3	STE204	9	20	30	-	50
STE102	Building Construction Materials	2	STE103	6	20	30	-	50
STE205	Concrete Technology	2	STE102	7	20	20	10	50
STE206	Construction Economics	2	BAS012	6	20	30	-	50
STE308	Construction Project Management	3	STE206 + ENG412	9	20	30	-	50
IHE101	Civil Drawing	3	PDE052	9	20	30	--	50
IHE201	Hydraulics	2	Not applied	6	20	30	-	50
PWE101	Plane Surveying	3	Not applied	9	20	20	10	50
PWE401	Sanitary Engineering (1)	2	IHE201	6	20	30	-	50
PWE402	Highway Engineering	2	Not applied	6	20	30	-	50
STE403	Finite Element Method	3	BAS215 + STE302	8	20	30	-	50
STE404	Modern Construction Materials	2	STE205	6	20	30	-	50
STE405	Foundations (2)	2	STE307	6	20	30	-	50
STE315	Specifications and Quantities	2	STE203	5	20	30	-	50
STE207	Construction Methods and Equipment	2	STE206	6	20	30	-	50
STE316	Contracts and Laws in Construction	2	ENG412	5	20	30	-	50
STE406	Project Evaluation	2	STE308	6	20	30	-	50
ARC101	Architectural Construction, Technical and Sanitary Installations	3	PDE052	9	20	30	--	50
ARC102	Architectural Design (1)	3	PDE052	9	20	30	-	50
ARC203	Shop Drawings	2	ARC102 + ARC101	6	20	30	-	50
ARC103	Architecture Theory (1)	2	PDE052	6	20	30	-	50
PWE201	Traffic Planning and Traffic Engineering	2	BAS115	6	20	30	-	50
ARC303	Building Information Modeling	3	IHE101 + ARC101	8	20	30	-	50
STE419	Risk Management in Construction Projects	3	STE308	7	20	30	-	50

Table (3b) Elective Courses as Requirements for General and Specific Specialization (12 Credit Hours = 7.362% of 163)

Course code	Course name	Credit hours	Prerequisite	Total SWL	Marks Distribution			
					Mid Term	semester Works	Lab	Final Term
STE309	Studies in the Field of Structural Engineering	3	Not applied	9	20	30	--	50
STE310	Design of Masonry Structures	3	STE202 + STE102	9	20	30	--	50
STE311	Sustainable Construction	3	STE205	9	20	30	--	50
STE312	Inspection and Maintenance of Structures	3	STE205	9	20	30	--	50
STE313	Quality Control and Confirmation in Structures	3	STE205	9	20	30	--	50
ARC301	Architectural Design (2)	3	ARC102	9	20	30	--	50
ARC302	Environmental control and climate change	3	ARC102	9	20	30	--	50
IHE302	Irrigation and Drainage Engineering	3	IHE201	9	20	30	--	50
IHE303	Design of Water Structures	3	IHE201	9	20	30	--	50
PWE302	Topographic Surveying	3	PWE101	9	20	30	--	50
PWE303	Maps and Geographic Information Systems	3	PWE302	9	20	30	--	50
STE407	Reinforced Concrete (4)	3	STE304	8	20	30	--	50
STE408	Steel Structures (3)	3	STE306	8	20	30	--	50
STE409	Structural Dynamics	3	STE302	8	20	30	--	50
STE410	Analysis and Design of Tall Buildings	3	STE303 + STE306 + STE302	8	20	30	--	50
STE411	Shell Structures Design	3	BAS113 + STE303 + STE302	8	20	30	--	50
STE412	Prestressed Concrete	3	STE303	8	20	30	--	50
STE413	Strut-and-Tie Modeling Method	3	STE303 + STE302	8	20	30	--	50
STE414	Composite Structural Elements Design	3	STE203 + STE306	8	20	30	--	50
STE415	Rehabilitation and Strengthening of Concrete Structures	3	STE303	8	20	30	--	50
STE416	Soil Excavated Retaining Systems	3	STE405	8	20	30	--	50
PWE403	Sanitary Engineering (2)	3	PWE401	8	20	30	--	50
STE417	Management of Construction Information Systems	3	ENG412	8	20	30	--	50
STE418	Monitoring Construction Projects	3	STE308	8	20	30	--	50
STE420	Computer Applications in Structural Engineering	3	STE403	8	20	30	--	50
IHE401	Port Engineering	3	STE307	8	20	30	--	50
ARC401	Architectural Design (3)	3	ARC301	8	20	30	--	50
ARC402	Architectural Design (4)	3	ARC401	8	20	30	--	50
ARC403	Architectural Construction (2)	3	ARC101	8	20	30	--	50
ARC404	Architecture theory (2)	3	ARC103	8	20	30	--	50

Table (4) Project Decisions, Practical Training, and Field Training (6 Credit Hours)

Course code	Course name	Credit hours	Prerequisite	Total SWL	Marks Distribution			
					Mid Term	semester Works	Lab	Final Term
STE201	**Field Training (1) - Building and Construction Engineering**	**0**	**--**	**--**	**--**	**--**	**--**	**--**
STE301	**Field Training (2) - Building and Construction Engineering**	**0**	**STE201**	**--**	**--**	**--**	**--**	**--**
STE401	**Graduation Project (1) - Building and Construction Engineering**	**3**	**120 Credit Hours**	**--**	**--**	**50**	**--**	**50**
STE402	**Graduation Project (2) - Building and Construction Engineering**	**3**	**STE401**	**--**	**--**	**50**	**--**	**50**

5. Student's Study Plan Proposal

The following tables clarify a proposal for the regular student to schedule the courses in the first and second semesters for each of the five levels of study, indicating the number of study hours prescribed as lectures, exercises and laboratories, as well as the number of credit hours and contact hours.

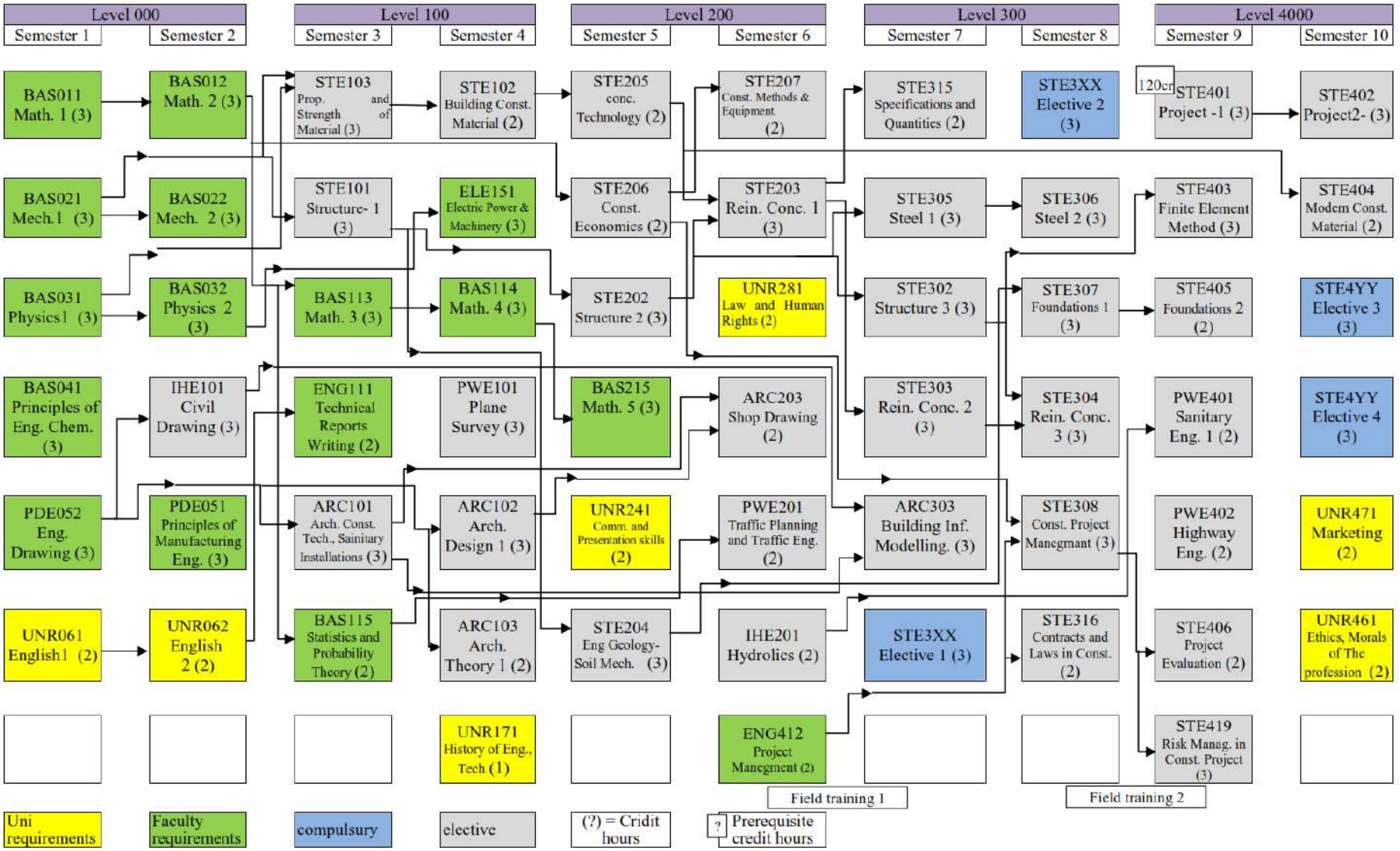

Level 000
Semester 1
Semester 2
Level 100
Semester 3
Semester 4
Level 200
Semester 5
Semester 6
Level 300
Semester 7
Semester 8
Level 4000
Semester 9
Semester 10
BAS011 Math. 1 (3)
BAS012 Math. 2 (3)
STE103 Prop. and Strength of Material (3)
STE102 Building Const. Material (2)
STE205 conc. Technology (2)
STE207 Const. Methods & Equipment. (2)
STE315 Specifications and Quantities (2)
STE3XX Elective 2 (3)
120cr
STE401 Project -1 (3)
STE402 Project2- (3)
BAS021 Mech.1 (3)
BAS022 Mech. 2 (3)
STE101 Structure- 1 (3)
ELE151 Electric Power & Machinery (3)
STE206 Const. Economics (2)
STE203 Rein. Conc. 1 (3)
STE305 Steel 1 (3)
STE306 Steel 2 (3)
STE403 Finite Element Method (3)
STE404 Modern Const. Material (2)
BAS031 Physics1 (3)
BAS032 Physics 2 (3)
BAS113 Math. 3 (3)
BAS114 Math. 4 (3)
STE202 Structure 2 (3)
UNR281 Law and Human Rights (2)
STE302 Structure 3 (3)
STE307 Foundations 1 (3)
STE405 Foundations 2 (2)
STE4YY Elective 3 (3)
BAS041 Principles of Eng. Chem. (3)
IHE101 Civil Drawing (3)
ENG111 Technical Reports Writing (2)
PWE101 Plane Survey (3)
BAS215 Math. 5 (3)
ARC203 Shop Drawing (2)
STE303 Rein. Conc. 2 (3)
STE304 Rein. Conc. 3 (3)
PWE401 Sanitary Eng. 1 (2)
STE4YY Elective 4 (3)
PDE052 Eng. Drawing (3)
PDE051 Principles of Manufacturing Eng. (3)
ARC101 Arch. Const. Tech., Sainitary Installations (3)
ARC102 Arch. Design 1 (3)
UNR241 Comm. and Presentation skills (2)
PWE201 Traffic Planning and Traffic Eng. (2)
ARC303 Building Inf. Modelling. (3)
STE308 Const. Project Manegmant (3)
PWE402 Highway Eng. (2)
UNR471 Marketing (2)
UNR061 English1 (2)
UNR062 English 2 (2)
BAS115 Statistics and Probability Theory (2)
ARC103 Arch. Theory 1 (2)
STE204 Eng Geology- Soil Mech. (3)
IHE201 Hydrolics (2)
STE3XX Elective 1 (3)
STE316 Contracts and Laws in Const. (2)
STE406 Project Evaluation (2)
UNR461 Ethics, Morals of The profession (2)
UNR171 History of Eng., Tech (1)
ENG412 Project Manegment (2)
STE419 Risk Manag. in Const. Project (3)
Field training 1
Field training 2
Uni requirements
Faculty requirements
compulsury
elective
(?) = Cridit hours
? Prerequisite credit hours

Table of level (000)

First Semester

Course code	Course Name	Weekly hours						Course grades distribution					Prerequisite
		Credit Hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
BAS011	Calculus (1) (Math. 1)	3	2	2	--	4	8	20	30	--	50	100	-------
BAS021	Mechanics (1)	3	2	2	--	4	8	20	30	--	50	100	-------
BAS031	Physics (1)	3	2	1	1/5	4/5	9	20	20	10	50	100	-------
BAS041	Principles of Engineering Chemistry	3	2	1	1/5	4/5	9	20	20	10	50	100	-------
PDE052	Engineering Drawing	3	2	2	--	6	10	20	30	--	50	100	-------
UNR061	English Language (1)	2	1	2	--	2	5	20	30	--	50	100	-------
	Total	17	11	10	3	25	49					600	
Total Contact Hours = 24 hrs./week Total SWL = 49 hrs./week													

Second Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
BAS012	Calculus (2) (Math. 2)	3	2	2	--	4	8	20	30	--	50	100	BAS011
BAS022	Mechanics (2)	3	2	2	--	4	8	20	30	--	50	100	BAS021
BAS032	Physics (2)	3	2	1	1/5	4/5	9	20	20	10	50	100	BAS031
IHE101	Civil Drawing	3	2	3	0	4	9	20	30	--	50	100	PDE052
PDE051	Principles of Manufacturing Engineering	3	2	--	3	3	8	20	20	10	50	100	-------
UNR062	English Language (2)	2	1	2	--	2	5	20	30	--	50	100	UNR061
	Total	17	11	10	4/5	21/5	47					600	
Total Contact Hours = 25.5 hrs./week Total SWL = 47 hrs./week													

Table of level (100)

Third Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE103	Properties and Strength of Materials	3	2	1	1	4	8	20	20	10	50	100	BAS031 BAS021
STE101	Structural Analysis (1)	3	2	2	--	5	9	20	30	--	50	100	BAS021
BAS113	Differential equations (Math. 3)	3	2	2	--	4	8	20	30	--	50	100	BAS012
BAS115	Statistics and Probability Theory	2	2	1	--	3	6	20	30	-	50	100	BAS012
ARC101	Architectural Construction, Technical and Sanitary Installations	3	2	2	--	5	9	20	30	--	50	100	PDE052
ENG111	Technical Reports Writing	2	2	--	--	4	6	20	30	--	50	100	UNR062
	Total	16	12	8	1	25	46					600	
Total Contact Hours = 21 hrs./week Total SWL = 47 hrs./week													

Fourth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE102	Building Construction Materials	2	2	1	--	3	6	20	30	-	50	100	STE103
ELE151	Electric Powers and Machines	3	2	2	--	4	8	20	30	-	50	100	BAS032
BAS114	Special functions (Math. 4)	3	2	2	--	4	8	20	30	-	50	100	BAS113
PWE101	Plane Surveying	3	2	1	2	5	9	20	20	10	50	100	----------
ARC102	Architectural Design (1)	3	2	2	--	5	9	20	30	-	50	100	PDE052
ARC103	Architecture Theory (1)	2	2	1	--	3	6	20	30	-	50	100	PDE052
UNR171	History of Technology Engineering	1	1	-	-	1	2	20	30	--	50	100	----------
	Total	17	13	9	2	25	48					700	
Total Contact Hours = 24 hrs./week Total SWL = 48 hrs./week													

Table of level (200)

Fifth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE205	Concrete Technology	2	2	1	1	3	7	20	20	10	50	100	STE102
STE206	Construction Economics	2	2	1	--	3	6	20	30	–	50	100	BAS012
STE202	Structural Analysis (2)	3	2	2	--	5	9	20	30	–	50	100	STE101
BAS215	Numerical Analysis (Math. 5)	3	2	2	--	4	8	20	30	–	50	100	BAS114
STE204	Engineering Geology and Soil Mechanics	3	2	2	--	5	9	20	30	–	50	100	STE101
UNR241	Communication and Presentation Skills	2	2	--	--	3	5	20	30	–	50	100	----------
	Total	15	12	8	1	23	44					700	
Total Contact Hours = 21 hrs./week Total SWL = 44 hrs./week													

Sixth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE207	Construction Methods and Equipment	2	2	1	–	3	6	20	30	–	50	100	STE206
STE203	Reinforced Concrete (1)	3	2	2	–	5	9	20	30	–	50	100	STE202+ STE205
ARC203	Shop Drawings	2	2	1	–	3	6	20	30	–	50	100	ARC102+ ARC101
PWE201	Traffic Planning and Traffic Engineering	2	1	2	–	3	6	20	30	–	50	100	BAS115
IHE201	Hydraulics	2	2	1	–	3	6	20	30	–	50	100	----------
UNR281	Law and Human Rights	2	2	–	–	2	4	20	30	–	50	100	----------
ENG412	Projects Management	2	2	1	–	3	6	20	30	–	50	100	---------
STE201	Field Training (1) (Summer Semester)	--	--			--	--	--	--	–	--	--	
	Total	15	13	8	0	22	43					700	
Total Contact Hours = 21 hrs./week Total SWL = 43 hrs./week													

Table of level (300)

Seventh Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE315	Specifications and Quantities	2	2	1	–	2	5	20	30	–	50	100	STE203
STE305	Steel Structures (1)	3	2	2	–	5	9	20	30	–	50	100	STE202
STE302	Structural Analysis (3)	3	2	2	–	5	9	20	30	–	50	100	STE202
STE303	Reinforced Concrete (2)	3	2	2	–	5	9	20	30	–	50	100	STE203
ARC303	Building Information Modeling	2	2	2	–	4	8	20	30	–	50	100	IHE101 + ARC101
STE3XX	Elective (1)	3	2	2	–	5	9	20	30	–	50	100	Table (3b)
	Total	16	12	11	0	26	49					600	
Total Contact Hours = 23 hrs./week Total SWL = 49 hrs./week													

Eighth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE3XX	Elective (2)	3	2	2	–	5	9	20	30	–	50	100	Table (3b)
STE306	Steel Structures (2)	3	2	2	–	5	9	20	30	–	50	100	STE305
STE307	Foundations (1)	3	2	2	–	5	9	20	30	–	50	100	STE204
STE304	Reinforced Concrete (3)	3	2	2	–	5	9	20	30	–	50	100	STE303 + STE302
STE308	Construction Project Management	3	2	2	–	5	9	20	30	–	50	100	ENG412 + STE206
STE316	Contracts and Laws in Construction	2	2	0	–	3	5	20	30	–	50	100	ENG412
STE301	Field Training (2) (Summer Semester)	–	–	–	–	–	–	–	–	–	–	–	Field Training (1)
	Total	17	12	10	0	28	50					600	
Total Contact Hours = 22 hrs./week Total SWL = 50 hrs./week													

Table of level (400)

Ninth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE401	Graduation Project (1)	3	1	4	–	6	11	–	50	–	50	100	120 Credit hours
STE403	Finite Element Method	3	2	2	–	4	8	20	30	–	50	100	BAS215 + STE302
STE405	Foundations (2)	2	2	1	–	3	6	20	30	–	50	100	STE307
PWE401	Sanitary Engineering (1)	2	2	1	–	3	6	20	30	–	50	100	IHE201
PWE402	Highway Engineering	2	2	1	–	3	6	20	30	–	50	100	-------
STE406	Project Evaluation	2	2	1	–	3	6	20	30	–	50	100	STE308
STE419	Risk Management in Construction Projects	3	2	2	–	3	7	20	30	–	50	100	STE308
	Total	17	13	12	0	25	50					700	
Total Contact Hours = 25 hrs./week Total SWL = 50 hrs./week													

Tenth Semester

Course code	Course name	Weekly hours						Course grades distribution					Prerequisite
		Credit hours	Lectures	Tutorials	Lab	Free work	SWL	Mid-term	Class work	Lab grade	Final Exam	Total	
STE402	Graduation Project (2)	3	1	4	--	7	12	--	50	–	50	100	STE401
STE404	Modern Construction Materials	2	1	2	--	3	6	20	30	–	50	100	STE205
STE4YY	Elective (3)	3	2	2	--	4	8	20	30	–	50	100	Table (3b)
STE4YY	Elective (4)	3	2	2	--	4	8	20	30	–	50	100	Table (3b)
UNR471	Marketing	2	2	--	--	2	4	20	30	–	50	100	---------
UNR461	Ethics and Morals of The Profession	2	2	--	--	2	4	20	30	–	50	100	---------
	Total	15	10	10	0	22	42					600	
Total Contact Hours = 20 hrs./week Total SWL = 43 hrs./week													

8. Scientific content of the courses of Bachelor of Building and Construction Engineering

8.1 University requirements

UNR061	English (1)								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---
Main skills of the English language – listening to short and long conversations – reading scientific passages – writing reports, summaries, and scientific articles – speaking and presenting new ideas									
References: ▪ *Mark Ibbotson, Cambridge English for Engineering Student's book free, Cambridge press 2011*									

UNR062	English (2)								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	UNR061
Analysis and interpretation of engineering issues – summarizing engineering issues – preparation for language tests.									
References: ▪ *Mark Ibbotson, Cambridge English for Engineering Student's book free, Cambridge press 2011*									

UNR171	History of Engineering and Technology								Prerequisites
1 Cr	Lecture	1	Tutorial	--	Lab.	--	Semester	2nd	---
Engineering history: Art, Science, Engineering and technology – Role of engineering and technology in development and establishment of civilizations -Technology and environment - Examples on development of engineering activity.									
References: ▪ *Roger S. Kirby, Engineering in History, Dover Publications Inc. New York, United States, 1990, ISBN10 0486264122*									

UNR281	Law and Human Rights								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	2ed	---
Systems and laws of institutions – Introduction to Accounting – Labor legislation and laws governing engineering professions – Industrial security legislation and environment – Historical philosophical origins of human rights – international sources of human rights – national sources of human rights – global bodies based on the protection of human rights.									

UNR241	Communication and Presentation Skills								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---
Communication skills – Presentation planning and preparation – Delivery skills such as eye contact, voice control, gestures, body language and appearance – Presenter's characteristics – Using visuals – Presentation structure – Elevator Pitch									
References: ▪ *Joan van Emden, Lucinda Becker, Presentation Skills for Students, 3rd Edition, Red Globe Press, 2016* ▪ *M. Wa Mutua, S. Mwaniki, P. Kyalo, B. Sugut, Communication Skills: A University Book, Succex Publishers, 2016* ▪ *Ian Tuhovsky, Wendell Wadsworth, Communication Skills Training, Ian Tuhovsky, 2015* ▪ *Tabitha Wambui, Alice W. Hibui, Elizaeth Gathuthi, "Communication skills " Vol.1, Students' coursebook, LAP LAMBERT Academic Publishing, 2012*									

UNR461	Ethics and Morals of The Profession								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	1st	---
General principles of professional ethics – Commitments to society – Responsibilities of the engineer – Detection of violations – Behavior – Case studies and general issues.									
References: ▪ *Lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson 2018.* ▪ *Harris, C. E., Jr., Pritchard, M. S., & Rabins, M. J. Engineering Ethics. Second edition. Belmont, CA: Wadsworth, 2000*									

UNR471	Marketing								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	1st	---
Principles of products marketing – Marketing research – Customers buying behavior – Marketing mix – Plotting marketing strategy – Building marketing plan – Pinpointing the target market – Marketing on the world wide web – Branding strategy – Developing new products – Advertising and promotions – Costing and pricing strategies – Case studies on products marketing									
References: ▪ *Principles of Marketing, University of Minnesota Libraries Publishing, 2015, ISBN 13: 9781946135193*									

8.2 Faculty Requirements:

BAS011	Calculus (1) (Math. 1)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---
Calculus: Function (definition - theorems) - Basic functions - limits - Continuity - Derivation - definition - theorems - types - higher orders - Applications on derivatives - partial derivatives - indefinite integral - theories and properties of integration. Algebra: Binomial theorem (with any exponent and applications) - Partial Fractions - Theory of Equations - Matrices - System of linear equations - Gauss elimination method.									
References: ▪ *Akhtar & Ahsan, Textbook of Differential Calculus, second edition, 2009, PHI Learning Private Limited.* ▪ *Alan Jeffrey, Matrix operations for Engineers and Scientists, 2010, Springer Science & Business Media.*									

BAS021	Mechanics (1)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---
Newton's laws - Types of forces، coplanar forces، Rectangular components of vector (1D, 2D, Space), Forces in space - Equilibrium of a particle - Conditions, Free-body diagram - Moment - Couple moment - Resultant of a system of forces and couples as a force and couple system - General procedure for reducing force and couple systems - Equilibrium of a rigid body - Conditions of equilibrium of a rigid-body، free body diagrams – friction									
References: ▪ *R.C. Hibbeler, "Engineering Mechanics: Statics and Dynamics, 14th Edition", Pearson Prentice Hall, New Jersey, 2016.* ▪ *J. L. Meriam, L. G. Kriage, and J. N. Botton, "Engineering Mechanics: Statics, 8th Edition", John Wiley & Sons, New York, 2016.*									

BAS012	Calculus (2) (Math. 2)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2nd	**BAS011**
Integral Calculus: Definite integral - Methods of integration – Applications on definite integral (plane area - volume of revaluation - length of a plane curve - area of surfaces of revolution) - improper integral. Analytic Geometry: Equations of second degree - Equation of pair of straight lines - Translation of axes - Conic sections - parabola - ellipse - hyperbola) Equation of plane - Equation of sphere.									
References: ▪ *Jumarie, G., Fractional Differential Calculus for Non-Differentiable Functions: Mechanics, Geometry, Stochastics, Information Theory. 2013: LAP Lambert Academic Publishing.* ▪ *Hestenes, D. and G. Sobczyk, Clifford algebra to geometric calculus: a unified language for mathematics and physics. Vol. 5. 2012: Springer Science & Business Media.* *Grossman, S.I., Multivariable calculus, linear algebra, and differential equations. 2014: Academic Press.*									

BAS022	Mechanics (2)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	**BAS021**
Kinematics of a particle: curvilinear motion - Normal and tangential components. - Newton's laws - motion of projectiles - Work and energy of a particle - applications of friction.									
References: ▪ *R.C. Hibbeler, "Engineering Mechanics: Statics, 11th Edition", Pearson Prentice Hall, 2006.* ▪ *F. P. Beer, and E. R. Johston, Jr., D. F. Mazurek, P. J. Cornwell, E. R. Eisenberg, "Vector Mechanics for Engineering, Statics and Dynamics, 9th Edition", McGraw-Hill, New York, 2010.*									

BAS031	Physics (1)								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	1st	---
Material properties: Physical quantities - Standard units and dimensions - Mechanical properties for materials - Fluid properties - Periodic motion - Mechanical waves - Sound waves - Waves in elastic media. **Heat and thermodynamics**: Temperature measurements and thermometers - Thermal expansion - Specific and latent heat - Heat transfer - Gas motion theory - First law of thermodynamics - Entropy and second law of thermodynamics.									

References:

- *Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 6th Edition, Thomson Brooks/Cole 2014.*
- *Paul A. Tipler, " Physics for scientists and engineers" sixth edition, 2008.*

BAS032	Physics (2)								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	2nd	---

Electricity and Magnetism: Electric charge - Electric force - Electric field- Column's law- Electric flux- Gauss law- Electric potential- Electric capacitance and Dielectrics - Ohm's law and simple circuits- Magnetic field - Baiot and Savart laws.
Optics and Modern physics: Nature of light and laws of geometric optics - Interference - Diffraction - polarization - optical fiber - laser - photoelectric effects - principle of quantum theory - special theory of relativity.

References:

- *Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 9th Edition, Thomson Brooks/Cole 2014.,*
- *Paul A. Tipler, " Physics for scientists and engineers" sixth edition, 2008.*

BAS041	Principals of Engineering Chemistry								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	1st	---

Equations of state-chemical thermodynamics - Material and energy balance in chemical processes- properties of solutions - Basic principles in electrochemistry and it's applications- selected topics in chemical industry.

References:

- *Brown, L. T, LeMay H. E. Jr; Bursten, B. E.; Murphy, C.J., and Woodward, P.; " Chemistry The Central Science", Pearson International Edition (11th edn), Pearson Printice Hall, (2009).*

PDE051	Principles of Manufacturing Engineering								Prerequisites
3 Cr	Lecture	2	Tutorial	--	Lab.	3	Semester	2ed	---

Introduction to the following processes (Casting- Forging- Metal filing - Machining- Forming- Woodworking)

References:

- *Hitomi, Katsundo. Manufacturing Systems Engineering: A Unified Approach to Manufacturing Technology, Production Management and Industrial Economics. Routledge, 2017.*

PDE052	Engineering Drawing								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---

Two-dimensional drawings - Free-hand sketching - Sectional views - Auxiliary views and conventions - Computer-aided drawing (CAD) of 2D and 3D figures.

References:

- *Mcgraw-hill Mint, "Mechanical Drawing Board & CAD Techniques", Student Edition,2011*

ENG111	Technical Reports Writing								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	2nd	UNR062
Technical writing definition - audience analysis - technical writing styles - technical document characteristics - automated document organization - official and unofficial document types - structure of different types of technical documents.									
References: ▪ *G. J. Alred, W. E. Oliu, The Handbook of Technical Writing, 12th Edition, Bedford/St. Martin's; 2018* ▪ *K. Hyland, Teaching and researching writing. 3rd edition Routledge academic publisher, 2016* ▪ *M. Markel, Technical Communication, 11th edition, MacMillan, 2015.*									

BAS113	Differential equations (Math. 3)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	**BAS012**
Applications of partial differentiation - Maximum values of functions in more than one variable and applications - First order differential equations - Second order differential equations - Laplace transform and its applications - Analytical geometry in space.									
References: ▪ *D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.* ▪ *S. A. Wirkus, and R. J. Swifi, "A Course of Ordinary Differential Equations", Taylor & Francis Group, LLC, 2015.*									

BAS114	Special Functions (Math. 4)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	**BAS113**
Fourier series – Fourier transform – Complex numbers – Functions of a complex variable – Complex integration – Residue theorem – Direction derivatives – Double integrals – Triple integrals – Line integrals – Surface integrals.									
References: ▪ *J. Brown, and R. Churchill, "Complex Variables and Applications", 9th Edition, McGraw-Hill, 2013.* ▪ *D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.*									

BAS115	Statistics and Probability Theory								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	**BAS012**
Measures of tendency and dispersion – Probability distributions – Sampling theorem – tests of hypothesis – non-parametric tests – regression and correlation – time series.									
References: ▪ *Mary C. Meyer, Probability and Mathematical Statistics: Theory, Applications, and Practice in RSBN-10: 1611975778, SIAM (June 24, 2019)*									

ELE151	Electrical Power and Machines								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2nd	---
Power: Electrical power systems – three phase systems – Theory and models of transformers – Transmission line models – Voltage and frequency control – effective and ineffective power – Optimal work of power systems. Machines: The theory of operation – The construction of the Direct Current motors. The speed، torque، and current characteristics – applications of the DC motors. The theory of operation and construction of stepper motors – Permanent-magnet DC motor and Low-									

inertia DC Motors. The theory of operation، construction of three phase induction motors.

References:

- *Nilsson, J.W. and S.A. Riedel, Electric circuits. 2015: Pearson Upper Saddle River, NJ.*
- *Slade, P.G., Electrical contacts: principles and applications. 2017: CRC press.*

BAS215	Numerical Analysis (Math. 5)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	BAS113

Numerical solution of linear and non-linear systems of equations – Iterative methods – Curve fitting: Least square of (Straight lines, Polynomials), Linearization of nonlinear relationship. Interpolation and polynomial approximation –finite difference operators – Numerical integration and differentiation.

References:

- *Mazumder, Numerical Methods for Partial Differential Equations, Finite Difference and Finite Volume Methods, science direct ,2016.*
- *Sheldon Rose, A First course in probability, Eighth edition, 2010, Pearson Prentice Hall.*

ENG412	Project Management								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---

Fundamentals of project management – Integration management – Scope management – Time management – Cost management – Quality management – Human resources management – Communication management – Risk management – Procurement management – Projects case studies

References:

- *Kerzner, H. and H.R. Kerzner, Project management: a systems approach to planning, scheduling, and controlling. John Wiley & Sons, 2017.*
- *Kalpakjian, S., K. Vijai Sekar, and S.R. Schmid, Manufacturing Engineering and technology. Pearson, 2014.*
- *Nigel J. Smith, "Engineering Project Management", 3rd Edition, Wiley-Blackwell, 2008.*

8.3 Requirements for general and specific specialization courses

STE103	Properties and Strength of Materials								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	1	Lab	1	Semester	First	Physics (1) BAS031 + Mechanics (1) BAS021

Content:

Introduction to the characteristics and tests materials – machines testing and calibration – the behavior of engineering materials under the influence : tensile static, pressure static, bending static, shear static – shock – fatigue – discuss the physical properties of the basic mechanical and for a variety of materials related to civil engineering , such as concrete, asphalt, wood, vehicles **Fibers – Safety factor selection for design stresses – Metal rust – Fracture types – Fracture mechanics.**

References:

- *Neville, A.M., "Properties of Concrete",5th ed., Longman, 2010.*

STE101	Structural Analysis (1)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Mechanics (1) BAS021

Content:

Types of loads – Types of support points – Reactions – statically determinate structures - internal forces in statically determinate beams, trusses, frames, and arches – analysis of statically determinate trusses.

Influence lines for statically determinate beams, trusses, and frames.

References:

- *Kassimali, A. "Structural Analysis (Si Edition)". Stamford USA: Cengage Learning 2011.*
- *Kenneth M. Leet, Chia-Ming Uang, Joel T. Lanning, Anne M. Gilbert. "Fundamentals of Structural Analysis". McGraw-Hill Education, 2018.*

STE102	Building Construction Materials								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	2nd	Properties and Strength of Materials STE103

Content:

General introduction to concrete and its components – Cement (chemical and physical properties of cement types – cement tests) – Aggregate (Aggregate classification – Aggregate properties) – Chemical additives – Substitution materials for cement - Advanced and modern materials - Concrete industry – Properties and tests of fresh and hardened concrete – Lime – Gypsum – water – iron.

References:

- *P. Purushothama Raj, " Building Construction Materials and Techniques". Pearson Education India, ISBN: 9789332579118, 2016.*
- *M L Gambhir and Neha Jamwal, " Building and Construction Materials: Testing and Quality Control, (Lab Manual Series)". McGraw Hill Education (India) Private Limited, ISBN: 1259029662, 2014.*

ARC101	Architectural Construction, Technical and Sanitary Installations								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Engineering Drawing PDE052

Content:

Principles of architectural construction – the basics of construction work (stone – brick – concrete– iron) – architectural and construction codes and materials for materials – types of buildings – structural – load bearing walls - construction methods for each type and structural elements– insulating layers, floors, and stairs – methods of moisture insulation, drainage Rain water – building materials, finishing materials and equipment used – applications with simplified building drawings of buildings – an introduction to the installations and sanitary installations of the building – a study of how to implement the various stages of construction operations in theory and field locations . Introduction to technical installations.

References:

- *Ching F. D. K. "Building Construction illustrated, CBS publishers& distributors", India, 2014.*

ARC102	Architectural Design (1)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Engineering Drawing PDE052

Content:

Developing the ability to perceive architectural formations and their design – design considerations and functional requirements, study functional relationships, guidance, privacy and space configurations– simplified projects that address the aesthetic, cultural, environmental, functional and structural determinants of architectural form and space – the foundations for the use and design of internal and external spaces and services and vertical and horizontal communication – and focus those topics to human needs and its interaction with the surrounding environment ' natural and built – applications of architectural models and methods of studying directing and Manifesting architectural projects.

References:

- **Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.**
- **Francis D. K. Ching. "Architectural Graphics", Amazon Digital Services LLC, April 2015.**
- **Ernest R. Norling. "Perspective Made Easy** (Dover Art Instruction)**", 2012.**
- **Nikolas, D. & Jokiniemi, E. "Dictionary of Architecture and Building Construction", 1st Ed. 2008.**
- **Crosbie, Michael J. "Time Saver Standards for Architectural Design Data", McGraw Hill book company, New York, 2009.**

ARC103	Architecture Theory (1)								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	2nd	Engineering Drawing PDE052

Content:

The concept of architecture and its theories – architectural formation (line, level, and mass) – principles of formation (unity – symmetry – homogeneity – rhythm – hierarchy – diversity - ….) – types of buildings - factors that influence architectural design – the concept of public and private spaces – Design standards, rates, capabilities, and design limitations based on providing efficiency, comfort, and safety – Spatial relationships – Scale and dimensions of the human body and its relationship to design standards for architectural spaces – Elements of horizontal movement and elements of vertical movement in buildings – Service units for individuals, equipment supply, and infrastructure.

References:

- **Ching, Francis D.K. "Architecture: form, space and order", van nostrand reinhold company, 4ed, NY, 2014.**
- **Nikos A. Salingaros. "A Theory of Architecture", 2016.**

IHE101	Civil Drawing								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	3	Lab	0	Semester	1st	Engineering Drawing PDE052

Content:

Irrigation works: earthworks for canals, drains, and roads. Retaining walls: brick walls – the walls of ordinary concrete – RC walls. Various types of bridges, culverts, siphons, arches, and wasters. Obsession . RC works: tiles – beams – columns – bases . Metal works: connections with nails, between beams, between columns and beams, and between columns and bases .

References:

- *Singh, Gurcharan. "Civil Engineering Drawing". Standard publications-Delhi, 2009.*

PWE101	Plane surveying								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	1	Semester	2nd	----

Content:

Introduction to mapping and surveying science – Definitions and branches of surveying science and its applications – Different surveying instruments and their uses – The surveying maps and their types – Point positioning techniques – Introduction to vertical control in surveying – Different surveying instruments used for height difference measurement – Ordinary and precise leveling – Calculation of leveling – Applications of leveling – Grid leveling and generation of contour lines – Longitudinal profiles and cross sections. Introduction to Total Station.

References:

- *Johnson, Aylmer. "Plane and Geodetic Surveying 2nd Edition". CRC Press, 2014.*
- *Bossler, and Moffit. "Surveying 10th Edition". 2004.*

Lab	The use of tape – Tidolite – levels

STE202	Structural Analysis (2)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Structural Analysis (1) STE101

Content:

Normal Stresses: properties of plane areas, straining actions, distribution of normal stresses in homogeneous sections, distribution of normal stresses in heterogeneous sections, core of cross sections. Shear stresses: Shear Stresses in homogeneous section due to shearing force and torsion moments, shear stresses on bolts, riveted (bolted) and welded connections due to shearing force and torsion moments. Combined stresses analytically and graphically using Mohr's circle.

References:

- *George, N. Frantziskonis. "Essentials of the Mechanics of Materials, Second Edition". USA: DEstech Publications, Inc., 2013.*
- *Pytel, A. and Kiusalaas, J. "Mechanics of Materials Second Edition". Cengage Learning2012.*
- *Kelly, Pa. "Solid Mechanics Part I: An Introduction to Solid Mechanics". http://homepages.engineering.auckland.ac.nz/~pkel015/SolidMechanicsBooks/Part_I/. 2018.*

STE203	Reinforced Concrete (1)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Structural Analysis (2) STE202 + Concrete Technology STE205

Content:

Physical and mechanical properties of concrete and steel reinforcement - structural systems and systems for floor slabs and the distribution of loads on structural elements – design for moment – design of short and long columns under centric and eccentric loads - design of RC beams for moment and shear forces and diagonal tension and compression using limit states design method - the bond between the steel and concrete and the development length - Details of reinforced beams - serviceability limit states (cracking and deflection). Design and detailing of one- and two-way solid slabs.

References:

- *Fanella, David A. "Reinforced Concrete Structures: Analysis and Design". McGraw-Hill Professional Publishing, 2010.*
- *Jack C. McCormac, Russell H. Brown. "Design of Reinforced Concrete". 2013.*

STE204	Engineering Geology and Soil Mechanics								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Structural Analysis(1) STE101

Content:

Introduction to Geology and the origins of the Earth - rocks, composition and types - geological maps in Egypt - Introduction to soil mechanics : soil characteristics; soil types and soil structure - soil composition : terms and characteristics of volumetric and gravimetric - definitions and relationships especially mechanics of soil - mechanical analysis of soil - soil texture and Atrberg limits - soil - soil classification systems - stresses on soil as a result of weight and as a result of external loads (analysis of the strains within the soil) - Introduction to soil Hydraulics - water movement in the soil - soil permeability and uni flow and dual direction directional - Shear force- cementing and landing - lateral soil presur slope stability.

References:

- *Das, Braja M., "Principles of Foundation Engineering," 2010.*
- *"Egyptian Code for Soil Mechanics and Design and Execution of Foundations", 2002.*
- *Barnes, G. E. "Soil Mechanics: Principles and Practice". Macmillan Education UK, 2000*

STE205	Concrete Technology								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	1	Semester	1st	Building Construction Materials STE102

Content :

Concrete materials : cement - aggreagte - mixing water - additives . Concrete mix design : engineering design methods - empirical methods . Concrete: storage of materials - Mixing - Transporting - casting - compaction - Treatment – construction joints - movement joints – shrinkage joints - forming and shuttering – ready mixed concrete . Pouring concrete in hot climates: the definition of hot weather – problems of pouring concrete in hot climates - precautions to be followed for pouring concrete in hot climates. Fresh concrete properties: slump - workability – separation, etc. Properties of hardened concrete: compresive strength - tensile strength - shear strength – bond strength – volume changes of concrete - elasticity and creep- durability and permeability - non destructive tests: hammer - ultrasound – core test. Quality control of concrete . Special types of concrete: polymeric concrete - fiber concrete – lightwieght concrete.

References:

- *Neville, A.M., "Properties of Concrete", 5th ed., Longman, 2010.*

STE206	Construction Economics								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	Calculus (2) (Math. 2) BAS012

Content:

Basic concepts and importance of studying engineering economics - The concept of building economics analysis - The time value of money and life-cycle costs - Cash flows and the present value of fixed and variable payments. Economic evaluation of alternatives using the current value and internal return method - life cycle costs - cost-benefit ratio analysis. Industry applications, depreciation, estimating cost of operating and leasing equipment, replacement, profit and others.

References:

- *Danny Myers, "Construction Economics: A New Approach ", 2nd edition, Routledge; , 2008.*
- *Stephen L. Gruneberg, "Construction Economics: A New Approach ", Springer Nature, DOI.*
- *D.G. Newnan, J. Whittaker, T.G. Eschenbach and J.P. Lavelle, "Engineering economic Analysis", 3rd edition, Don mills, Toronto, Ontario, 2014.*

STE207	Construction Methods and Equipment								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	2nd	Construction Economics STE206

Content:

Introduction - Construction methods: concrete, excavation, forms, and tunnels – dewatering systems and design methods, shoring, planning construction sites - costs and operating of equipment – factors affecting selection of construction equipment and productivity calculation - transporting and excavating soil - Soil stabilization and compaction equipment - Dewatering - Cranes - Formwork design - Production and expansion of hot asphalt mixtures.

References:

- *Leonhard E. B., " Construction Equipment and Methods: Planning, Innovation, Safety", Wiley, 2013.*

ARC303	Building Information Modeling BIM								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Civil Drawing IHE101 + Architectural Construction, Technical and Sanitary Installations ARC101

-Content:

Introduction to BIM and its applications in construction – Its starting and developing - Creating basic building and structural components – Model viewing and presenting - Detailing, drafting and clash detection - Massing studies - Creating documentation standards - Creating BOQ and schedules - Templates and file management - Project collaboration and work sharing - Working with families.

References:

- *- Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.*
- *- Francis D. K. Ching. "Architectural Graphics", Amazon Digital Services LLC, April 2015.*
- *- Ernest R. Norling. "Perspective Made Easy (Dover Art Instruction)", 2012.*
- *- Nikolas, Davies & Jokiniemi, Erkki. "Dictionary of Architecture and Building construction", 1st Edition. 2008.*
- *- Crosbie, Michael J. "Time Saver Standards for architectural design data", McGraw Hill book company, NY, 2009.*

ARC301	Architectural Design (2)								Prerequisites
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Architectural Design (1) ARC102

Content:

Addressing the design process in its various dimensions - studying design performance techniques - analyzing the elements of medium-sized projects and installation - principles of studying the environmental impact of projects at the design stage - studying the importance of the structural idea in shaping architectural voids - simple structural systems and the architectural function - application with educational projects and studying architectural voids from In terms of quantity and quality.

References:

- *- Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.*
- *- LAWSON, Bryan. "The Language of Space", Architectural Press, Oxford, 2015.*
- *- Annie R. Prerace, Yong Han Ahn and HanmiGlobal. "Sustainable Buildings and Infrastructure", by Routledge in USA and Canada, 2012.*

ARC302	Environmental control and climate change								Prerequisites
3 Cr Elective	Lecture	2	Tutorial	2	Lab.	--	Semester	1st/2 nd	ARC102

Studying thermal effects on humans in architectural and urban space, and how to create an architectural environment within the scope of thermal comfort, study the possibility of application through software simulating of heat, wind movement, sound and light in buildings.

Studying different mathematical methods for solar radiation angles on building and the ways to deal with it to reduce or increase light or heat according to environmental site

References:

- *Dynamic thermal environment and thermal comfort, Y. Zhu Q. Ouyang B. Cao X. Zhou J. Yu First published:14 July 2015*
- *Renewable and Sustainable Energy Reviews, Science direct journal, vol 65*
- *Architectural acoustics, M Long - 2005*
- *Environmental and architectural acoustics,Z Maekawa, J Rindel, P Lord - 2010*

ARC203	Shop Drawings								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	Architectural design (1) ARC102 + Architectural Construction, Technical and Sanitary Installations ARC101

Content:

Basis of preparation and clarification of all elements in the projections, sectors and interfaces - a detailed study of the preparation of drawings of architectural full of projects large - a detailed study through implementation at the sites - and the preparation of research in the various construction methods to cover the large spans and specialized buildings - drawings of architectural full of that preparation Projects - Make field visits to engineering projects sites under construction to study operational details on the ground.

References:

- *- Rosemary Kilmer, W. Otie Kilmer. "Construction Drawings and Details for Interiors", 3rd Edition, January 2016.*

STE201	Field Training (1)								Prerequisite
0 Cr Compulsory	Lectures	0	Tutorials	0	Lab	0	Semester	Summer	----

Content:

Training on industrial establishments relevant to the program. Training lasts for total of 120 hours, during a period about four weeks. The program training advisor schedules at least one follows up visit to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. *The course is graded as Pass/Fail grade- system*.

STE301	Field Training (2)								Prerequisite
0 Cr Compulsory	Lectures	0	Tutorials	0	Lab	0	Semester	Summer	Field Training (1)

Content:

Training on industrial establishments relevant to the program. Training lasts for total of 120 hours, during a minimum period of four weeks. The program training advisor schedules at least two follow-up visits to the training venue and formally report on performance of trainee(s). A Mentor in the industrial establishment provides a formal report on the student's performance during training. The student submits a formal report and presentation to be evaluated by a panel of three members with one member being an external examiner appointed from industry or other colleges of engineering. *The course is graded as Pass/Fail grade- system*.

IHE201	Hydraulics								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	----

Content:

Fluid properties - hydrostatics - buoyancy and flotation – Kinematics fluid flow - energy considerations for the flow of stable applications and the amount of movement and strong in the flow of fluid - models analog and meta-analysis.

References:

- *Saeid Eslamian, " Handbook of engineering hydrology : environmental hydrology and water management", Crc Press, 2014.*

STE302	Structural Analysis (3)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Structural Analysis (2) STE202

Content:

Double integration method – methods of conjugate beam and moment area – three moment equations for indeterminate structures – Virtual work method. The method of compatible deformation – slope deflection method - the moment distribution method.

References:

- *Kassimali, A. "Structural Analysis (Si Edition)". Stamford USA: Cengage Learning 2011.*
- *Kenneth M. Leet, Chia-Ming Uang, Joel T. Lanning, Anne M. Gilbert. "Fundamentals of Structural Analysis". McGraw-Hill Education, 2018.*
- *McCormac, C.J. "Structural Analysis Using Classical and Matrix Methods". United States of America.: 4th Edition , John Wiley & Sons, Inc, , 2007*

STE303	Reinforced Concrete (2)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Reinforced Concrete (1) STE203

Content :

Flat slab: An introduction to the structural system of flat slab, areas of use, limits of specifications and different methods, analysis of internal stresses. Shear in slabs and design of slabs and columns and openings in slabs and reinforcement detailing. The design of hollow block slabs with one- and two-way ribs - design of paneled beams - structural systems for halls with large spans - design of frames and arches - design of arched roofs.

References:

- *Fanella, David A. "Reinforced Concrete Structures: Analysis and Design". McGraw-Hill Professional Publishing, 2010.*
- *Jack C. McCormac, Russell H. Brown. "Design of Reinforced Concrete". 2013.*
- *El-behairy, S., "Reinforced Concrete Design Handbook", Fifth edition, Cairo, 2002.*

STE304	Reinforced Concrete (3)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Reinforced Concrete (2) STE303 + Structural Analysis (3) STE302

Content :

Revolutionary surfaces: methods of forming surfaces of revolution of various types; cones and domes, an introduction to the theory of analysis of shell structures and internal stresses under different loads, design and arrangement of reinforcement in these surfaces. Types of tanks; circular (elevated and ground) and rectangular tanks. Forces and methods of loading of these forces and the method of internal stresses and design of deep beams, and rebar detailing in sections and plans.

References:

- *Fanella, D. A. "RC Structures: Analysis and Design". McGraw-Hill Professional Publishing, 2010.*
- *Jack C. McCormac, Russell H. Brown. "Design of Reinforced Concrete". 2013.*
- *El-Behairy, S., "Reinforced Concrete Design Handbook", Fifth edition, Cairo, 2002.*

STE305	Steel Structures (1)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1st	Structural Analysis (2) STE202

Content :

Introduction – general layout for steel halls - Design methods of steel buildings (ASD - LRFD Methods) - type of loads – Design of trusses, tension members, compression members, beams (subjected to static and dynamic load), bolted connections, and welded connections.

References:

- *Alan Williams. "Steel Structures Design (ASD/LRFD)". USA: International Code Council, 2011.*
- *Liang, Q. Q. "Analysis and Design of Steel and Composite Structures". USA: Taylor & Francis, 2015.*
- *"Egyptian code of practice for steel construction and bridges (ASD)", Code No. ECP 205-2001, Edit 2009, Ministry of Housing, Utilities, & Urban Development.*

STE306	Steel Structures (2)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Steel Structures (1) STE305

Content :

Design of steel roofs for halls – Design of frames – Design of beams (subjected to static and dynamic loads) - Design of columns and beam-columns - Design of different types of foundations (roller, hinged, and fixed bases) – Design of rigid connections – Design of different bracings systems - Design of built-up sections - Workshop drawings

References:

- *Alan Williams. "Steel Structures Design (Asd/Lrfd)". USA: International Code Council, 2011.*
- *Liang, Qing Quan. "Analysis and Design of Steel and Composite Structures". USA: Taylor & Francis Group, 2015.*
- *"Egyptian code of practice for steel construction and bridges (ASD)", Code No. ECP 205-2001, Edit 2009, Ministry of Housing, Utilities, & Urban Development.*

STE307	Foundations (1)								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Engineering Geology and Soil Mechanics STE204

Content:

Foundations settlements -Types of foundations - bearing capacity of the soil - design of shallow foundations under vertical loads - methods of foundation design - design of different types of concrete footings (combined footing - strip footing – strap footings – footing subjected to eccentricity – raft foundations- design different types of retaining walls).

References:

- *Das, Braja M., "Principles of Foundation Engineering," 2010.*
- *"Egyptian Code for Soil Mechanics and Design and Execution of Foundations", 2002.*
- *Barnes, G. E. "Soil Mechanics: Principles and Practice". Macmillan Education UK, 2000*

STE308	Construction Project Management								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Projects Management ENG412 + Construction Economics STE206

Content:
Project planning, scheduling and resource management. Scheduling recurring projects: linear projects, scheduling written projects considering resources, short timelines for repetative projects, balance line and time sitemap. Time program pressure: the relationship between cost and cost of the activity and the relationship between cost and time of the project. Cash flow analysis and contract pricing: direct and indirect costs, project cash flow, pricing and price policy. Project monitoring: schedule update, analysis and earned value management.

References:
- *Hegazy, T., "Computer-Based Construction Project Management", 2002*
- *Paul Netscher, " Construction Project Management: Tips and Insights", Panet Publications, 2017.*

STE315	Specifications and Quantities								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	Reinforced Concrete (1) STE203

Content:
Calculate the quantities of the various items and counting methods. Explore concepts, methods, and procedures used to estimate construction. Study the principles and application of construction cost estimates. Initial cost estimation: unit method, space method, etc., adjusting initial costs for time, space and time factors, detailed costing of materials, equipment and workers, estimating business costs, building information modeling, estimating and costs from the point of view of the contractor or the owner's engineers. Estimate details with an emphasis on labor, materials and equipment, indirect cost estimation, margin estimation, business item pricing and assay composition and pricing policies.

References:
- *Datta, B.N., " Estimating and Costing in Civil Engineering: Theory & Practice Including Specifications and Valuation", Sangam Books Ltd, 27 revised edition, 2002.*

STE316	Contracts and Laws in Construction								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	0	Lab	0	Semester	2nd	Projects Management ENG412

Contents:
Contracts: a definition of contracts, how they are drafted, and the different types of contracts - the components of the contract and the points it must include - how to bid the bid - parties involved in construction work and the relationship between them - project delivery methods - contract documents

Laws: laws in construction, the law of tenders and auctions, disputes and methods for resolving them, arbitration, introduction and definition of the requirements of international law (FIDIC).

References:

- شامل هادي نجم العزاوي" ,التزامات المتعاقد في عقود التشييد ونقل الملكية :B.O.T دراسة مقارنة," المركز القومي للإصدارات القانونية – القاهرة مصر.
- *N. M. Fraser and E.M. Jewkes, "Engineering economics: Financial decision making for Engineers", 5th edition, Pearson, Toronto, Ontario, 2013.*
- *D.G. Newnan, J. Whittaker, T.G. Eschenbach and J.P. Lavelle, "Engineering economic Analysis", 3rd edition, Don mills, Toronto, Ontario, 2014.*

STE309	Studies in the Field of Structural Engineering							Prerequisite	
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	----

Content:

One or more topics in the specialization of Structural Engineering that are not covered by the other program courses and/or present recent or advanced development of interest to the structural engineers in the areas of building materials, solid mechanics, analysis and design of structures.

STE310	Design of Masonry Structures								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Building Construction Materials STE102 + Structural Analysis 2 STE202

Content:

Types and specifications of traditional bricks and reinforced bricks - types and specifications of the used mortar - factors affecting the bearing strength of bricks and mortar - relationship between strength of brick, mortar, and building strength - the design of the masonry walls under compression - the design of the masonry walls under the effect of horizontal forces - the design of the walls and columns in masonry structures - Design of roof slabs constructed from brick and reinforced bricks - Design of roofs constructed from bricks and their types.

References:

- *Egyptian code for design and construction of building walls, ECP 204, 2005.*

STE311	Sustainable Construction								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Concrete Technology STE205

Content:

Deals with Decision on impacts of environmental design and construction processes - discusses the concept of sustainable construction as a means of reducing these not revolted. To identify the principles of sustainable construction, which seeks to reduce the negative impacts on environmental buildings by enhancing efficiency and rationalizing the use of natural resources and energy. Environmental assessment of building materials, resource efficiency, recycling, energy strategies and sustainable water management, methods for assessing environmental sustainability of construction projects - dynamic systems for sustainability analysis.

References:

- *Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery, 4th Edition, wiley, ISBN: 978-1-119-05517-4, 2016.*

STE312	Inspection and Maintenance of Structures								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Concrete Technology STE205

Content:

Introduction - the causes of deterioration and maintenance needs - methodology and strategy of maintenance - symptoms, diagnosis and treatment - Assessment of resistance of concrete structures - repair: materials, methods, and strengthening - brick walls: inspection and repair.

References:

- *Bakhoum, M.M., and Juan A. Sobrino. "Case Studies of Rehabilitation, Repair, Retrofitting, and Strengthening of Structures". IABSE, 2010*

STE313	Quality Control and Confirmation in Structures								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Concrete Technology STE205

Content:

Definition of Quality control - Program and Plan Quality Assurance - Quality control internally and externally - the role of quality during the project life - stages of quality control - monitoring and quality control of concrete - tests on concrete during construction - Non-destructive tests - Load test of elements in concrete structures**.**

References:

- *Abdul Razzak Rumane. "Quality Management in Construction Projects ". CRC Press; 2 edition, 2017.*

STE404	Modern Construction Materials								Prerequisite
3 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	2nd	Concrete Technology STE205

Content:
Introduction to technological development of materials science, classification of modern construction materials, composite materials and their applications. Fibers, insulation, polymers and nanomaterial.

References:

- *P. P. Raj, "Building Construction Materials and Techniques". Pearson Education India, 2016.*
- *M L Gambhir, Neha Jamwal, " Building and Construction Materials: Testing and Quality Control, (Lab Manual Series)". McGraw Hill Education (India) Private Limited, ISBN: 1259029662, 2014.*

IHE302	Irrigation and Drainage Engineering								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Hydraulics IHE201

Content:
Introduction to Irrigation and Drainage Engineering - water relationship with soil - water needs - when irrigation is needed - agricultural cycle and shifts of irrigation - various irrigation areas systems in Egypt - irrigation methods - modern irrigation - sprinkler irrigation - drip irrigation - drainage - types of exchange - planning and design of Irrigation projects .

References:

- *Sturm, Terry W., "Open channel hydraulics", New York: McGraw-Hill, 2010.*

IHE303	Design of Water Structures								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Hydraulics IHE201

Content:
Design of some types of retaining walls – An introduction to bridge design - design of Siphons - design of Culverts - design of Estuaries end - different ways of lining irrigation streams.

References:

- *Austroads, "Waterway Design: A Guide to the Hydraulic Design of Bridges, Culverts and Floodways", 1994*

PWE201	Traffic Planning and Traffic Engineering								Prerequisite
2 Cr Compulsory	Lectures	1	Tutorials	2	Lab	0	Semester	2nd	Statistics and Probability Theory BAS115

Content:

Transportation and surveys planning - generating flight - flight distribution - allocation of traffic movement on the road network - the distribution of trips to transport modes - assessment of transportation alternatives - Introduction to Traffic Engineering - the characteristics of the flow of traffic - traffic volume, capacity and level of service - Studies parking facilities - Traffic lights.

References:

- *Roess, R. P., E. S. Prassas, and W. R. McShane., "Traffic Engineering", Fourth Edition, International Edition, Pearson, 2011.*
- *Ortuzar, J.D. and L.G. Willumsen., "Modelling Transport", Third Edition, Jon Wiley&Sons, Inc., 2011.*

PWE302	Topographic Surveying								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	1	Lab	1	Semester	1st/ 2nd	Plane Surveying PWE101

Content:

Horizontal curves and vertical curves - spaces and volumes - an introduction to error theory - an introduction to pictorial science - an introduction to remote sensing science - an introduction to global meteorology using satellites

Practical (Integrated Meteorological Station).

References:

- *Johnson, Aylmer. "Plane and Geodetic Surveying 2nd Edition". CRC Press, 2014.*
- *Bossler, and Moffit. "Surveying 10th Edition". 2004.*

PWE303	Maps and Geographic Information Systems								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Topographic Surveying PWE302

Content:

Maps - Metrics - GIS assets - GIS data: Point - line - polygon. Raster and vector data. Database structures: data types - continuous, ordinal and separate data. Incorporating different data and data types - overview.

References:

- *Johnson, Aylmer. "Plane and Geodetic Surveying 2nd Edition". CRC Press, 2014.*
- *Bossler, and Moffit. "Surveying 10th Edition". 2004.*

STE401	Graduation project (1)								Prerequisite
3 Cr Compulsory	Lectures	1	Tutorials	4	Lab	0	Semester	1st	120 Credit Hours

Content:

Students undertake a major project as part of the program. The aim of the project is to provide the students, who work in groups, with an opportunity to implement appropriate concepts and techniques to a particular design. Students are required to select and research the expected project to be designed and implemented in the following course Graduation Project-2. The student should give an oral presentation to be approved.

Reinforced Concrete – Structural Analysis – Steel Structures – Properties and Strength of Materials – Soil Mechanics and Foundations – Construction Project Management.

STE402	Graduation Project (2)								Prerequisite
3 Cr Compulsory	Lectures	1	Tutorials	4	Lab	0	Semester	2nd	Graduation Project (1) STE401

Content:

All students undertake a major project as part of the program. The aim of the project is to provide the students, who work in groups, with an opportunity to implement the appropriate concepts and techniques to a particular design. A dissertation on the project is submitted on which the student is examined orally.

Reinforced Concrete – Structural Analysis – Steel Structures – Properties and Strength of Materials – Soil Mechanics and Foundations – Construction Project Management.

STE403	Finite Element Method								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	2	Lab	0	Semester	1St	Numerical Analysis (Math. 5) BAS215 + Structural analysis (3) STE302

Content:

This course should cover the principles of the finite element method: generalized stress-generalized strain concept, principle of virtual displacement. The basic finite elements should be addressed, e.g., truss element, beam element, constant strain triangle, bilinear displacement rectangle, three dimensional solid element, etc. Basic problems such as plane stress, plane strain, plate element, axisymmetric problem and three-dimensional problems should be treated.

References:

- *Karnovsky, I. A., "Advanced Methods of Structural Analysis", 2010.*
- *Eugenio Oñate, " Structural Analysis with the Finite Element Method", springer 2009.*

STE420	Computer Applications in Structural Engineering								Prerequisite
3 Cr Elective	Lectures	3	Tutorials	2	Lab	0	Semester	1st/ 2nd	Finite Element Method STE403

Content:

The use of modern applications and programs in structural analysis and design, in which the analysis is carried out according to the finite element method, in solving problems and issues in the field of structural engineering, through some prefab programs such as (SAP - SAFE - ETABS - PERFORM 3D, Etc.)

References:

- *Karnovsky, I. A., "Advanced Methods of Structural Analysis", 2010.*

STE405	Foundations (2)								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1St	Foundations (1) STE307

Content:

Introduction to deep foundations - Types of piles and methods of construction - Load capacity of the pile vertically and horizontally - structural design of piles – Piles testing - Analysis of Pile Groups – settlements of Piles - design of Piles caps - Methods of solving flow problems in porous media - groundwater flow in soil and its impact on the foundations - dewatering, systems and methods of implementation - design of sheets and various shoring systems.

References:

- *Das, Braja M., "Principles of Foundation Engineering," 2010.*
- *"Egyptian Code for Soil Mechanics and Design and Execution of Foundations", 2002.*
- *Barnes, G. E. "Soil Mechanics: Principles and Practice". Macmillan Education UK, 2000*

STE406	Project Evaluation								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1St	Construction Project Management STE308

Content:

Methods of assessment of civil engineering projects - studying the causes of delaying and cost in construction projects and methods of treatment - delays analysis in the construction and identification of project responsibilities - occupational health and safety in sites, preparation of safety and security project plan, risk analysis and methods of response, planning construction sites to respond to the requirements of safety occupational health, identifying the elements of temporary services during construction - value engineering, functional analysis, the stages of the application of value engineering - sustainability projects construction and methods of evaluation of projects to achieve the requirements of sustainability - evaluation of multiple alternatives, hierarchical method of analysis - analysis and evaluation of results, dynamic systems, maps and statistical control.

References:

- *Knut Samset, " Project Evaluation: Making Investments Succeed", Fagbokforlaget, 2003.*

PWE401	Sanitary Engineering (1)								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	Hydraulics IHE201

Content :

Drinking water treatment and wastewater treatment plants: preliminary studies and specifications of drinking water - components of drinking water purification plants - design of purification plants, sedimentation, filtration and sterilization process - primary studies, wastewater characteristics and environmental protection requirements from pollution - components of sanitation projects - Design of primary and biological treatment units - sludge treatment and disposal.

References:

- *Metcalf & Eddy, " Wastewater Engineering (Treatment, Disposal& Reuse)", Forth Edition, Mc Graw-Hill Book Co., 2003.*

PWE402	Highway Engineering								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	1	Lab	0	Semester	1st	----

Content: Introduction - Visibility distance - Cross section elements - Horizontal road planning - Vertical planning of roads - Types of paving - Foundation layer properties - Properties of road construction materials: bitumen and aggregates - Volumetric properties and design of asphalt mixtures - Traffic loads - Structural design of paving.

References

- *Meyer, Michael D. "Transportation planning handbook", Wiley, 2016.*
- *Ceder, A., "Public Transit Planning and Operation: Theory, Modeling and Practice" Burlington, MA: Elsevier, 2007.*
- *Vuchic, Vukan R. "Urban transit systems and technology", John Wiley & Sons, 2007.*
- *Transit Capacity and Quality of Service Manual", 3rd Edition, Transportation Research Board, 2013.*

STE407	Reinforced Concrete (4)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Reinforced Concrete (3) STER304

Content:

Lateral loads, earthquake and wind; Lateral load resisting systems, analysis, design, and detailing. Prestressed concrete design; Reinforced concrete bridges, loads, types and systems, analysis, design, detailing, special considerations.

References:

- *Fanella, David A. "Reinforced Concrete Structures: Analysis and Design". McGraw-Hill Professional Publishing, 2010.*
- *Jack C. McCormac, Russell H. Brown. "Design of Reinforced Concrete". 2013.*
- *El-behairy, S., "Reinforced Concrete Design Handbook", Fifth edition, Cairo, 2002.*

STE408	Steel Structures (3)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Steel Structures (2) STE306

Content :

Introduction to different types of bridges (railway bridges – roadway bridges – pedestrian bridges) – Different statical systems for bridges (Plate girder bridge - Truss girder bridge - Arch bridge - Cable-stayed Bridge - Suspension bridge - Box girder bridges) – Loads on Bridges and Allowable Stresses - Design of bridge elements (Design of Floor Beams - Main Girder - Design of Stiffeners- different bearings types and splices) - Analysis and design of wind bracing system – Design of truss bridge - design of Box section Bridge

References:

- *Unsworth, John F. "Design and Construction of Modern Steel Railway Bridges". CRC Press, 2017.*
- *Lebet, Jean-Paul, Hirt, Manfred A. "Steel Bridges - Conceptual and Structural Design of Steel and Steel-Concrete Composite Bridges". Taylor & Francis, 2013.*
- *"Egyptian code of practice for steel construction and bridges (ASD)", Code No. ECP 205-2001, Edit 2009, Ministry of Housing, Utilities & Urban Development.*

STE409	Structural Dynamics								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Structural Analysis (3) STE302

Content:

Dynamic equilibrium; Equations of motion for SDOF systems; Analysis of free and forced vibration; Response to impulsive loading; Numerical evaluation of dynamic response; Generalized SDOF systems; Dynamic equations of motion for MDOF systems; Natural vibration properties of structures; Damping; Introduction to response spectra; Vibrations of bars and beams; Computer applications.

References:

- *Aggarwal P., Shrikhande, M., "Earthquake Resistant Design of Structures", Prentice Hall India Learning Private Limited; 1 edition, 2006.*
- *Anil K. Chopra, " Dynamics of structures", Prentice Hall, UUSA; 4th edition, 2012.*
- *Ray W. Clough, J. Penzien "Dynamics of structures", Computers & Structures, Inc, USA; 1st Ed., 2003.*

STE410	Analysis and Design of Tall Buildings								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Reinforced Concrete (2) STE303 + Steel Structures (2) STE306 + Structural Analysis (3) STE302

Content:

Deals with the structural aspects of high-rise buildings, analyzes the behavior of various forms of building structures including frames, shear walls, tubular, and outrigger systems. Considering design criteria, loads, and various structural systems. The dynamic response of structures exposed to strong winds and earthquakes. Approximate methods of analysis.

References:

- *Aggarwal P., Shrikhande, M., "Earthquake Resistant Design of Structures", Prentice Hall India Learning Private Limited; 1 edition, 2006.*
- *Anil K. Chopra, " Dynamics of structures", Prentice Hall, United States of America; 4th edition, 2012*
- *Ray W. Clough, J. Penzien "Dynamics of structures", Computers & Structures, Inc., USA; 1st Ed., 2003*

STE411	Shell Structures Design								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Reinforced Concrete 2 STE303 + Math. 3 BAS113 + Structural Analysis 3 STE302

Content:
Analysis of Fourier Series - Differential geometry of surfaces – Membrane theory for shells of revolution - Analysis and design of cylindrical shells, shells of revolution, elliptic parboiled shells, and hyperbolic shells - design of folded plates roofs.

References:

- *Maria Radwańska, Anna Stankiewicz, Adam Wosatko, Jerzy Pamin, " Plate and Shell Structures: Selected Analytical and Finite Element Solutions 1st Edition", Wiley, 2017.*

STE412	Prestressed Concrete								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Reinforced Concrete (2) STE303

Content:
Design of prestressed concrete structures – calculation of stresses, losses, and deflection - design for shear, splicing and development length - structural behavior and modes of failure of prestressed structures, design of prestressed concrete structures with large spans - selected topics.

References:

- *Antoine E. Naaman, "Prestressed Concrete Analysis and Design 3rd Edition", Techno Press 3000, 2012.*

STE413	Strut-and-Tie Modeling Method								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Reinforced Concrete (2) STE303 + Structural Analysis (3) STE302

Content:
The basic principles of the strut-and-tie model - Bernoulli and discontinuities regions – strengths of struts, ties, and nodes - applications for deep beams and deep beams with openings, prestressed concrete, and pile caps, etc.

References:

- *S. El-Metwally, W. Chen, " Structural Concrete: STMs for Unified Design", CRC, Taylor & francis, 2017.*

STE414	Composite Structural Elements Design								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Reinforced Concrete (1) STE203 + Steel Structures (2) STE306

Content:
Types of composite structural elements and their properties – Methods of design according to the specifications - Loads and types of composite beams; with shoring, without shoring, Design of shear connectors, Encased steel beams) - Composite columns concrete filled steel tube (CFST) and Encased steel section under axial load - Composite slab - Composite columns subjected to axial compression or tension and bending – Connections – Design of composite walls - fire resistance of composite structures - Detailing of composite structures.

References:

- *Alan Williams. "Steel Structures Design (ASD/LRFD)". USA: International Code Council, 2011.*
- *Liang, Q. Q. "Analysis and Design of Steel and Composite Structures". USA: Taylor & Francis, 2015.*
- *"Egyptian code of practice for steel construction and bridges (ASD)", ECP 205-2001, Edit 2009.*

STE415	Rehabilitation and Strengthening of Concrete Structures								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Reinforced Concrete(2) STE303
Content: Reasons for defects - Methods to avoid cracks in concrete - Evaluation of defects of structures - Materials used in the rehabilitation and protection of concrete structures - Methods for rehabilitation and reinforcement of various structural elements - Corrosion of structures and cathodic protection.									
References: ▪ *Bakhoum, M.M., and Juan A. Sobrino. "Case Studies of Rehabilitation, Repair, Retrofitting, and Strengthening of Structures". IABSE, 2010*									

STE416	Soil Excavated Retaining Systems								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Foundation (2) STE405
Prerequisite: Foundations (2) STE405									
Content: Soil pressure on flexible and propped walls – soil ties - the walls of Berlin – H-beam and H-pile walls - secant and contiguous pile walls – sheet pile walls - diaphragm walls – filed dams.									
References: ▪ *Klaas Jan Bakker, "Soil Retaining Structures 1st edition". CRC Press, 2000.*									

STE417	Management of Construction Information Systems								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Projects Management ENG412
Content: Introduction to information systems, information management systems, information technology in industry, classification of information systems, personal information systems to support planning and control and support decision - making process at the level of implementation and policy, information flow models, the impact of the exchange of electronic information, knowledge management, Developing an organization's information management system, choosing the appropriate system, applying to construction companies, making use of information technology, providing information, and case studies.									
References: ▪ *A. Galiano Garrigos, L. Mahdjoubi, C. A. Brebbia, R. Laing, "Building Information Systems in the Construction Industry". WIT Press, 2018.*									

STE418	Monitoring Construction Projects								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Construction Project Management STE308
Content: The basic principles of project planning and control - the project's dismantling structure and cost elements as a project control tool - project update - deviation of time and costs - methods used to plan, program, estimate and control costs in projects - delays analysis - earned value method - case studies, program applications used in monitoring the project.									
References: ▪ *Hegazy, T., "Computer-Based Construction Project Management", 2002* ▪ *Paul Netscher, " Construction Project Management: Tips and Insights", Panet Publications, 2017.* ▪ *Nigel J. Smith, "Engineering Project Management", 3rd Edition, Wiley-Blackwell, 2008*.									

STE419	Risk Management in Construction Projects								Prerequisite
2 Cr Compulsory	Lectures	2	Tutorials	0	Lab	0	Semester	1st	Construction Project Management STE308

Content:
Sources of uncertainty and risk in the construction, the need for projects to risk management, risk management steps, hazard identification, assessment and risk analysis, Firecracker qualitative and quantitative risk analysis, ways to reduce and transfer risk, control risk, the way Burt to analyze the project considering the risk, model Monte Carlo simulation , Decisions based on the study of risks, the role of different parties in dealing with risks, case studies, computer software applications for risk management.

References:

- *Nigel J. Smith, Tony Merna, Paul Jobling, " Managing Risk in Construction Projects, 3rd Edition", Wiley blackwell, 2014*

PWE403	Sanitary Engineering (2)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	PWE401

Content :
Sewage drinking water networks: Preliminary studies and behavior calculation - Types and design of different drinking water tanks - Systems, forms and design of different drinking water supply networks - Valve champers - Implementation and testing of drinking water networks. Preliminary studies and sources of wastewater and behavior accounting - systems, forms and design of sewage lines - manholes - lifting stations and sewage ejection lines - implementation and testing of sewage lines.

References:

- *Metcalf & Eddy, " Wastewater Engineering(Treatment, Disposal& Reuse)", Forth Edition, Mc Graw-Hill Book Co., 2003*

IHE401	Port Engineering								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Foundations (1) STE307

Content:
Introduction - natural phenomena and technical studies - tidal - wind - sea currents - the principles of marine survey - waves - refraction waves - port planning - Breakwater - internal navigation - design navigational channels - Guidance signs of navigation.

References:

- *Tsinker, Gregory P., ed. "Port engineering: planning, construction, maintenance, andsecurity", John Wiley & Sons, 2004*

ARC401	Architectural Design (3)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Architectural Design (2) ARC301

Content:

Methods for determining dealing with design problems - studying void spaces in terms of formation and function - studies assessing the environmental impact of openings on ventilation and natural lighting of buildings - construction materials and how to adapt design with its components and elements to the surrounding environment, habits and human characteristics - conducting research and field visits and applying them to architectural design projects .

References:

- *Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.*
- *Annie R Pearce. "Sustainable Buildings and Infrastruction", 2012.*
- *Mary Guszowski. "Towards Zero-energy Architecture New Solar Design", laurence king, 2010.*

ARC402	Architectural Design (4)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/2nd	Architectural Design (3) ARC401

Content:

Studying the external environmental effects with the architectural projects in terms of context, location, blocks and voids - the quality of the relationship between the external space and the forms of buildings with the urban character and the surrounding fabric - studying the importance of the structural idea in forming large architectural voids. Raising the efficiency of dealing with aspects that violate the process of designing multi-component projects and overlapping internal relations - an advanced study of strategic and environmental studies of green architectural projects.

References:

- *Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.*

ARC403	Architectural Construction (2)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	Architectural Construction, Technical and Sanitary Installation ARC101

Content:

The components of the building - theoretical and field study of construction materials and systems - types of foundations - thermal insulation of final roofs and exterior walls - an introduction to finishing work and equipment used in building finishing, with application to a limited space example - study of different methods of constructing buildings – skeleton buildings - frames - sliding slabs – prestressed concrete – folded plates – shell structures - steel constructions - trusses - details of constructing stairs .

References:

- *Neufert, E. "Architect's Data, Crosby Lockwood Staples", 5th edition, London, 2019.*
- *Francis D. K. Ching. "Architectural Graphics", Amazon Digital Services LLC, April 2015.*
- *Ernest R. Norling. "Perspective Made Easy (Dover Art Instruction)", 2012.*
- *Nikolas, Davies & Jokiniemi, Erkki. "Dictionary of Architecture and Building construction", 1st Edition. 2008.*
- *- Crosbie, Michael J. "Time Saver Standards for architectural design data", McGraw Hill book company, New York, 2009.*

ARC404	Theory of Architecture (2)								Prerequisite
3 Cr Elective	Lectures	2	Tutorials	2	Lab	0	Semester	1st/ 2nd	ARC103

Content:
An analytical study of factors affecting architectural design (economic, functional, social, human, psychological, and environmental) - Building materials technology - Study of architectural theories and design determinants of building elements - vertical distribution units and horizontal corridors - theories of residential buildings - Administrative buildings - commercial buildings - study the visual relationships of buildings and means of lighting and natural ventilation.

References:

- *Ching, Francis D.K. "Architecture: form, space and order", van nostrand reinhold company, 4ed, NY, 2014.*
- *Nikos A. Salingaros. "A Theory of Architecture", 2016.*