Faculty of Engineering
Mansoura University

Bachelor's Curriculum Plan Two
Terms Regulations

2021

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Introduction: Establishment of the Faculty

The Faculty of Engineering - Mansoura University is one of the pioneer Faculties of Engineering in the Delta region, Egypt and has gone through several stages until it has reached the status quo:

1. The Higher Industrial Institute was established in 1957 to graduate practical technicians for a four-year duration study.
2. The duration of the study has been extended to a five-years in 1959.
3. In 1961, the study in the institute was divided into two stages: the study duration of the first stage was three years, at the end of which the student obtains the Higher Industrial Institutes Diploma; the second stage lasts for two years, and the student can be enrolled provided that he excellently passes the first stage, in which case he/she is to be granted B.Sc. in Engineering after these five years of study.
4. In 1974, Republican Resolution No. (542) of the year 74 has been issued to transform the Higher Industrial Institute in Mansoura into a five-year Faculty of Engineering.
5. The faculty has achieved tremendous scientific development since 1974 up till the present day as its area has increased, its advanced laboratories have multiplied, and new study programs have been established to cope with the changing labor market requirements and, therefore, has ranked as a pioneer among the Faculties of Engineering in Egypt.

Part One

Article (1): Faculty Vision, Mission, and Objectives

Faculty Vision:

"Distinction, and leadership locally and regionally for attaining a universal status based upon the cooperation of its staff."

Faculty Mission:

"The Faculty of Engineering at Mansoura University graduates distinguished engineers capable of competing locally and regionally in scientific, research and ethical aspects and of solving the problems of society and developing its resources within the framework of adhering to the rules organizing society".

Strategic Objectives of the Faculty:

1. Enhancing the Faculty's capabilities to develop institutional performance and achieve excellence in all fields.
2. Supporting the quality assurance system and continuous improvement in light of national and international quality standards.
3. Qualifying the administrative system of the faculty to play its role in achieving the mission and objectives of the faculty with high efficiency.
4. Developing material and resources as well as the technological and infrastructures.
5. Improving the abilities of staff members and juniors.
6. Augmenting the students' skills and pursuing sustainable communication with graduates.
7. Supporting and boosting the teaching, learning and evaluation strategies.
8. Developing the scientific research system and scientific activities.
9. Promoting the regional and international competitiveness of the faculty.
10. Meeting the needs and satisfying the priorities of the surrounding community in addition to furthering environmental development.
11. Encouraging and supporting the community's participation in the faculty's activities.

Creation of the Regulation

The first regulation of the Faculty of Engineering at Mansoura University was prepared in 1974 and then amendments to this regulation were rolled out in 1979 - 1984 - 1997 - 2005. All previous regulations were based on the single-semester exam per year exception for the last two regulations, which are founded upon the two-semester system. This regulation is prepared according to the reference frame for the preparation of undergraduate engineering programs (2020) from the Supreme Council of Universities; the courses in any programs are divided into four categories: University requirements, Faculty requirements, Discipline requirements and Program requirements. This modified bylaw is a modification of

the bylaw 2019, in which the decision of the Minister of Higher Education was issued on December 24, 2019. However, the sector committee, in coordination with the faculty administration, decided to modify the regulation to agree with the Engineering Reference Framework 2020 and the National Academic Reference Standards (NARS-2018).

Article (2): Academic Departments at the Faculty

The Faculty of Engineering - Mansoura University consists of the following scientific departments:

1. Department of Mathematics and Engineering Physics
2. Department of Electrical Engineering
3. Department of Electronics and Communications Engineering
4. Department of Computers and Control Systems Engineering
5. Department of Mechanical Power Engineering
6. Department of Production Engineering and Mechanical Design
7. Department of Textile Engineering
8. Department of Structural Engineering
9. Department of Irrigation and Hydraulic Engineering
10. Department of Public Works Engineering
11. Department of Architecture Engineering

Article (3): Academic Degrees

At the request of the Faculty of Engineering, Mansoura University awards a B.Sc. degree in the following Programs:

A- Two-semester system:

1. B.Sc. in Electrical Power & Machines Engineering
2. B.Sc. in Electronics and Communications Engineering
3. B.Sc. in Computers and Control Systems Engineering
4. B.Sc. in Mechanical Power Engineering
5. B.Sc. in Production and Mechanical Design Engineering
6. B.Sc. in Textile Engineering
7. B.Sc. in Civil Engineering
8. B.Sc. in Architecture Engineering

B- Credit Hour systems:

9. B.Sc. in Biomedical Engineering
10. B.Sc. in Communications and Computers Engineering
11. B.Sc. in Mechatronics Engineering
12. B.Sc. in Building and Construction Engineering
13. B.Sc. in Infrastructure and Environment Engineering
14. B.Sc. in Chemical and Environment Engineering
15. B.Sc. in Renewable and Sustainable Energy Engineering
16. B.Sc. in SUSTAINABLE ARCHITECTURE Engineering
17. B.Sc. in Sustainable Water Engineering

18. B.Sc. in Structural Engineering Program
19. B.Sc. in Materials Engineering for Advanced Technology
20. B.Sc. in Artificial Intelligence Engineering

These Credit Hour programs have different bylaw.

Part Two: General Rules

Article (4): Admission Conditions and Requirements

1. The student's admission to the faculty is conditioned by obtaining a high school diploma or an equivalent certificate and admission is as determined by the Supreme Council of Universities.
2. The medical examination should prove that the student is free of infectious diseases and fit to follow up his/her studies at the faculty.
3. If the student, if hired by the government or any other body, must submit a certificate proving that he/she has obtained a license from the institution for which he/she is employed to study regularly.

Article (5): Transfer from outside the faculty

1. Transfer to and from the equivalent Faculties is permitted in accordance with the rules and regulations stipulated by the Faculty Council and approved by the University Council through the main Admission Office.
2. The student transferred from one of the faculties of engineering acknowledged by the Supreme Council of Universities to the Faculty may be exempted from some courses after their equivalence them with their counterpart at the faculty, provided that the courses studied at the faculty is not less than 60% of the total courses.

Article (6): Duration and System of the study

The duration of study at the faculty under the two-semester system is five years making a total of ten semesters each of which lasts for fifteen weeks and ends with its own independent exam, provided that the result of every academic year remains one unit. The study begins for all the students with the preparatory year and the specialization is thereafter according to what is contained in the course's schedules.

Article (7): The B.Sc. Degree Requirements

To obtain a B.Sc. Degree in one of the engineering specializations contained in **Article 3** of the regulation, the student must achieve the following:

1. He/she should study 250 contact hours according to the schedules of courses attached to this regulation.

2. He/she must pass the examinations for each course with a cumulative total is not less than 3750 degrees, equivalent to 50% of the total score which is 7,500 degrees.
3. He/she must successfully pass the graduation project by at least 60%.
4. He/she must successfully pass the human rights course, the German language course and societal issues and they are taught at a rate of two hours per week without adding their grades to the cumulative total.

Article (8): Courses

The tables attached to this regulation show the courses distributed over the two semesters for the years of study, the number of hours for lectures, the weekly exercises and practical lessons for each course, the time allotted for the exam, and the highest grades. The general features of the courses are as follows:

1. The number of courses per semester ranges from 4 to 6. The total score of the courses per semester is 750 degrees and the total score for all semesters is 7,500 degrees.
2. The contact hours for each course and the equivalent hours of the Student's Workload (SWL) are calculated with a view to being compared with international education systems.
3. The Student's Workload (SWL) hours represent the total hours he/she spends for the study (direct in the classrooms and indirect, whether at Faculty or at home).
4. The Faculty Council approves the scientific content of each course after being determined by the responsible departments Councils. The faculty has the right to partially modify the contents of the courses during the validity of the regulation provided that the scientific material of the course remains consistent with the course name and never deviate from the objective of the program.
5. All courses are independent and finished in the same semester.
6. The student's total score in any course is the total score of the written and oral exams and applied tasks, if any, in addition to the year's work degrees.
7. The grades of the written examination for some courses in this regulation may be reduced to a minimum of 40%.
8. The student is considered successful in the course if he/she achieves 50% of the total degree of the course.
9. The student is a failure if he/she achieves less than 40% of the total score of the final semester written exam even if the total score in the course is higher than the minimum success rate.
10. The student absents in the final semester written examination of the course is a failure and is entitled to retain the grades of the year's work in the event of his/her transfer to the higher level.

Article (9): Summer Training

1. Each scientific department council determines a system of practical training for the first-year students and field training for the second- and third-years students for at least three weeks annually inside or outside the faculty during the summer holiday and is carried out under the supervision of the staff members within the available potentials.
2. 50 degrees of the total grades of the first semester in the second year are to be allocated to the practical training of the first year and 50 degrees of the total grades of the first semester in the fourth year to the field training of the second and third years.

3. At the end of the field training, the student submits a report on the skills and knowledge he has acquired and presents it to a committee of examiners involving some industry men.
4. The faculty helps students find training opportunities in industry and creates incentives for companies and industrial institutions to provide training opportunities for students during their studies.
5. Second- and third-years students may be exempted from field training if they participate in field projects/international competitions under the supervision of the scientific department or in cooperation with one of the companies/specialized bodies provided that a report on the project be submitted to a committee of examiners comprising one of the project officials.
6. The graduation certificate is only granted and issued to students who have successfully completed the practical and field training referred to. Students who fail to perform training may be allowed to perform it in any summer vacation before graduation.

Article (10): Exam Dates

1. The transfer and B.Sc. examinations are held at the end of each semester in the courses studied by the student in his/her year and in the courses in which he failed in previous years, if any, according to the schedules attached to this regulation.
2. For the student to take examination in any of his year's courses, he/she must meet the attendance rate of at least 75% of the periods allocated to the course. The Faculty Council issues, at the request of the responsible departments councils, a decision to deprive the student of taking examination in the courses for which he/she has not attended the required 75% rate after issuing an absentee warning notice to the student. In this case, the student is considered to have failed in the courses the examinations of which he was deprived of taking.
3. If the student provides an excuse accepted by the Faculty Council, he/she is considered absent with an excuse, and if the student has attended one of the examinations during the period of issuing the decision to deny him/her access to the exam, the exam is considered as if it were not once the decision is issued.

Article (11): Graduation Project

1. Scientific trips are allocated to students of the third and fourth years at all departments under the supervision of staff members for visiting locations closely related to their studies and their graduation projects, in accordance with the system determined by the Faculty Council based on the recommendations of the concerned scientific departments.
2. Fourth-Year students should prepare the B.Sc. projects the topics of which are determined by the concerned departments councils. Preferably, the projects must be committed to the national and community interests and encourage innovation in a modern field within the scope of the department's majors.
3. The graduation project is collective and may be individual in some cases in accordance with the approval of the concerned scientific department. The project's grade is written on the B.Sc. Degree certificate. It can also be conducted jointly on an inter-departmental basis within the faculty.
4. The project is allocated an appropriate time span according to what is contained in the program. Work on the project extends for a period of not less than three weeks and not more than four weeks after the final written examination of the second semester of the final academic year to prepare the report and complete the required practical part.

Article (12): Retake Courses and the Second Exam Session for undergraduate

1. The student is transferred from the level he is enrolled for to a higher one if he/she succeeds in all courses or fails or is absent with an excuse in no more than two courses from all the courses of all the previous semesters.
2. A student who fails in one of the courses of humanities or technical languages, as well as the two courses referred to in the previous paragraph, can move to the higher level.
3. The student takes the exams of the courses in which he fails with the students of the level in which the courses are taught; in this case, his/her success is rated with a “Pass Grade” at a percentage that does not exceed the maximum of that “Pass Grade”.
4. If the assessment in one course includes a written exam and an oral or practical one, the student's grade in this course consists of the total grades of the written and oral or practical exam grades in addition to the year’s work of the previous year. The “absent” student in the written examination is considered “absent in the whole course” and is not assessed with any grade.
5. At the beginning of the first semester of every year, an exam is held for fourth year students who fail or are absent with or without an excuse for no more than two courses in addition to courses of the humanities and technical languages. The graduation project is an exception as the student who fails in it must make-up for it the following year.

Article (13): Grades System

The student attains one of the following grades in the final result of the courses and in the general grade according to the ratios he/she obtains from the highest grades:

Grade	Ratio
Excellent	85% and above
Very Good	75% to less than 85%
Good	65% to less than 75%
Pass	50% to less than 65%
Weak	40% to less than 50%
Very Weak	30% to less than 40%

The student’s cumulative grade on his/her graduation is evaluated by calculating the ratio of the total score obtained in the five years of study to the total of the highest grades in the five years.

Article (14): Specialization and Branching out Requirements.

Successful students in the preparatory year are distributed among the diverse programs at the faculty according to an internal admission guide governed by the student's desire and the maximum limit set by every program for the number of students sought to be eligible for admission. The Faculty Council annually ratifies the number of students for every program before announcing the result of the preparatory year.

Article (15): Rules of Clemency and Facilitation

1. It is not permissible to consider applying the rules of clemency on a student with a “Very Weak” grade or a student who has theoretically failed in more than two courses other than the humanities ones.
2. The rules of clemency are applied on the student if it led to a change in his/her condition from failure to transfer with courses or from transfer with two courses to that with one course or complete success. These rules are not applied for reducing the failure courses of the student whose condition does not change.
3. The rules of clemency are authorized by the approval of the Faculty Council annually.

Article (16): Code Course System

The course is linked to the scientific department that teaches it, regardless the majors of the students to whom the course is offered. The course code consists of two parts. The first part is the code of the scientific department as shown in the following table. The second part consists of three numbers, the first of which represents the year, the second is the number of the course's specialization, and the third the serial number of the course in the same year.

Serial	Department	Code
1	Mathematics and Engineering Physics	BAS
2	Electrical Engineering	ELE
3	Electronics and Communications Engineering	ECE
4	Computers and Control Systems Engineering	CSE
5	Mechanical Power Engineering	MPE
6	Production and Mechanical Design Engineering	PDE
7	Textile Engineering	TXE
8	Structural Engineering	STE
9	Irrigation and Hydraulic Engineering	IRH
10	Public Works Engineering	PWE
11	Architecture Engineering	ARE

Article (17): Language of study

The English language is the medium of instruction and examinations. It is permissible to teach some of the University-required courses in Arabic after the approval of the Faculty Council.

Article (18): Application of regulation

This regulation will be applied to the new students; in the academic year that follows the date of adoption of the regulation. Also, this regulation will be applied to students who

joined the faculty on the regulation 2019 and passed the preparatory year after clearing the academic courses and their approval by faculty council.

Article (19): General Topics

The Education and Students Affairs Committee will review all the topics that are not mentioned in the articles of this regulation to take the appropriate recommendation and submit it to the Faculty Council for approval before being submitted to the University Council. The articles of the University Regulation Law are applied on topics that are not included in this regulation.

Program Courses Distribution According to Reference Framework (2020) and NARS (2018)

Part Four: Program Courses Distribution According to Reference Framework (2020) and NARS (2018)

Faculty of engineering in Mansoura University offered number of undergraduate programs with Two Terms Regulations system. These programs are divided according to NARS 2018 into specialized programs as described in the table below.

List of Undergraduate Two Terms Regulations Programs Offered by Faculty of Engineering – Mansoura University.

Two Terms Regulations Engineering Programs	Specialized Programs	Electrical Engineering	▪ Electrical Power & Machines Engineering Program ▪ Electronics and Communications Engineering Program. ▪ Computers and Control Systems Engineering Program
		Mechanical Engineering	▪ Mechanical Power Engineering Program ▪ Production and Mechanical Design Engineering Program
		Textile Engineering	▪ Textile engineering program
		Civil Engineering	▪ Civil engineering program
		Architectural Engineering	▪ Architectural Engineering Program

List of Overall Data About the Programs.

#	Program Name	NC	Total Contact Hours					Requirements %				BS %	EC%
			Lec	Tut	Lab	TT	SWL	UR	FR	DR	PR		
1	Electrical Power & Machines Engineering	60	132	76	31	239	487	7.7	25	37.7	30	26.2	14.7
2	Electronics and Communications Engineering	59	133	76	33	242	482	7.8	24.7	37.7	30	25.6	15
3	Computers and Control Systems Engineering	60	134	67	45	246	486	7.6	24.7	37.3	30	25.1	15
4	Mechanical Power Engineering	60	132	74	33	239	491	7.7	25	36.4	30.7	25.4	16.3
5	Production and Mechanical Design Engineering	60	133	81	24	238	477	7.8	25.1	36.6	30.8	25.6	14.7
6	Textile Engineering	60	132	85	24	241	469	7.6	23.5	38.2	30.4	25.6	14.7
7	Civil Engineering	60	145	78	22	245	494	7.6	24.4	40	28	25.6	19.7
8	Architecture Engineering	58	108	124	11	243	483	7.6	23.3	39.1	29.8	21.3	13.5

University Requirements	UR	Total number of Courses	NC
Faculty Requirements	FR	Student Workload	SWL
Discipline Requirements	DR	Lectures	Lec
Program Requirements	PR	Tutorials	Tut
Basic Sciences Percentage	BS	Laboratory	Lab
Elective Courses Percentage	EC	Total	TT

Attributes of the Graduates of Engineering (NARS 2018)

The Engineering Graduate must:

1. Master a wide spectrum of engineering knowledge and specialized skills and can apply acquired knowledge using theories and abstract thinking in real life situations.
2. Apply analytic critical and systemic thinking to identify, diagnose and solve engineering problems with a wide range of complexity and variation.
3. Behave professionally and adhere to engineering ethics and standards.
4. Work in and lead a heterogeneous team of professionals from different engineering specialties and assume responsibility for own and team performance.
5. Recognize his/her role in promoting the engineering field and contribute in the development of the profession and the community;
6. Value the importance of the environment, both physical and natural, and work to promote sustainability principles.
7. Use techniques, skills, and modern engineering tools necessary for engineering practice.
8. 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.
9. Communicate effectively using different modes, tools and languages with various audiences; to deal with academic/professional challenges in a critical and creative manner.
10. Demonstrate leadership qualities, business administration and entrepreneurial skills.

Competencies for Engineering Graduates (Level A)

The engineering 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, economic, 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.

University Requirements

The University requirements courses are selected to build a graduate cultural personality develop his personal skills and be aware of community issues. It also focuses on identity and ethics.

List of University Requirements Courses

	Compulsory Courses									
Code	Course Title	Lec.	Tut.	Lab.	Contact hours	SWL	Marking			
							Semester work	Lab	Final Exam	total
MUR111	Technical English language	1	2	0	3	5	25	0	50	75
MUR112	Introduction to computer programming	1	0	2	3	5	20	10	70	100
MUR113	Introduction to engineering	2	0	0	2	4	15	0	35	50
MUR114	Communication and presentation skills	2	2	0	4	6	40	0	60	100
MUR115	Professional Ethics	2	0	0	2	3	15	0	35	50
MUR116	Human Rights	2								Pass/fail
MUR117	German language	2								Pass/fail
MUR118	Societal issues	2								Pass/fail
	Elective course 1	2	0	0	2	4	15	0	35	50
	Elective course 2	2	1	0	3	4	25	0	50	75
	Total	12	5	2	19		140	10	325	475
Elective course 1										
MUR221	Research and analysis skills									
MUR222	Decision-making and problem- solving skills									
MUR223	Entrepreneurship and marketing									
Elective course 2										
MUR231	Introduction to sustainable development									
MUR232	Energy, water and climate change issues									
MUR233	Environmental issues									
MUR234	Industry and Environment									
MUR235	Energy issues and environment									

Faculty Requirements

The faculty requirements courses must cover the minimum basic science, engineering culture and basic engineering in different disciplines.

List of Faculty Requirements Courses

Compulsory Courses										
Code	Course Title	Lec.	Tut.	Lab.	Contact hours	SWL	Marking			
							Semester Work	Lab/ Oral	Final Exam	Total
BAS011	Mathematics (1)	3	2	0	5	١٠	40	0	110	150
BAS021	Physics (1)	3	1	1	5	١٠	30	10/10	100	150
BAS012	Mechanics (1)	2	2	0	4	٨	35	0	90	125
BAS031	Engineering Chemistry	3	1	1	5	٨	30	20	100	150
BAS013	Mathematics (2)	3	2	0	5	٨	40	0	110	150
BAS022	Physics (2)	3	1	1	5	٨	30	10/10	100	150
BAS014	Mechanics (2)	2	2	0	4	٦	30	0	70	100
ENG115	Engineering drawing	1	3	0	4	١٠	50	0	100	150
ENG116	Production engineering	2	0	2	4	٧	20	10	70	100
ENG111	Technical reports writing	2	1	0	3	٥	30		70	100
ENG112	Training 1			2	2	٠	10	15	25 Discussion	50
ENG113	Training 2			2	2	٠	10	15	25 Discussion	50
	Elective courses	2	1	0	3	٥				100
	Total contact hours	30	21	9	60		420	80	1080	1600
Elective Courses										
ENG211	Operation research	2	1	0	3	5	30	0	70	100
ENG212	Quality control	2	1	0	3	5	30	0	70	100
ENG213	Contracts and Specifications	2	1	0	3	5	30	0	70	100
ENG214	Project management	2	1	0	3	5	30	0	70	100
ENG231	Electrical & Mechanical engineering	2	1	0	3	5	30	0	70	100
ENG232	Electrical & Electronic Engineering	2	1	0	3	5	30	0	70	100
ENG233	Engineering Thermodynamic	2	1	0	3	5	30	0	70	100
ENG234	Fluid Mechanic & Thermodynamics	2	1	0	3	5	30	0	70	100
ENG235	Thermal & Hydraulic Machines	2	1	0	3	5	30	0	70	100
ENG241	Civil Engineering	2	1	0	3	5	30	0	70	100
ENG242	Theories of structures	2	1	0	3	5	30	0	70	100
ENG243	Surveying	2	1	0	3	5	30	0	70	100
ENG244	Building Construction	2	1	0	3	5	25	0	50	75
ENG245	Specifications, Quantities & Quality control	2	1	0	3	5	30	0	70	100
ENG251	Operating systems	2	0	1	3	6	20	10	70	100
ENG252	Sensors	2	0	1	3	6	20	10	70	100
ENG221	Engineering economy	2	1	0	3	5	30	0	70	100

ENG222	Law & Economic Engineering	2	1	0	3	5	30	0	70	100
ENG233	Building Economies& Feasibility Studies	2	1	0	3	5	30	0	70	100
ENG234	Economics and Costs	2	1	0	3	5	30	0	70	100

Electrical Engineering Requirements

In addition to the Competencies for All Engineering Programs the BASIC ELECTRICAL Engineering graduate must be able to (Level B):

B1e. Select, model and analyze electrical power systems applicable to the specific discipline by applying the concepts of generation, transmission and distribution of electrical power systems.

B2e. Design, model and analyze an electrical/electronic/digital system or component for a specific application; and identify the tools required to optimize this design.

B3e. Design and implement elements, modules, sub-systems or systems in electrical/electronic/digital engineering using technological and professional tools.

B4e. Estimate and measure the performance of an electrical / electronic/digital system and circuit under specific input excitation and evaluate its suitability for a specific application.

B5e. Adopt suitable national and international standards and codes to design, build, operate, inspect and maintain electrical/electronic/digital equipment, systems and services.

The electrical engineering requirements courses must cover the competences of the basic electrical engineering (Level Be).

List of Basic Electrical Engineering Requirements Courses

Compulsory Courses										
Code	Course Title	Lec.	Tut.	Lab.	Contact hours	SWL	Marking			
							Semester Work	Lab/ Oral	Final Exam	total
BAS151	Engineering Mathematics (3)	3	2		5	10	40		110	150
BAS155	Engineering Mathematics (4)	3	2		5	10	40		110	150
BAS251	Engineering Mathematics (5)	3	2		5	10	40		110	150
ELE141	Electric circuits (1)	3	1	1	5	10	20	20	110	150
ELE241	Electric circuits (2)	3	1	1	5	10	20	20	110	150
ELE243	Electrical Measurements	2	1	1	4	8	35	15	100	150
ELE144	Power electronics (1)	3	2		5	10	50		100	150
ECE243	Electromagnetic Fields	3	2		5	10	40		110	150
ECE24٢	Electronic circuits (1)	2	1	1	4	8	40	10	100	150
ECE142	Signals and systems	3	2		5	10	50		100	150
ECE241	Analog Communication systems	3	2		5	10	50		100	150
CSE142	Automatic control systems	3	1	1	5	10	50		100	150
CSE143	Logic and digital systems	2	1	1	4	8	35	25	90	150
CSE343	Embedded system	2	1	2	5	10	30	20	100	150
CSE141	Programming languages	2	1	2	5	10	30	20	100	150
Elective courses										
Elective course 1										
ELE142	Electric materials	3	1	1	5	10	20	15	90	125
ECE141	Solid state and electronic devices	3	2	0	5	10	40	10	100	150
CSE 241	Data structure and algorithms	3	1	1	5	10	20	15	90	125
Elective course 2										
ELE222	D.C Machines and Transformers	3	2	0	5	10	30	20	100	150
ELE247	Electric Power and machine Systems	10	5	0	2	3	50	0	100	150
CSE 242	Intro. to Computer Networks	3	1	1	5	10	30	20	100	150
Elective course 3										
ECE311	Electronic Circuits (2)	3	1	1	5	8	40	10	100	150
ELE342	Power system transmission	3	2	0	5	10	20	15	90	125
CSE 342	Artificial intelligence	3	1	1	5	10	20	15	90	125
Elective course 4										
ELE221	Power electronics (2)	3	1	1	5	10	20	15	90	125
CSE341	Microprocessors design & architecture	3	1	1	5	10	20	15	90	125

Mechanical Engineering Requirements

In addition to the Competencies for All Engineering Programs the BASIC MECHANICAL Engineering graduate must be able to:

B1m. Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of: Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.

B2m. Plan, manage and carry out designs of mechanical systems and machine elements using appropriate materials both traditional means and computer-aided tools and software contemporary to the mechanical engineering field.

B3m. Select conventional mechanical equipment according to the required performance.

B4m. Adopt suitable national and international standards and codes; and integrate legal, economic and financial aspects to: design, build, operate, inspect and maintain mechanical equipment and systems.

The Mechanical engineering requirements courses must cover the competences of the basic mechanical engineering (Level Bm).

List of Mechanical Engineering Requirements Courses

Compulsory Courses										
Code	Course Title	Lec.	Tut.	Lab.	Contact Hours	SWL	Marking			
							Semester Work	Lab/ Oral	Final Exam	Total
BAS151	Engineering Mathematics (3)	3	2		5	10	40		110	150
BAS 152	Applied mechanics	2	2		4	8	35		90	125
BAS155	Engineering Mathematics (4)	3	2		5	10	40		110	150
BAS252	Numerical methods and statistics	3	2		5	10	40		110	150
MPE 141	Thermodynamics 1	3	1	1	5	10	25	20	80	125
MPE 144	Fluid Mechanics 1	3	1	1	5	8	25	20	80	125
MPE242	Measurements and measuring devices	3	1	1	5	10	40	20	90	150
MPE245	Heat transfer (1)	3	1	1	5	10	30	20	100	150
MPE 145	Computer-aided mechanical drawing	1	0	3	4	8	40	10	75	125
PDE142	Mechanical engineering drawing	1	4	0	5	10	35	0	90	125
PDE143	Materials strength &stress analysis	3	2		5	10	35		90	125
PDE146	Production and material engineering	3	2		5	8	35		90	125
PDE243	Theory of machine (1)	3	2		5	8	35		90	125
PDE241	Machine design (1)	3	2		5	10	35		90	125
CSE 253	Automatic control system	2	1		3	6	30		70	100
Elective Courses										
Elective Course 1										
PDE311	Theory of machine (2)	3	2	0	5	10	35	0	90	125
PDE246	Advanced mechanical systems	3	2	0	5	8	35	0	90	125
Elective Course 2										
CSE341	Microprocessors Design and Architecture	3	1	1	5	8	40	20	90	150
PDE421	Computer Numerical Control Machines	2	3	0	5	10	40	0	110	150
Elective Course 3										
MPE322	Modelling & Simulation of dynamic systems	3	2	0	5	10	35	15	90	150
PDE342	Computer Aided Design/ Computer Aided Manufacturing	3	2	0	5	10	50	0	100	150
Elective Course 4										
PDE215	Machine design (2)	3	2	0	5	10	50	0	100	150
ELE342	Power &electrical machines	3	2	0	5	10	50	0	100	150

Textile Engineering Requirements

In addition to the Competencies for All Engineering Programs the BASIC TEXTILE Engineering graduate and similar programs must be able to:

B1t. Design and operate different processing systems in the textile industries and assess the balance of cost, quality and effects on the environment in production operations.
B2t. Analyze, design and evaluate textile products by applying essential theories, principles, methods and different production technologies in textile manufacturing.
B3t. Engage in the recent technological developments and emerging fields relevant to textile engineering to design textile products, processes and systems.
B4t. Manage resources, plan textile mills and implement quality assurance activities in textile engineering.

The Textile engineering requirements courses must cover the competences of the basic Textile engineering (Level B).

List of Basic Textile Engineering Requirements Courses

Code	Course Title	Lec.	Tut.	Lab.	Contact Hours	SWL	Marking			
							Semester Work	Lab/ Oral	Final Exam	Total
	Compulsory Courses									
BAS151	Mathematics (3)	3	2	-	5	8	40		110	150
BAS155	Mathematics (4)	3	2	-	5	8	40		110	150
BAS152	Applied Mechanics	2	2	-	4	8	35		90	125
TXE 131	Textile Materials	2	1	1	4	8	30	20	100	150
TXE 133	Textile Physics 1	2	1	1	4	8	30	20	100	150
TXE 253	Computer Programming	2		2	4	8	25	20	80	125
TXE 132	Textile Chemistry	2	1	1	4	8	30	20	100	150
TXE 211	Cotton Yarn Manufacturing 1	4	2		6	10	45	20	110	175
TXE 222	Weaving Technology 1	4	2		6	10	30	20	100	150
TXE 221	Fabric structures	2	2	1	5	10	30	20	100	150
TXE 231	Textile Physics 2	2	1	1	4	8	30	20	100	150
TXE 223	Weaving preparations	3	2		5	8	30	20	100	150
TXE 351	Engineering Measurements	2	1	1	4	8	20	10	70	100
TXE 353	Applied Statistics	2	2		4	8	30		70	100
TXE 451	Quality Control in textile	3	1		4	8	20	15	90	125
TXE 432	Textile finishing	2	0	1	3	6	20	20	60	100
PDE 153	Strength of Materials	2	2		4	8	30		70	100
PDE 152	Machine Drawing	1	3		4	9	50		100	150
PDE 251	Machine Design	2	3		5	10	30	20	100	150
PDE 252	Theory of Machines	2	2		4	8	30		70	100
MPE 156	Heat Transfer& Conditioning	2	1		3	5	30		70	100
CSE354	Automatic Control	2	1		3	6	30	10	60	100
	Total	51	34	9	94		2900	1960	255	685

Civil Engineering Requirements

In addition to the above Competencies for All Engineering Programs the BASIC CIVIL Engineering graduate must be able to:

B1c. Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; 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.

B2c.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.

B3c.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.

B4c. Deal with biddings, contracts and financial issues including project insurance and guarantees.

The Civil engineering requirements courses must cover the competences of the basic Civil engineering (Level B).

List of Basic Civil Engineering Requirements Courses

Compulsory Courses										
Code	Course Title	Lec.	Tut.	Lab.	Contact Hours	SWL	Semester Work	Lab/ Oral	Final Exam	Total
BAS184	Engineering Mathematics 3	3	2	-	5	10	40	0	110	150
BAS 183	Statistical applications in civil engineering	3	2	-	5	10	50	0	100	150
STE111	Theory of Structures (1)	3	2	-	5	10	40	10	100	150
STE112	Theory of Structures (2)	2	1	-	3	6	20	10	70	100
STE211	Theory of Structures (3)	2	1	-	3	6	30	10	60	100
STE212	Theory of Structures (4)	3	2	-	5	10	50	10	90	150
STE121	Properties& testing of materials	2	0	1	3	6	10	20	70	100
STE123	Concrete materials	2	0	1	3	6	10	20	70	100
STE221	Concrete technology	4	1	1	6	12	35	20	120	175
STE231	Reinforced concrete (1)	3	2	-	5	10	50	10	90	150
STE331	Reinforced concrete (2)	4	2	-	6	12	50	25	100	175
STE341	Steel constructions (1)	4	2	-	6	12	60	20	120	200
STE315	Construction project management	2	2	-	4	8	45	0	80	125
PWE 112	Plane Survey	4	1	2	7	14	40	40	120	200
PWE 211	Topographic surveying & Geodesy	4	1	2	7	14	40	40	120	200
PWE 221	Geology & Soil mechanics	2	1	-	3	6	20	10	70	100
PWE 231	Transportation and traffic Engineering	2	1	-	3	6	20	0	80	100
IRH 111	Civil Engineering Drawing	2	2	1	5	10	50	0	100	150
IRH 121	Hydraulics 1	2	2	1	5	10	30	30	90	150
IRH 221	Hydrology	2	1	-	3	6	20	20	60	100
IRH 211	Irrigation and drainage engineering	2	2	-	4	8	30	10	60	100
IRH 311	Design of water structures 1	2	2	-	4	8	30	0	70	100
	Total	59	32	9	100					

Architectural Engineering Requirements

In addition to the Competencies for All Engineering Programs the BASIC ARCHITECTURAL Engineering graduate must be able to:

B1a. Create architectural, urban and planning designs that satisfy both aesthetic and technical requirements, using adequate knowledge of: history and theory, related fine arts, local culture and heritage, technologies and human sciences.

B2a. 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.

B3a..Generate ecologically responsible, environmental conservation and rehabilitation designs; through understanding of: structural design, construction, technology and engineering problems associated with building designs.

B4a. Transform design concepts into buildings and integrate plans into overall planning within the constraints of: project financing, project management, cost control and methods of project delivery; while having adequate knowledge of industries, organizations, regulations and procedures involved.

B5a. Prepare design project briefs and documents and understand the context of the architect in the construction industry, including the architect's role in the processes of bidding, procurement of architectural services and building production.

The Architectural engineering requirements courses must cover the competences of the basic Architectural engineering (Level Ba).

List of Basic Architectural Engineering Requirements Courses

Compulsory Courses										
Code	Course Title	Lec.	Tut.	Lab.	Contact Hours	SWL	Marking			
							Semester Work	Lab/ Oral	Final Exam	Total
BAS141	Applied Statistics	3	2	0	5	10	50	0	100	150
ARE121	Building Construction (1)	2	4	0	6	12	90	10	50	150
ARE142	History and theories of Architecture (1)	2	0	0	2	4	30	0	70	100
ARE144	Architecture Principles& Drawing techniques	2	2	0	4	8	60	20	70	150
ARE122	Building Construction (2)	2	4	0	6	12	90	10	50	150
STE146	Properties and techniques of building materials (1)	3	0	0	3	6	35	0	90	125
ARE112	Visual Design	1	4	0	5	10	90	10	50	150
ARE221	Building Construction (3)	2	4	0	6	12	90	10	50	150
ARE241	Computer Applications in Architecture (1)	1	2	0	3	6	30	10	60	100
ARE242	History and theories of Architecture (2)	2	0	0	2	4	30	0	70	100
ARE244	Environmental Control	2	2	0	4	8	30	10	60	100
ARE231	Theories of Town Planning	2	0	0	2	4	30	0	70	100
ARE222	Building Construction (4)	2	4	0	6	12	90	10	50	150
ARE245	Computer Applications in Architecture (2)	1	2	0	3	6	40	10	75	125
STE246	Foundation & Concrete Structures	3	2	0	5	10	40	10	75	125
ARE321	Working drawing (1)	1	4	0	5	10	90	10	50	150
ARE331	Urban Planning (1)	1	3	0	4	8	75	10	40	125
STE341	Steel structure	2	2	0	4	8	40	0	60	100
ARE322	Working drawing (2)	1	5	0	6	12	90	10	75	175
ARE332	Housing	2	2	0	4	8	40	10	100	150
ARE343	Technical supply	1	2	0	3	6	50	0	75	125
ARE432	Regional Planning	2	4	0	6	12	90	10	50	150
ARE444	Environmental Impact of engineering projects	2	1	0	3	4	30	0	70	100
	Total contact H.	42	55	0	97					

Preparatory Year

Preparatory Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical /Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS011	Mathematics (1)	3	2	0	5	10	3	40	0	110	150			5		0		
BAS021	Physics (1)	3	1	1	5	10	3	30	20	100	150			4		1		
BAS012	Mechanics (1)	2	2	0	4	10	2	35	0	90	125			3		1		
BAS031	Engineering Chemistry	3	1	1	5	10	3	30	20	100	150			3		2		
MUR111	Technical English language	1	2	0	3	5	2	30	0	70	100	3						
MUR113	Introduction to Engineering	2	0	0	2	5		25	0	50	75	2	0	0	0	0	0	0
Total		14	8	2	24	50		165	40	545	750	5	0	15	0	4	0	0

Preparatory Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical /Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS013	Mathematics (2)	3	2	0	5	10	3	40	0	110	150			5		0		
BAS022	Physics (2)	3	1	1	5	10	3	30	20	100	150			4		1		
BAS014	Mechanics (2)	2	2	0	4	7	2	30	0	70	100			3		1		
ENG115	Engineering drawing	1	3	0	4	10	4	50	0	100	150				1	3		
ENG116	Production engineering	2	0	2	4	7	2	20	10	70	100				2	2		
MUR112	Introduction to computer programming	1	0	2	3	6	2	20	10	70	100					3		
Total		12	8	5	25	50		185	40	525	750	0	0	12	3	10	0	

Summary of Courses Specification

Preparatory Year-first Semester

Course title	Engineering (1)				Course Code	BAS011
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		2	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	0	0	40	110		

Differential Calculus (Differentiation)

Transcendental functions – Inverse function of transcendental functions –Derivative of transcendental functions – Leibniz's rule –L'hopital's rule – Mean value theorem – Taylor and Maclaurin series –Functions of several variables – Partial derivatives – Applications of partial derivatives.

Algebra

Binomial theorem – Partial fractions – Mathematical induction – Theory of equations –Matrices and determinants –System of linear algebraic equations (Gauss methods)– Applications of system of linear algebraic equations – Eigenvalues and Eigenvectors – Vector space.

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.***

Course title	Physics (1)				Course Code	BAS021
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		1	1		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	10	30	100		

Mechanical Properties of matter:

Units and dimensional analysis - Mechanical Properties of metals - Oscillations- The waves and superposition principle -The Sound Waves – Doppler effect.

Heat and thermodynamics:

Temperature and thermometers – Quantity of heat - Thermal expansion- Heat Transfer- The first law of thermodynamics- the entropy and the second law of thermodynamics.

Experiments: Determine the Young's modulus of materials. - Determine the gravity of acceleration by using the simple pendulum. - Determine the spring constant and the verification of Hook's law. - Determine the speed of sound by using open air column and tuning forks.

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.***

Course title	Mechanics (1)				Course Code	BAS012
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	0	0	35	90		

Statics: Force vectors in three dimensions - Equilibrium of a particle in three dimension – System of forces and moments – Moment of a force about point and line - Moment of a couple – Equivalent systems of forces and couples – Reduction of systems of forces and couples - Equilibrium of Rigid body in two dimension - Equilibrium of Rigid body in three dimension - Center of gravity and centroid– Frames and Machines: Analysis of frames – Dismembering connected parts of the frame - Analysis of Machines.

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.***

Course title	Engineering Chemistry				Course Code	BAS031
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	10	30	100		

Equations of state-chemical thermodynamics - kinetics of chemical reactions - Material and energy balance in fuel combustion and chemical processes - properties of solutions - Dynamic equilibrium in physical and chemical processes - Basic principles in electrochemistry - Introduction to corrosion engineering - Industry and chemistry of cement - Chemical fertilizers - Dyes and dyeing industry.

Experiments:

1-Oxidation-Reduction Titration (Redox Reaction).

2- Acid Base Titration.

3- Precipitation titration.

4-Measure Henery's law constant for oxygen in water in contact with air.

5-Study the effect of addition of moderate amounts of acid or base to water with buffer and without buffer.

6-Measuring the pH of a solution.

7-Instrumental methods of analysis of water and wastewater.

8-Determination of iron oxide in cement.

9- Determine the concentration of phosphorus and phosphate in wastewater effluents

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).***
- ***http://www.chemweb.com***

Course title	Technical English language				Course Code	MUR111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
			30	70		

Technology in use - Materials technology – Components and assemblies - Engineering design – Breaking point (types of technical problems, Assessing faults, repairs and maintenance) – Technical development (technical requirements, improvements and redesigns) – Procedures and precautions (health and safety precautions, importance of precautions) – Monitoring and control (automated systems and measurable parameters) – Theory and practice (tests and experiments, results and expectations, causes and effects) – Pushing the boundaries (Performance and suitability – capabilities and limitation).

References:

Mark Ibbotson, Cambridge English for Engineering *Student's book* free, ***Cambridge press 2011***

Course title	**Introduction to Engineering**				**Course Code**	MUR113
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	2
	2	0	0			
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grads**	75
			25	50		

An introduction to environmental science:

The struggle between man and environment and the effects of this struggle on human-Environmental quality and development - the technological basis of solid waste handling and disposal Economical aspects of environmental abatement. Environmental protection - Environmental impact assessment (EIA) for development projects.

An introduction to Engineering

International specifications of engineering profession - Engineering specializations - Ethics of engineering profession- Basic concepts of private business culture.

References:

Rashed, I.G, "Struggle between man and environment"

Preparatory Year-Second Semester

Course title	Mathematics (2)				Course Code	BAS013
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	0	0	40	110		

Integral Calculus (Integration)

Integration techniques – Reduction formula – Definite integral and its properties – Improper integral – Applications of integration (area, volume, and arc length) – First order ordinary differential equations (separable, homogeneous, exact, linear and Bernoulli) and their applications– Infinite series.

Analytic Geometry

Two-variable quadratic equations – Conic sections (circle, parabola, ellipse and hyperbola) – Parametric equations of conic sections –Coordinates systems in plane and space – Line and plane in space – Quadratic surfaces (cylinder, sphere, ellipsoid, hyperboloid, cone and paraboloid).

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.***

Course title	Physics (2)				Course Code	BAS022
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	10	30	100		

Electricity and Magnetism:

The Charge and matter - The electric field – Coulomb's law- The electric flux Gauss's law - The electric Potential - the capacitors and dielectrics- The magnetic field -Boit- Savart's law- The magnetic flux Gauss's Law – Faraday's Law- Magnetic Induction.

Optics and atomic physics:

Nature of light -Interference - Diffraction - Polarization - Early quantum theory - Special Relativity.

Experiments: Determine the value of unknown resistance by using metric bridge. - Verification of Ohm's law. Determine the refractive index of the prism's material. - Verification of Malus' law.

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.***

Course title	Mechanics (2)				Course Code	BAS014
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

Statics: Distributed forces– Fluid statics: Hydrostatic forces – Horizontal, Vertical and Inclined flat plate, curved plate of constant width –Trusses: Internal and external redundancy, Assumptions of design, Method of joints and Methods of sections. – Friction: Types of friction, Theory of dry friction – Static friction and Impending motion – Kinetic friction – Types of problems involving dry friction – Wedges – Power screws.

Dynamics: Introduction to dynamics – Kinematics of a particle: curvilinear Motion – Rectangular components – Motion of projectiles – Normal and Tangential components – cylindrical components.

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.***

Course title	Engineering Drawing				Course Code	ENG115
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	1	3	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	0	0	50	100		

Introduction to Engineering Drawing – Visualization - Free Hand Sketching - Instrumental Drawing - Geometric Constructions - Representation by Plane Images - Representation by Stereographic Images – Dimensioning - Intersections of Engineering Solids and Developments. Intersections of Engineering Solids and Developments - Drive the Missing Views - Sectional Views - Steel Structures - Introduction to Computer Aided Design Programs.

References:

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

Course title	Production Engineering				Course Code	ENG116
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	0	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	10	20	70		

Introducing of engineering materials (Ferrous, Nonferrous, iron and steel production furnaces Cast). Introduction to technological processes: Casting processes - Forming processes (forging, rolling, extrusion, drawing and bending), and welding, cutting processes (turning, planning, milling, drilling and grinding)- Measuring tools, production quality and Industrial safety.

Experiments: Training in workshops (plumbing - blacksmithing - the refrigerator - operating - profile - carpentry)

References:

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

Course title	Introduction to Computer Programming				Course Code	MUR112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	0	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
		10	20	70		

Introduction to Computer and Programming - operating systems, compiler, interpreter, editor, application Programming languages - machine language, assembly, high level - Basic concepts of flow chart and algorithm

Network and Internet and Web Programming: Experimental 1 Building a small network

Problem Solving - Fundamentals of VB.net Programming Language & Input/Output- Basic VB.net operators : Experimental 2 Building a small program

Simple application

Control Statements: Experimental 3 Building a small program based on control Statements

Do Loops Statements: Experimental 4 Building a small program based on control Statements - Complex applications

References:

- ***Peter Van Roy, Seif Haridi, "Concepts, Techniques, and Models of Computer Programming" The MIT Press (February 20, 2012)***

Electrical Power & Machines Engineering Program

Electrical Power & Machines Engineering Program

Program Description

Electrical power and machines engineering discipline is that main branch of electrical engineering which concerns with generation, transmission, distribution, utilization, and control of electric energy.

Program LO (specialized)

In addition to the competencies for all engineering programs (Level A) and the competencies for the BASIC **Electirical** engineering discipline (Level B), the **Electrical Power & Machines Engineering Program** graduate must be able to (Level C):

C1. Identify and formulate engineering problems to solve problems in the field of electrical power and machines engineering.
C2. Analyze design problems and interpret numerical data and test and examine components, equipment and systems of electrical power and machines.
C3. Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
C4. Analyze the performance of electric power generation, control and distribution systems

Required Courses

In order to get a Bachelor of science Degree in this program, and to satisfy the program LO, the following set of courses need to be completed.

List of Electrical Power & Machines Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requirements
	Faculty of Engineering Requirements
	Electrical Engineering Requirements
ELE231	Computer Applications in Electrical Engineering
ELE211	Power Generation Systems
ELE232	Electrical Lab. (1)
ELE321	Induction & Synchronous Machines
ELE311	High Voltage
ELE312	Power System Analysis
ELE322	Special Machines
ELE313	Protective Devices and Switchgear
ELE411	Power System Distribution
ELE421	Machines Design & Analysis
ELE412	Power System Protection
ELE413	Power System control
ELE422	Electrical Machine Control
ELE432	Electrical Lab. (2)
ELE433	Electric Energy Utilization
ELE431	Graduation Project 1
ELE434	Graduation Project 2

-	Elective course 1
-	Elective course 2
-	Elective course 3
	Total contact H.

Elective Courses	
Code	**Elective Course (1)**
ELE314	Smart Grids
ELE331	Water Desalinations
ELE323	Electric Vehicles
ELE315	Design of Low and Medium Voltage Networks
Elective Course (2)	
ELE414	Power Electronic Applications in Transmission Systems
ELE435	Energy Storage Technologies
ELE423	Computer Aided DC machines Design
ELE415	Transient Phenomena in Power Systems
Elective Course (3)	
ELE416	Artificial intelligence applications in electric power systems
ELE436	Energy Conservation and Management
ELE424	Electric Traction
ELE417	Electrical Power Systems Planning

Distribution of Program Courses on the Semesters:

In addition to the courses of preparatory year, the students of Electrical Power & Machines Engineering Program should study the following courses:

First Year- First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS151	Engineering Math (3)	3	2		5	10	3	40		110	150			5				
ELE141	Electric Circuits (1)	3	1	1	5	10	3	20	20	110	150			3		2		
ELE142	Electric Materials	3	1	1	5	10	3	20	15	90	125			3		2		
ECE242	Electronics Circuits (1)	2	1	1	4	8	3	40	10	100	150			2		2		
MUR235	Energy Issues & Environment	2	1		3	5	2	25		50	75	3						
ENG234	Fluid Mechanic & Thermodynamics	2	1		3	5	2	30		70	100				3			
Total		15	7	3	25	49	16	175	45	530	750	3	0	13	3	6	0	0

First year-Second Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS155	Engineering Mathematics (4)	3	2		5	10	3	40		110	150			5				
ELE144	Power Electronics (1)	3	2		5	10	3	50	0	100	150			4		1		
ELE241	Electric Circuits (2)	3	1	1	5	10	3	20	20	110	150			3		2		
CSE 141	Programming Languages	2	1	2	5	10	3	30	20	100	150					5		
MUR221	Research and analysis skills	2	0	0	2	4	2	15		35	50	2						
ENG231	Project Management	2	1		3	5	2	30	0	70	100	0	3					
Total		15	7	3	25	49	16	185	40	525	750	2	3	12	0	8	0	0

Second year – First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS251	Engineering Math. (5)	3	2		5	10	3	40		110	150			5				
CSE143	Logic and Digital circuits	2	1	1	4	8	3	30	20	100	150					4		
ELE231	Computer Applications in Electrical Engineering	2	0	2	4	10	2	35	20	70	125						4	
MUR115	Professional Ethics	2	0	0	2	4	2	15	0	35	50	2	0					
ELE 221	Power Electronics (2)	3	1	1	5	10	3	20	15	90	125					3	2	
ENG 235	Thermal & Hydraulic Machines	2	1	0	3	5	3	30		70	100				3			
ENG112	Summer Training (1)				2		0	10	15	25	50							2
Total		14	5	4	23	47	16	195	60	495	750	2	0	5	3	7	6	2

Second Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE211	Power Generation Systems	2	1		3	8	3	20	10	70	100					2	1	
ELE243	Electrical Measurements	2	1	1	4	8	3	35	15	100	150			2		2	0	
ELE222	DC Machines& Transformers	3	2	0	5	10	3	30	20	100	150					2	3	
ELE232	Electrical Lab. (1)			3	3	6	3	50	50	-	100					2	1	
ECE243	Electromagnetic fields	3	2	0	5	10	3	40	0	110	150			3		2		
ENG111	Technical reports Writing	2	1		3	5	2	30		70	100	3						
Total		12	7	4	23	47	17	205	95	450	750	3	0	5	0	10	5	0

Third Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE321	Induction & Synchronous Machines	2	1	0	3	8	3	20	10	70	100						3	
ECE142	Signals and Systems	3	2		5	10	3	50	0	100	150				2	3	0	
ELE342	Power System Transmission	3	2		5	10	3	20	15	90	125						5	
CSE142	Automatic Control Systems (1)	3	1	1	5	10	3	30	20	100	150			2		3		
ELE311	High Voltage	2	1	0	3	7	3	30	15	80	125					1	2	
ENG214	Contracts& Specifications	2	1	0	3	5	2	25		50	100		3					
Total		15	8	1	24	50	17	185	70	495	750	0	3	2	2	7	10	0

Third Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE312	Power System Analysis	2	1	0	3	8	3	35	20	70	125						3	
ELE322	Special Machines	2	1	0	3	8	3	15	15	70	100					1	2	
ELE313	Protective Devices and Switchgear	2	1	0	3	8	3	35	20	70	125						3	
CSE343	Embedded systems	2	1	2	5	10	3	30	20	100	150					5		
-	Elective Course (1)	2	1		3	6	3	30	10	60	100						3	
ECE241	Analog Communication Systems	3	2	0	5	10	3	50	0	100	150					5		
Total		13	7	2	22	50	18	185	85	480	750	0	0	0	0	11	11	0

Fourth Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE411	Power System Distribution	2	2		4	8	3	30	15	80	125						4	
ELE421	Machines Design & Analysis	3	2		5	10	3	30	15	80	125						5	
ELE412	Power System Protection	3	1	0	4	8	3	25	10	90	125					0	4	
MUR114	Communication and presentation skills	2	2		4	5	2	40	0	60	100	4						
-	Elective Course (2)	2	2		4	6	3	30	15	80	125						4	
ELE431	Graduation Project 1		3		3	9		100			100							3
ENG113	Summer Training (2)			0	2			10	15	25	50							2
Total		12	12	0	24	46	16	280	25	445	750	4	0	0	0	0	17	5

Fourth Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical / Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE413	Power System control	3	2		5	8	3	40	20	90	150						5	
ELE422	Electrical Machine Control	3	2		5	10	3	40	20	90	150						5	
ELE432	Electrical Lab. (2)			3	3	6		50	50		100						3	
ELE433	Electric Energy Utilization	2	2		4	8	3	25	15	60	100	2					2	
-	Elective Course (3)	2	2		4	8	3	20	10	70	100						4	
ELE434	Graduation Project 2			4	4	10		50		100	150							4
Total		10	8	7	25	50	12	225	115	410	750	2	0	0	0	0	19	4

Distribution Of Program Contact Hours Over The Subject Areas

Semester		Teaching Hours				Student Work Load (SWL)	Subject Area						
		Lectures	Tutorial	Practical	Contact Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/ 1st		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2nd		12	8	5	25	50	0	0	12	3	10	0	0
First year/1st semester		15	8	2	25	48	3	0	13	3	6	0	0
First year/ 2nd		15	6	4	25	49	2	3	12	0	8	0	0
Second year/1st		14	5	4	23	47	2	0	5	3	7	6	2
Second year/ 2nd		12	7	4	23	47	3	0	5	0	10	5	0
Third year/1st semester		15	7	1	23	50	0	3	2	2	7	10	0
Third year/ 2nd		13	7	2	22	50	0	0	0	0	11	11	0
Fourth year/1st		12	12	0	24	46	4	0	0	0	0	17	5
Fourth year/ 2nd		10	8	7	25	50	2	0	0	0	0	19	4
Total of Five Years		132	76	31	239	487	21	6	64	11	63	68	11
% of Five Years							8.6	2	26.2	4.5	26.3	27.9	4.5
% NARS And Reference framework	Minimum					8.00	2.00	2.00	25.0	25	25	4.00	4.00
	Maximum					12.00	4.00	4.00		30.00	30.00	6.00	6.00

Summary of Courses Specification

First Year-First Semester:

Course title	Engineering Mathematics (3)				Course Code	BAS151
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		2	0		
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
	0	0	40	110		

Ordinary Differential Equations (ODE)

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undesemesterined coefficients method and variation of parameters method for finding the particular solution) – Cauchy - Euler ODE (homogeneous and nonhomogeneous) – System of ODE– Laplace transform – Inverse Laplace transform – Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables

Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems – Mathematical modeling using partial differential equations.

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.***

Course title	Electric Circuits (1)				Course Code	ELE141
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		1	1		
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
		20	20	110		

Basic DC Electric circuit elements-basic laws of electrical circuits - Ohm's law-Kirchhoff current law - Kirchhoff voltage law – methods of electric circuits analysis: Thevenin's theory - Norton theory- superposition theorem - conversion of sources-maximum power transfer. Electric charge storage in electric field- capacitance and capacitor dimensions.– AC circuits: Generation of A.C, definitions of AC basic elements - Inductance and capacitors in AC circuit – analysis of AC circuits- Three – phase circuits, voltage generation in balanced and unbalanced 3-phase system, star and delta connected loads.

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.***

Course title	Electric Materials				Course Code	ELE142
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		1	1		
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	15		20	90		

Electrical Properties of Materials:

Electrical Conduction in Metals and Alloys, - Classical Electron Theory, - Quantum Mechanical Considerations, Pure Metals, Alloys, Ordering, Superconductivity, Thermoelectric Phenomena Electrical Properties of Polymers, Ceramics, Dielectrics.

Magnetic Properties of Materials:

Basic Concepts in Magnetism, Quantum Mechanical Considerations: Paramagnetic, Diamagnetism, Ferromagnetism and

Antiferromagnetic.

Optical Properties of Materials:

The optical constants, Atomistic Theory of the Optical Properties, Optoelectronic Applications, Carbon Dioxide Laser, Semiconductor Laser, Direct-Versus Indirect-Band Gap Semiconductor Lasers, Wavelength of Emitted Light, Threshold Current Density Light-Emitting Diodes (LEDs), Integrated Optoelectronics

References:

- *E. Bruck, "Handbook of Magnetic Materials", 1st Edition, Elsevier, North Holland, 2018.*
- *Cristoloveanu, S. and S. Li, Electrical characterization of silicon-on-insulator materials and devices. Vol. 305. 2013: Springer Science & Business Media.*
- *Seanor, D.A., Electrical properties of polymers. 2013: Elsevier.*

Course title	Electronics Circuits (1)				Course Code	ECE242
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
		0	50	100		

Introduction – Semiconductors – Diode theory – Diode circuits – Special-Purpose diodes- BJT Fundamentals – BJT Biasing – Basic BJT Amplifiers – Multistage, CC, and CB amplifirs - Power amplifier- Field Effect transistor (FET) – Field DC Bias. BJT small signal analysis- BJT amplifier- FET small signal analysis- FET Amplifier – Amplifiers frequency response - operational amplifier – linear digital integrated circuits (ICS).

References:

- *John Bird, Electrical and Electronic Principles and Technology 6th Edition, Routledge; 2017*
- *M.L. Anand, Electronic Principles: Devices and Circuits, A H Wheeler Publishing Co Ltd, 2001*

Course title	Energy Issues and Environment				Course Code	MUR235
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	75
			25	50		

Importance of Energy, Overview of energy resources, Basic energy problems -Conventional and unconventional reserves and resources - Electric industry overview - Environmental impacts of Electric industry - The evidence for and emerging impacts of climate change - Renewables energy resources: Biofuels - Wind Energy - Solar Energy - Other Renewables: Geothermal and Ocean Energy- Hydro and Nuclear Energy -Nuclear Waste -Domestic and International Energy Policies

References:

- *R. A. Hinrichs, Energy: Its Use and the Environment, Fourth edition, Thompson Learning, 2006.*
- *R. A. Ristinen and J. J. Kraushaar, Energy and the Environment, 3rd Edition, Wiley, 2015*

Course title	Fluid Mechanics and Thermodynamics				Course Code	ENG234
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
			30	70		

Properties of fluids - Fluid statics - Fluid kinematics - Fluid flow - Principles of motion Quantity and thrust - Fluid dynamics and its applications - Fluid measurements - Principles of hydrodynamics - First law of thermodynamics and its application to different systems - Second law of thermodynamics and its applications - Thermal power stations - Methods of heat transfer - Thermal insulators - Critical diameter of thermal insulation - Cooling surfaces.

References:

- *Yunus Cengel, Fluid Mechanics: Fundamentals and Applications 4th Ed., McGraw-Hill Higher Education, 2017*
- *Atul Sharma, Introduction to Computational Fluid Dynamics: Development, Application and Analysis, published by Wiley, 2016*
- *Sanjiv Gupte, Applied Thermal Engineering, 1st edition, Ishan Publications; 2016*

First Year-Second Semester:

Course title	Engineering Mathematics (4)				Course Code	BAS155
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
	0	0	40	110		

Partial Differential Equations (PDE)

Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE)– Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.

Complex Analysis

Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping.

References:

- ***J. Brown, and R. Churchill, "Complex Variables and Applications", 9th Edition, McGraw-Hill, 2013.***
- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***

Course title	Power Electronics (1)				Course Code	ELE144
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
	0	0	50	100		

Mono stable Multi vibrators –Bi stable Multi vibrators- Flip Flops based counters - Use of counters as pulse circuits - Control methods of pulse circuits by frequency and pulse width - Decoding circuits - Microcontroller programming - applications of Microcontrollers in power electronics.

Single-phase uncontrolled rectifier circuits – Three-phase uncontrolled rectifier circuits – Single-phase controlled rectifier circuits – Three-phase controlled rectifier circuits – power switches protection –Thyristor firing circuits – Firing pulse amplifiers – Thyristor commutation circuits and techniques – DC choppers – Applications of DC choppers.

References:

- ***Mohamed Rashid, Narendra Kumar, Ashish R. Kulkarni, "Power Electronics Circuits, Devices and Applications'' Pearson-Hall, 4 ed, 2014.***
- **Daniel W. Hart, "Power Electronics", McGraw-Hill, 2011.**

Course title	Electric Circuits (2)				Course Code	ELE241
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
	0	20	20	110		

Introduction to electrical circuits - Electrical circuits in switching on/off mode and instantaneous behavior- Solution of the first order electrical circuits– Solution of the second order electrical circuits –Magnetically linked circuits – Analyse circuits in frequency mode – Resonance in electric circuits – The two port electrical networks – Analyse electrical circuits by using Laplace transform - Use Fourier analysis for solving electric circuits - Circuit analysis using Matlab program.

References:

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

Course title	Programming Languages				Course Code	CSE141
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	1	2			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
		20	30	100		

Introduction to Programming - MATLAB Programming (Algorithms - MATLAB Scripts - Scripts with Input and Output- Scripts to Produce and Customize Simple Plots- File Input/Output (Load and Save)- User-Defined Functions that Return a Single Value) - Selection Statements (Relational Expressions - The if, if-Else, and Nested if-Else Statements) – Looping (for, nested for, and While Loops) - MATLAB Programs (Matlab Program Organization - Variable Scope - Debugging Techniques) - String Manipulation - Data Structures: Cell Arrays and Structures - data analysis methods – illustrations and control – dynamic simulation – solving equations-statistical analysis.

References:

- ***Stephen J. Chapman, MATLAB Programming for Engineers, 6th Edition, Cengage Learning, 2019***
- ***Huei-Huang Lee, Programming and Engineering Computing with MATLAB, SDC Publications, 2018***
- *Stormy Attaway, "Matlab: A Practical Introduction to Programming and Problem Solving", 2009.*

Course title	Research and Analysis skills				Course Code	MUR 221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	50
			15	35		

Critical thinking - Assess and develop thinking skills – Identifying arguments - Argument and non-argument - Clarity, internal consistency and structure - Reading between the lines: Recognising underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and note-making: Critical selection, interpretation and noting of source material – Critical thinking when writing – Evaluating critical writing.

References:

- *Stella Cottrell, Critical Thinking Skills, 3rd Edition, published by Macmillan Study Skills, 2017*
- *John Butterworth and Geoff Thwaites, Thinking Skills: Critical Thinking and Problem Solving 2nd edition, Cambridge University Press 2013*

Course title	Project Management				Course Code	ENG231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	100
			30	70		

Projects and project management - Modern Administrative Thought - Management Levels and Types - Management Functions - Organization - Leadership - Motivation - Financial and Moral Incentives - Control - Concept and importance of project management - Life cycle of Engineering projects - Strategies and types of project planning - Feasibility study - Project resource management - Project implementation - Project evaluation - Practical models for small projects management - Engineering ethics and rules of practicing the Engineering profession in Egypt.

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.***

Second Year-First Semester:

Course title	Engineering Mathematics (5)				Course Code	BAS251
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
			40	110		

Numerical Methods

Curve fitting – Interpolation – Numerical integration – Numerical solution of algebraic and transcendental equations – Iterative methods for solving system of linear algebraic equations – Numerical differentiation – Numerical solution of ordinary differential equations – Numerical solution of partial differential equations– Finite difference method.

Applied Probability and Statistics

Introduction to probability – Discrete random variables – Special discrete distributions – Continuous random variables – Special continuous distributions – Multiple random variables – Sampling distribution and estimation theory – Test of hypotheses – Correlation theory – Analysis of time series.

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.***

Course title	Logic and Digital Circuits				Course Code	CSE143
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
		20	30	100		

Numeric Systems - Converting between binary, decimal, octal and hexadecimal numbers - Boolean algebra - Logic gates –simplification of logic functions – Karnaugh map (Sum of product) minimization - Karnaugh map (Product of sum) minimization - Combinational logic analysis - Combinational logic using NAND and NOR gates – Functions of combinational logic : (Adders (half, full), Comparators, Decoders/Encoders, Code converters, Multiplexers, Demultiplexer, Parity generators) Logic families: TTL, ECL, MOS and CMOS, their operation and specification – Experimental: Implementation of digital combinational circuit using TTL ICs.

References:

Mano, M. Morris, and Charles R. Kime. Logic and computer design fundamentals. Pearson Higher Education, 2015., Thomas L. Floyed, Digital fundamentals, Pearson international edition, 11th edition, 2019.

Course title	Computer Applications in Electrical Engineering				Course Code	ELE231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2		2			
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	125
		20	35	70		

Review on Matlanb basics - Mathematical applications on programming with Matlab: Represent and solving equations: linear equations, second order equations, polynomial equations – Drawing curves - Simulation using different programs - Processing in and out files - Modeling in Simulink - Optimization, and statistical analysis using Matlab - Representation of electrical power system components using Matlab/Simulink - Power systems modeling and simulation using Matlab/Simulink - Design and handling of graphical user interfaces.

References:

- ***R. Pathak, A. Pathak, H. Mahala Computer Applications to Power System, Satya Prakashan and Karol Bagh publishers, New Delhi, 2016***

- *R. Nawrowski, Computer Applications in Electrical Engineering, Published by: Poznan University of Technology, Poland, 2014*
- *Z. Stojkovic, Computer- Aided Design in Power Engineering: Application of Software Tools, Published by Springer, 2017*

Course title	Professional Ethics				Course Code	MUR115
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	50
			15	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.

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*

Course title	Power Electronics (2)				Course Code	ELE221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
		15	20	90		

Inverters – Multilevel inverters – Applications of inverters – AC voltage controllers – Cycloconverters – Applications of power electronic convertes (Switch-mode power supply, SMPS – Unintruptable Power Supplies, UPS – High voltage DC transimission, HVDC – Static Switches – Static circit breaker – Solid state relays – Resonant converters - Applications of power electronics in DC machines – power electronics applications in AC machines – power electronics applications in renewable energy systems).

References:

- *L. Ashok Kumar, A. Kalaiarasi, "Power Electronics with MATLAB", Cambridge University, 2018.*
- **Mohamed Rashid, Narendra Kumar, Ashish R. Kulkarni, "Power Electronics Circuits, Devices and Applications'' Pearson-Hall, 4 ed, 2014.**

Course title	Thermal & Hydraulic Machines				Course Code	ENG235
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
			30	70		

Types of thermal power stations - Steam power stations - Steam generators - Steam turbines- Condensers and cooling towers - Gas turbines - Compressor and its types - Hydraulic power stations - Hydraulic turbines - Bolton wheels - Francis turbine-Caplan turbine- Types of pumps - Performance of pumps.

References:

- *G. S. Sawhney, Thermal and Hydraulic Machines, PHI Learning Pvt. Ltd., Technology & Engineering, 2011*
- *G. Ferrari, Hydraulic and Thermal Machines, Società Editrice Esculapio, 2007*

Course title	Summer Training (1)				Course Code	ENG112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
			2			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	50
		15	10	25		
Students promoted to the 2nd year are to carry out professional training inside the faculty, or in specialized training centers						

Second Year-Second Semester

Course title	Power Generation Systems				Course Code	ELE211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
		10	20	70		

Structure of electric power system - Sources of generation of electrical energy – Types of generating stations– Operation principles and basic components of different generation stations: thermal stations, natural gas stations, hydroelectric stations nuclear stations, and renewable energy systems (wind and solar).
Load curves and load duration curve - Basic definitions of commonly used factors - Base and peak load - method of meeting load by interconnected stations - Economics of electric power stations – total cost and operating cost – tariffs of electric consumption - selection of station type and size.

References:

- ***S. N. Singh, "Electric Power Generation, Transmission and Distribution", CRC Press; 3rd edition 2016.***
- ***R.K. Hegde, Power Plant Engineering, Publisher: Pearson Education India, 2015.***
- ***D. Glover, M. Sarma, and T. Overbye, Power System Analysis & Design, SI Version, Cengage Learning, 2012.***

Course title	Electrical Measurements				Course Code	ELE243
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
		15	35	100		

Basics and concepts of electrical measurements - Principle and types of analog and digital voltmeters and ammeters - Measurement devices for AC&DC power and power factor in single and three phase system-Measuring frequency – Instrument transformers – Instruments for measurement of frequency and phase. - D.C & A.C potentiometers, D.C & A.C bridges, measuring resistance and inductive reluctance- Multiple earth and earth loops – Grounding techniques - Transducers and Data Acquisition Systems: Classification of transducers- Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers.

References:

- ***Kirkham, H., Measurement and Instrumentation. Pacific Northwest National Lab.(PNNL), Richland, USA, 2018.***
- ***Morris, A.S. and R. Langari, Measurement and instrumentation: theory and application, Academic Press, 2012***
- ***Hauschild, W. and E. Lemke, High-voltage test and measuring techniques, Springer, 2014***

Course title	DC Machines and Transformers				Course Code	ELE222
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
	20		30	100		

Power Transformers: Construction and theory of operation, equivalent circuit, determining transformer's constants through practical experiments, electrical performance of the transformer, operation of transformers in parallel.
DC. Machinery Fundamentals: Construction and theory of operation - power flow and losses.
DC Generators: equivalent circuit, characteristics of DC generators, types of excitation system, magnetization curve, armature reaction, parallel operation, types and applications of DC generators.

DC motors: equivalent circuit, performance and characteristics, DC motor starting, speed and braking control, efficiency, types and applications of DC motors

References:

- ***K R Siddhapura, D B Raval, DC Machines and Transformers, Vikas Publishing, New Delhi, 2015***
- ***I. D. Mayergoyz, and P. McAvoy, Fundamentals of Electric Power Engineering. Vol. 3. World Scientific, 2015***
- ***M. A.Laughton, and M.G. Say, Electrical engineer's reference book, Elsevier. 2013***
- ***M. V. Deshpande, Electrical Machines, Prentice Hall India, New Delhi, 2011.***

Course title	**Electrical Lab. (1)**				**Course Code**	ELE232
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
			3			
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	100
		50	50	-		

Experimental tests on DC circuits and their theories- resonance experiments- experiments of AC circuits and theories – experiments of three phase system - experiments of power electronics fundamental and logic circuits - experiments in electrical wiring and lighting circuits

References:

- ***J. M. Fiore, Laboratory Manual for DC Electrical Circuits, Version 1.3, Mohawk Valley Community College, 2019***
- ***M. EL-Shimy, Electrical and Electronic Circuits: Theory and Laboratory Workbook, Publisher: Egyptian Ministry of Health & Population (MOHP), and United States Agency of International Development (USAID), 2018***

Course title	**Electromagnetic Fields**				**Course Code**	ECE243
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	5
	3	2				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	150
		0	40	110		

Electrostatics: Coulomb's law - Gauss's law - electric potential - boundary conditions - electric dipole image theorem - Laplace's equation – capacitance – energy and electrostatic force – stationary current field.

Magneto-statics: Gauss law for Magnetics - Ampere's law- Biot-Savart's law - vector potential- magnetic boundary conditions - Faraday law for induction inductance

Electromagnetics: Time varying fields- Maxwell's equations - plane wave propagation in space and physical materials - reflection and refraction of waves in different materials.

References:

- ***William H. Hayt, Jr., John A. Buck, Engineering Electromagnetics, 9th Ed, McGraw-Hill Education, 2018***
- ***M.F. Iskander, Electromagnetic fields and waves, Waveland Press, 2013***
- ***A. Presman, Electromagnetic fields and life. Springer Science & Business Media, 2013***

Course title	**Technical reports Writing**				**Course Code**	ENG111
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	100
			30	70		

Introduction to technical writing - elements of writing strategy - planning technical reports – writing a technical report: using illustrations, organizing and numbering, writing reference lists and appendices.

Formal reports: categories of formal reports, structure of formal reports - Applications in report writing: laboratory report, field report, periodic reports, proposal, theses and dissertations - Ethical considerations and plagiarism - making presentation - writing a successful CV.

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.***

Third Year-First Semester:

Course title	Induction and Synchronous Machines				Course Code	ELE321
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
		10	20	70		

Basic Concepts of Rotating Electric Machine - constructional features of rotating electrical machine.
Polyphase Synchronous Generators: construction, speed of rotation, internal generated voltage, equivalent circuit, performance parameters measuring, equations of power and torque in synchronization generator.
Synchronous Motors: Steady state motor operation, effect of excitation on motor starting.
Three phase Induction Motors: construction, equivalent circuits, power and torque, torque/speed characteristic, motor starting, speed control of the motor - Single-phase Induction Motor: equivalent circuit, motor starting, speed control of the motor.

References:

- ***Lipo, T.A., Introduction to AC machine design. Vol. 63. John Wiley & Sons., 2017***
- ***Hindmarsh, J., Electrical machines & their applications. Vol. 1, Elsevier publisher, 2014***
- ***Pyrhonen, J., T. Jokinen, and V. Hrabovcova, Design of rotating electrical machines, John Wiley & Sons, 2013***

Course title	Signals and systems				Course Code	ECE142
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
		0	50	100		

Analog to digital conversion-Discrete Fourier transform-Fast transform and spectrum of discrete signals-time invariant linear digital filters- Filters response analysis and stability – Basics of filter design - Design of finite and infinite impulse response filters – Solid state implementation of filters – Discrete time random processes and optimal filters- Error analysis and effect of limited word length on digital filters - Finer's filters- Adaptive filters- Data coding and compression - Restoration techniques- Applications in image processing.

References:

- ***A. N. Kani, Digital Signal Processing Paperback, McGraw Hill Education, 2017***
- ***O. Schafer, Discrete - Time Signal Processing, 3rd edition Pearson India, 2014***
- ***R. G. Lyons, Understanding Digital Signal Processing, 3rd edition, Prentice Hall Co., 2010***

Course title	Power System Transmission				Course Code	ELE342
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
		15	20	90		

Introduction to electric power transmission systems - Transmission line parameters (resistance – induction – capacity) - transmission line models (short, medium and long lines) – Performance of transmission lines – High voltage DC transmission systems (HVDC) - insulators - Potential distribution over insulator string- Mechanical design of transmission lines - Power flow analysis using different methods: Gauss method, Gauss-sidle method, Newton-Raphson method - economic operation of power systems .

References:

- ***P. K. Sadhu, and S. Das, Elements of Power Systems, CRC Press, 2015.***
- ***B. M. Weedy, et al., Electric power systems, John Wiley & Sons, 2012.***
- ***R. N. Allan, Reliability evaluation of power systems. Springer Science & Business Media, 2013.***

Course title	Automatic Control Systems (1)				Course Code	CSE142
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
		20	30	100		

Introduction to control systems. Modeling of natural systems - Open and closed loop systems - Block diagram and transfer function - Signal flow diagram - Modeling with case variables - Frequency response analysis - Feeding back - Stability and root locus technique - Boar path analysis - Nyquist analysis - Methods of designing rear control systems – applications of automatic control in industrial processes

References:

- ***G. Franklin, J. Powell and A. Naeini, Feedback Control of Dynamic Systems, 8th Ed, Pearson publisher, 2018.***
- ***N. S. Nise, Control System Engineering, 7th Edition, John Wiley &Sons, 2015***
- ***K. Ogata, Modern Control Engineering by, 5th Edition, Prentice Hall, 2010.***

Course title	High Voltage				Course Code	ELE311
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
		15	30	80		

Introduction to high voltage technology - Generation of high voltage (DC, AC and impulse) - Measurement of DC High Voltages - Measurement of A.C. and Impulse High Voltages - Measurement of High D.C., A.C. and impulse currents - Breakdown Mechanism of Gases, Liquid and Solid insulators - Breakdown in Vacuum - High voltage testing of insulating materials - High voltage testing of electrical apparatus - Corona discharge – Grounding - Insulation coordination - High voltage safety principles

References:

- ***J.P. Holtzhausen W.L. Vosloo, High Voltage Engineering Practice and Theory, Stellenbosch University, South Africa 2014.***
- ***M.S. Naidu and V. Kamaraju, High Voltage Engineering, 5 th Edition, Tata McGraw-Hill, 2013.***
- ***C.L. Wadhwa, High Voltage Engineering, New Age International (P) Ltd., Publishers, 2007***

Course title	Contracts and Specifications				Course Code	ENG214
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
			30	70		

Legal aspects of contracting - General conditions of the contract - Types of Engineering contracts - General responsibilities in Engineering contracts - Methods of projects attribution – Preparation of specifications - Formulation of technical specifications - Specifications for fundamental materials and supplies – Specifications for fundamental processes - Specifications for machinery and apparatus - Basic aspects of cost estimation - Inspection and testing of electrical installations.

References:

- ***Daniel w. Mead, "Contracts, specifications and Engineering relations", FB & C Ltd, 2016.***
- ***J. B. Johnson, Engineering Contracts and Specifications Hardcover Wentworth Press,2016***

Third Year-Second Semester:

Course title	Power System Analysis				Course Code	ELE312
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	20		35	70		

Electrical loads characteristics and factors - Electric power system modeling - per unit calculations - symmetrical faults - symmetrical components - unsymmetrical faults - Z-bus methods in contingency analysis - Angular stability analysis of power systems: Static and Transient stability analysis, Long term stability.

References:

- ***Glover, J.D., M.S. Sarma, and T. Overbye, Power System Analysis & Design, SI Version. 2012: Cengage Learning.***
- ***Pai, M., Energy function analysis for power system stability. 2012: Springer Science & Business Media.***
- ***Gonen, T., Electrical power transmission system Engineering: analysis and design. 2015: CRC press.***

Course title	Special Machines				Course Code	ELE322
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
	15		15	70		

Introduction to special electrical Machines – construction and theory of operation of linear motors -construction and theory of operation of magnetic reluctance motors - construction and theory of operation of servo motors - construction and theory of operation of disk motors - construction and theory of operation of stepping motors - general engine - residual magnetism engine - orthogonal field machines - transition impedance motors - brushless motors- Applications of special electric machines.

References:

- ***E. G. Janardhanan, 'Special Electrical Machines' PHI Learning Private Limited, 2014***
- ***Venkataratnam K., Special Electrical Machines, CRC Press, 2009.***

Course title	Protective Devices and Switchgears				Course Code	ELE313
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	20		35	70		

Introduction to protective relaying - Circuit breakers (oil, air, SF6, Vacuum): construction, theory of operation, and applications. - Theories, constructions, and applications of the following relays: Electro-mechanical relays - Solid state relays - Numeric relays.

Relays classification: Instantaneous, Definite minimum time and Inverse definite minimum time types. Applications of relays: Over current/under voltage relays, Direction relays, Differential relays, and Distance relay.

References:

- ***J.B. Gupta, Switchgear and Protection S.K. Kataria & Sons; 2013***
- ***N. Chothani, M. Maheshwari, B. Bhalja, Protection and Switchgear, Oxford Higher Education, 2011***
- ***N. Veerappan & S.R. Krishnamurthy, Power System Switchgear and Protection, S Chand, 2010***

Course title	Embeded Systems				Course Code	CSE343
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	1	2			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
		20	30	100		

Introduction to microcontrollers– microcontrollers' architectures- microcontroller configurations – I/O programming - Advanced Programming Application (Buttons-LCD-Keypad-ADC-PWM-Motor control-LEDs-EEPROM-Interrupt) Embedded system architecture. Processor examples: AVR, ARM, DSP. Peripherals on chips. Real-time operating systems. Software for embedded systems design.

References:

Ibrahim, Dogan. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC 18F Series. Newnes, 2016.

Course name	Elective Course (1)				Course Code	--
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
	10		30	60		

Courses:

ELE314	Smart Grids
ELE331	Water Desalinations
ELE323	Electric Vehicles
ELE315	Design of Low and Medium Voltage Networks

Smart Grids

General considerations for a Smart Grid - Characteristics of Smart Grid - Smart Grid technologies - Smart Grid Elements : electric grid, control elements, communications infrastructure, applications layer - Smart Grid Control Elements: elements of monitor and control the grid: smart meters, sensors, and phasor measurement units - Smart Grid Operations: control and management functions, operations architectures, and information models.

References:

- ***Rajakaruna, S., Shahnia, F. and Ghosh, A., Plug in electric vehicles in smart grids. Springer Verlag, Singapor, 2016.***
- ***Borlase, S., Smart grids: infrastructure, technology, and solutions. CRC press, 2016.***
- ***Uslar, M., et al., Standardization in smart grids: introduction to IT-related methodologies, architectures and standards. Springer Science & Business Media, 2012.***

Water Desalinations

Introduction to water resources and desalination processes - thermal technologies: single and multi-stage flash (MSF) technology - process calculations and MSF performance parameters -single and multi-effect distillation (MED) technology - process calculations and MED performance parameters - membrane technologies: osmosis and reverse osmosis (RO) - RO system performance parameters, energy recovery and pretreatment - electrodialysis - solar desalination systems - desalination problems (scaling, fouling, corrosion), and their mitigation - future desalination technologies -

References:

- ***Youssef, P.G., Al-Dadah, R.K. and Mahmoud, S.M., 2014. Comparative analysis of desalination technologies. Energy Procedia, 61, pp.2604-2607.***
- ***Spiegler, K.S. ed., 2012. Principles of desalination. Elsevier.***
- ***Das, R., Ali, M.E., Hamid, S.B.A., Ramakrishna, S. and Chowdhury, Z.Z., 2014. Carbon nanotube membranes for water purification: a bright future in water desalination. Desalination, 336***

Electric Vehicles

Introduction to electric vehicles (EV) and hybrid vehicles (HEV) - hybrid vehicle architectures - propulsion system analysis - Fuel cell vehicles - electric motor drive systems for EV/HEVs. Power electronic converters for electric and hybrid vehicles - Energy Storage systems - Energy management and control strategies- new trends in electric aircraft and electric architectures.

References:

- ***Rajakaruna, S., Shahnia, F. and Ghosh, A., 2016. Plug in electric vehicles in smart grids. Springer Verlag, Singapor.***
- ***Borlase, S., 2016. Smart grids: infrastructure, technology, and solutions. CRC press.***
- ***Uslar, M., et al., 2012. Standardization in smart grids: introduction to IT-related methodologies, architectures and standards. Springer Science & Business Media.***

Design of Low and Medium Voltage Networks

Medium voltage networks: an overview – low and medium voltage distribution boards - conductors and cables - indoor and outdoor lighting systems - earthing and safety - Calculation of electrical load in Domestic and industrial buildings – Design of electrical wiring systems in domestic and industrial buildings - Electrical Installation Drawings - Design of networks of special systems (alarm systems - audio - information - telephones - call nurses - surveillance and cameras

References:

I. Kasikci, Analysis and Design of Low-Voltage Power Systems: An Engineer's Field Guide, Wiley-VCH Verlag GmbH & Co. KGaA, 2004

L. Mischler Electrical installation guide, Schneider Electric S.A, 2016

T. Schmelcher, Low-Voltage Handbook. Technical reference for switchgear, controlgear and distribution systems, Siemens Aktiengesellschaft, Berlin , 1982

Course title	**Analog Communication Systems**				**Course Code**	ECE241
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	5
	3	2				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	150
		0	50	100		

Introduction to communication systems; signals and systems; power spectral density; Amplitude modulation (AM) suppressed carrier; amplitude modulation large carrier, single side band amplitude modulation; demodulation techniques for AM signals; narrow-band and wide-band - Frequency modulation (FM); demodulation of FM signals; phase modulation (PM); AM and FM receivers; Frequency division multiplexing; pulse modulation; noise in analog modulation systems

References:

- ***Simon Haykin Communication System by 2nd Edition, Wiley India Edition, 2018***
- ***T. Ha. Tri, Theory and Design of Digital Communication Systems 1st Edition, Cambridge University Press, 2010***

Fourth Year-First Semester:

Course title	**Power System Distribution**				**Course Code**	ELE411
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	4
	2	2				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	125
	15		30	80		

An Overview of Distribution Systems - Sub-transmission lines and Distribution Substations - Primary feeders and Secondary mains – Voltage drop and power loss calculations - Protection of distribution networks (fuses - auto reclosers - over current and under voltage protection devices) - load shedding – voltage regulation - power factor improvement - Performance Indicators for Distribution Companies- underground cables: construction of cables, insulating materials, classification of cables - measurement of cables capacitance

References:

- ***T. Gönen, " Electric Power Distribution Engineering", 3rd Edition, Published by Taylor & Francis Group, LLC, 2014***
- ***U. Bakshi, M. Bakshi, "Transmission and Distribution of Electrical Power", Technical Publications Pune, 2009***
- ***J.B. Gupta, "Transmission & Distribution of Electrical Power", S. K. Kataria & Sons, 2009***

Course title	Machines Design and Analysis				Course Code	ELE421
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	15		30	80		

Essentials of rotating electrical machines, the basic two-pole machine, Concepts of primitive machine and its applications in electrical machines, Analysis of electrical machines - Machine properties (start-up, transient and stable operation) - How to apply generalized machine theory, electrical torque, restrictions of the generalized theory of machines. Matrices of DC and AC machines: Impedance matrix, impedance matrix of the synchronous machine, inductance and torque matrices, the flux linkage and the flux density matrices, rotation matrix. Analysis and design of electrical transformers.

References:

- ***Pyrhonen, J., T. Jokinen, and V. Hrabovcova, Design of rotating electrical machines. 2013: John Wiley & Sons.***
- ***Lipo, T.A., Introduction to AC machine design. Vol. 63. 2017: John Wiley & Sons.***
- ***Hindmarsh, J., Electrical machines & their applications. Vol. 1. 2014: Elsevier.***

Course title	Power System Protection				Course Code	ELE412
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	3	1	0			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	10	0	25	90		

Introduction to power system protection - Review on fault analysis- Zones of Protection - Current & potential transformers - Radial System Protection –Time-Coordinated Overcurrent Protection - Directional overcurrent protection- Distance protection - Differential protection - Protection of generators and motors- Protection of transformers -Transmission Lines protection - bus bar protection - Protection aspects of power system transient phenomena - Protection and Reliability

References:

- ***Power system relaying, Horowitz, Stanley H. Phadke, Arun G, 3rd edition, Chichester, West Sussex, New York: Wiley 2008.***
- ***Power system protection, P.M. Anderson, Wiley-Interscience, 1999***

Course title	Communication and Presentation Skills				Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	100
			40	60		

Introduction to communication - communication process - communication skills - oral and non-verbal communication and report writing - letter writing and interview - planning a management presentation - everyday management presentations - advantages and disadvantages of presentations- Four-stage presentation planning process (identify the aim, profile the audience, define the key message statement, and outline the scope) - audience profiling -presentation environment - management presentation planning guidelines.

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***

Course name	Elective Course (2)				Course Code	--
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	125
	15		30	80		

Courses:

ELE414	Power Electronic Applications in Transmission Systems
ELE435	Energy Storage Technologies
ELE423	Computer Aided DC machines Design
ELE415	Transient Phenomena in Power Systems

Power Electronic Applications in Transmission Systems

Introduction to flexible alternating current transmission system (FACTS): configurations, concepts, general system considerations, applications -Static shunt compensators -Static series compensators - Combined compensators -Special purpose FACTS controllers - Modeling of FACTS - Applications of FACTs in electrical power system: steady state, optimization, transients, wide area control, voltage stability.

References

- ***Åke Ekström, Power Semiconductor Devices and Circuits, Plenum Press, New York 1992***
- ***Ashok Kumar Akella, Principles of FACTS Devices, LAP LAMBERT Academic Publishing, 2018***

Energy Storage Technologies

The need for energy storage (grid connected and standalone applications) - Energy storage technologies (electrochemical, mechanical, thermal, Superconducting Magnetic Energy Storage) - Appreciation of balancing the Electric Power system - Battery systems – characteristics of different batteries, behavior at different rates, charging profiles -Supercapacitor modules and packs - Heat engines and thermal storage systems - Superconducting Magnetic Energy Storage - Mechanical systems: pumped hydro storage and practical flywheels.

References

Paul Breeze, Power System Energy Storage Technologies, Academic Press; 1 edition 2018.

Alfred Rufe, Energy Storage: Systems and Components, CRC Press; 1 edition, 2017

Computer Aided DC machines Design

Review of design, analysis and optimization; Selection of strategies and constraints; Defining material properties; Mathematical model of DC machines - Design of DC machines and their analysis; Development of computer program; Use of finite element method FEM package; Simulation of performance of electrical machine.

References

K M Vishnu Murthy, Computer Aided Design of Electrical Machines, BS Publications 2015

Transient Phenomena in Power Systems

Introduction to transients in power systems -Simple switching: DC – Single-phase AC -Switching of three-phase systems - Abnormal switching - Damping methods of transients -Transmission line modeling and traveling waves – Lightning - Computer modeling of transients - Insulation coordination.

References:

Eiichi Haginomori, Tadashi Koshiduka Power System Transient Analysis: Theory and Practice using Simulation Programs (ATP-EMTP), Wiley; 1 edition, 2016

Course title	Project (1)				Course Code	ELE431
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
		3				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
			100			

The student completes the theoretical and practical analysis for the project started in the first semester then realized before being completed after the exams of the second semester.

Course title	Summer Training (2)				Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
			2			
Course grades	Oral	Practical	Sem. work	Discussion	Total grads	50
		15	10	25		
Students promoted to the 3rd and 4th year are to carry out field training in specialized training sectors. Students trained outside the country should be approved by the Department Councils, The student will not be able to obtain his/her B.Sc. Graduation Certificate until Professional and Field Training are both accomplished succesfully.						

Fourth Year- Second Semester:

Course title	Power System Control				Course Code	ELE413
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
	20		40	90		
Load centers and operating economics – power system classification and methods of operation – power and frequency control – generators and load modeling – voltage and frequency controllers - Basics of using automatic control of generators in isolated and interconnected grids – control of electrical networks voltage by synchronous condensers and capacitors — Using FACTs in organizing network's voltage – monitoring and control of electrical power systems – controlling loads by voltage and frequency. **References:** ***- Grigsby, L.L., Power system stability and control. CRC press. 2016.*** ***- Sastry, S., Nonlinear systems: analysis, stability, and control (Vol. 10). Springer Science & Business Media. 2013.*** ***- Pai, M.A., Energy function analysis for power system stability. Springer Science & Business Media. 2012.***						

Course title	Electrical Machine Control				Course Code	ELE422
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	150
	20		40	90		
Rectifier control of DC motors, chopper control of DC drives, closed loop control of DC drives- Induction motor control: variable terminals voltage control- variable frequency control- rotor resistance control-operation with a current source inverters- control of induction motors by voltage source inverters - Synchronous motors control- Speed control of some special machines. **References:** ***- J. Pyrhonen, V. Hrabovcova, Electrical Machine Drives Control: An Introduction 1st Edition, Wiley, 2016*** ***- S.-Ki Sul, Control of Electric Machine Drive Systems, Wiley-IEEE Press, 2011*** ***- R. Husson, Control Methods for Electrical Machines, Wiley-ISTE, 2009***						

Course title	Electrical Lab. (2)				Course Code	ELE432
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
			3			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	100
		50	50			
Open circuit test in machines with rotating field - Synchronous machine test at short circuit, no load and load. Magnetization curve measurement - Synchronization of synchronous machine - Induction machine test at short circuit, no load and load for single phase and 3 phase machines – Measurement of impulse high voltage, Measurement of DC and AC High Voltage, Breakdown Tests of Transformer oil. Experiments in protection systems: Desemesterine characteristics of electrical power system protection devices - overcurrent protection – Grounding.						

References:
D.P. Kothari & B.S. Umre, Laboratory Manual for Electrical Machines, I K International Publishing House, 2013

Course title	**Electric Energy Utilization**				**Course Code**	ELE433
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	4
	2	2				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	100
	15		25	60		

Illumination and electrical loads: Electrical wiring devices and equipment - lighting systems equipment – cables, conductors, and pipes - electrical loads and sub-circuit calculations - design of electrical panels and emergency loads- Review of laws of illumination, lighting sources and their use in domestic, strELEt and industrial lighting.
Electrolytic Process: Methods, Electro-deposition and electroforming, Power supply for electrolysis processes.
Electric Heating: Methods, types of electric furnaces - Types of electric welding - Air conditioning and heating of buildings.
Electric Traction: Principles - Types of systems, speed time curve, elevators, electric cars and trolley buses.

References:

- ***L. Bloch, The Science of Illumination; an Outline of the Principles of Artificial Lighting, HardPress Publishing, 2012***
- ***E. O. Taylor, Utilization of Electric Energy in SI Units, Orient BlackSwan/ Universities Press, 2015***

Course name	**Elective Course (3)**				**Course Code**	--
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	4
	2	2				
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	100
	10		20	70		

Courses:	
ELE416	Artificial intelligence applications in electric power systems
ELE436	Energy Conservation and Management
ELE424	Electric Traction
ELE417	Electrical Power Systems Planning

Artificial intelligence applications in electric power systems

Experts systems, Fuzzy logic systems, Artificial Neural Networks, Genetic algorithms, Swarm algorithms,
Optimization techniques, Applications of AI in electrical systems: load flow, economic operation, power system stability, control of electric machines.

References:

WELErakorn Ongsakul***, Artificial Intelligence in Power System Optimization, CRC Press; 1 edition , 2013***

Energy Conservation and Management

Introduction- elements of energy conservation and management - techno-economic evaluation of energy conservation options - energy conservation approaches in industries - energy conservation in power generation - energy conservation transmission and distribution -consumers' energy conservation - energy costs and bill analysis - benefits of energy conservation for consumers and suppliers.

References:

Steve Doty and Wayne C. Turner, Energy Management Handbook, Ei Fairmont Press; 8 edition, 2012.

Electric Traction

Electric traction systems types - Study and analysis of movement of electric trains - Torque and speed characteristics of AC and DC motors - Speed control of motors- Transients and dynamic behavior of motors- Motion starters - Electric braking methods - Industrial applications of traction.

References:

L W. Gant, Elements of Electric Traction, BCR publishing 2009
Gonzalo Abad, Power Electronics and Electric Drives for Traction Applications 1st Edition, wiley 2016.

Electrical Power Systems Planning

Restructured power system - Load forecasting - Reliability and availability - Generation planning - Bulk power transmission planning- Transient and dynamic stability - Production costing analysis.

References:

Mohammad Shahidehpour, Hatim Yamin, and Zuyi Li, Market Operations in Electric Power Systems: Forecasting, Scheduling, and Risk Managemen Wiley-IEEE Press; 1 edition, 2008.

Course title	**Graduation Project 2**				**Course Code**	ELE434
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	4
			4			
Course grades	**Oral**	**Practical**	**Sem. work**	**Final Exam**	**Total grads**	150
			50	100		
The student completes the practical analysis for the project after the exams of the second semester.						

Electronics and Communications Engineering Program

Electronics and Communications Engineering Program

Program description

Electronics and communications are important fields in modern engineering. The discipline deals with electronic devices and software interfaces. They include microelectronic systems, microcontrollers, mobile communications, wireless networks, satellite systems and the internet. The industry ranges from companies that conduct fundamental research and development into future technologies, through to others that design and deploy state of the art technologies.

Program concentration

There is no specified concentration in this program.

Program LO (specialized)

In addition to the competences for all engineering programs (Level A) and the competences for the **Bacic electrical** engineering graduate (Level B), the Electronics and communications engineering graduate must be able to (Level C):

C1. Develop innovative solutions for the practical industrial problems.
C2. Plan, conduct and write a report on a project or assignment.
C3. Analyze the performance of digital and analog communication, mobile communication, coding, and decoding systems.
C4. Synthesis and integrate electronic systems for certain specific function using the right equipment.
C5. Analyze Communication Networks

Required course.

In order to get a Bachelor of science Degree in this program, and to satisfay the program LO, the following set of courses need to be completed.

List of Electronics and Communications Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requirements
	Faculty of Engineering Requirements
	Electrical engineering Requirements
ECE211	Digital Design
ECE231	Measurements
ECE321	Digital Communication Systems
ECE 322	Wireless Communications
ECE323	Electromagnetic Waves
ECE331	Microwave Electronics
ECE312	Digital Signal Processing
ECE 313	Electronic Circuits -3
ECE314	Opto-Electronics

BAS 351	Discrete Mathematics
ECE411	Integrated Circuits
ECE421	Mobile Communications
ECE422	Antenna and Wave Propagation
ECE423	Communication Net
ECE431	Graduation Project -1
ECE432	Graduation Project -2
-	Elective Course -1
-	Elective Course -2
-	Elective Course -3
	Total contact H.

Elective Courses	
Elective Course (1)	
ECE315	Digital Image processing
ECE316	Digital VLSI Circuits Design
ECE317	Error Control Coding
ECE318	Biomedical Electronics
Elective Course (2)	
ECE426	Satellite Communications
ECE413	Multimedia Processing
ECE414	Electronics for Instrumentations
ECE427	Nano-Photonics
ECE415	Computer Vision
Elective Course (3)	
ECE416	Robotics Design
ECE428	Broadband Wireless Communications
ECE429	Optical Communications
ECE417	Analog VLSI Circuits Design

Program Courses and Subject Area:

In addition to the courses of preparatory year, the students of Electronics and Communications Engineering program should study the following courses:

First Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS151	Engineering Mathematics (3)	3	2	0	5	10	3	40	0	110	150			5				
ELE141	Electric Circuits (1)	3	1	1	5	10	3	20	20	110	150			3		2		
ECE141	Solid State and Electronic devices	3	2	0	5	10	3	40	10	100	150			3		2		
CSE141	Programming Languages	2	1	2	5	10	3	30	20	100	150			2		3		
ENG233	Engineering Thermodynamic	2	1	0	3	5	2	30	0	70	100				3			
MUR115	Professional Ethics	2	0	0	2	3	2	15	0	35	50	2						
Total		15	8	2	25	48	16	175	50	525	750	2	0	13	3	7	0	0

First Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS155	Engineering Mathematics (4)	3	2	0	5	10	3	40	0	110	150			5				
CSE143	Logic and digital circuits	2	1	1	4	10	3	30	20	100	150			2		2		
ELE243	Electrical Measurements	2	1	1	4	10	3	35	15	100	150			2		2		
ECE142	Signals and Systems	3	2	0	5	10	3	50	0	100	150					5		
ENG111	Technical Report	2	1	0	3	5	2	30	0	70	100	3						
MUR221	Research and analysis skills	2	0	0	2	4	2	15	0	35	50	2						
Total		14	7	2	23	49	16	200	35	515	750	5	0	9	0	9	0	0

Second Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS251	Engineering Mathematics (5)	3	2	0	5	10	3	40	0	110	150			5				
ELE241	Electric Circuits (2)	3	1	1	5	10	3	20	20	110	150					2	3	
ECE211	Digital Design	2	1	0	3	8	3	20	10	70	100					2	1	
MUR114	Communication and presentation skills	2	2	0	4	4	2	40	0	60	100	4						
CSE142	Automatic Control Systems (1)	3	1	1	5	10	3	30	20	100	150				2	3		
ENG221	Engineering economy	2	1	0	3	4	2	30	0	70	100		3					
Total		15	8	2	25	46	16	180	50	520	750	4	3	5	2	7	4	0

Second Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ECE241	Analog Communications Systems	3	2	0	5	10	3	40	10	100	150					5		
ECE242	Electronic Circuits (1)	2	1	1	4	8	3	40	10	100	150					3	1	
ECE231	Measurements and instruments	2	1	1	4	8	3	20	10	70	100					3	1	
ELE247	Electric Power and Machine Systems	3	2	0	5	10	3	50	0	100	150				2	3		
ECE243	Electromagnetic Fields	3	2	0	5	10	3	40	0	110	150			3		2		
ENG112	Summer Training (1)	0	0	0	2	4	0	0	50	0	50							2
Total		13	8	2	23	50	15	190	80	480	750	0	0	3	2	16	2	2

Third Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ECE321	Digital Communications systems	3	1	1	5	8	3	40	10	100	150						5	
ECE311	Electronic Circuits (2)	3	1	1	5	8	3	40	10	100	150					2	3	
CSE341	Microprocessors design & Architecture	3	1	1	5	8	3	20	15	90	125						5	
ECE331	Microwave Electronics	2	1	1	4	8	3	20	15	90	125						4	
ECE312	Digital Signal Processing	2	1	0	3	8	2	20	10	70	100						3	
BAS351	Discrete Mathematics	2	1	0	3	6	2	30	0	70	100			3				
Total		15	6	4	25	46	16	170	60	520	750	0	0	3	0	2	20	0

Third Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ECE322	Wireless Communications	3	1	1	5	10	3	40	10	100	150						5	
ELE144	Power electronics 1	3	2	0	5	10	3	50	0	100	150					2	3	
ECE313	Electronic Circuits (3)	2	1	1	4	10	3	25	10	90	125						4	
ECE314	Opto-Electronics	2	1	1	4	8	3	25	10	90	125					2	2	
ECE323	Electromagnetic Waves	2	2	0	4	8	3	30	0	70	100					1	3	
-	Elective Course (1)	2	1	0	3	4	2	20	10	70	100						3	
Total		14	7	4	25	50	17	190	40	520	750	0	0	0	0	5	20	0

Fourth Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ECE421	Mobile Communications	2	2	0	4	8	3	35	0	90	125						4	
ECE411	Integrated Circuits	2	1	1	4	8	3	25	10	90	125						4	
ECE422	Antenna and Wave Propagation	2	2	1	5	10	3	40	10	100	150			2			3	
-	Elective Course (2)	2	1	0	3	6	2	20	10	70	100						3	
ECE431	Graduation Project (1)	1	2	1	4	8	0	100	25	0	125							4
MUR232	Energy, water and climate change issues	2	1	0	3	4	2	25	0	50	75	3						
ENG113	Summer Training (2)	0	0	0	2	4	0	0	50	0	50							2
Total		11	9	3	23	48	13	245	105	400	750	3	0	2	0	0	14	6

Fourth Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ENG214	Projects Management	2	1	0	3	5	2	30	0	70	100	2	1					
ECE423	Communication Networks	2	1	2	5	8	3	40	10	100	150					5		
CSE343	Embedded Systems	2	1	2	5	10	3	30	20	100	150					2	3	
-	Elective Course (3)	2	1	0	3	6	3	20	10	70	100						3	
ECE432	Graduation Project (2)	0	2	3	5	12	0	50	100		150							5
ENG211	Operation Research	2	1	0	3	5	2	30	0	70	100		1	2				
Total		10	7	7	24	45	13	200	140	410	750	2	2	2	0	7	6	5

Total teaching hours and subject's distribution over the subject areas according to the Reference Framework and NARS

Semester		Teaching Hours				Student Workload (SWL)	Subject Area						
		Lectures	Tutorial	Practical/Oral Exam	Contact Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year - 1st semester		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2ndsemester		12	8	5	25	50	0	0	12	3	10	0	
First year/1st semester		15	8	2	25	48	2	0	13	3	7	0	0
First year/ 2nd semester		14	7	2	23	49	5	0	9	0	9	0	0
Second year/1st semester		15	8	2	25	46	4	3	5	2	7	4	0
Second year/ 2nd semester		13	8	2	23	50	0	0	3	2	16	2	2
Third year/1st semester		15	6	4	25	46	0	0	3	0	2	20	0
Third year/ 2nd semester		14	7	4	25	50	0	0	0	0	5	20	0
Fourth year/1st semester		11	9	3	23	48	3	0	2	0	0	14	6
Fourth year/2nd semester		10	7	7	24	45	2	2	2	0	7	6	5
Total of Five Years		**133**	**76**	**33**	**242**	**482**	**21**	**5**	**64**	**10**	**67**	**66**	**13**
% of Five Years							8.5	2	25.6	4	27.6	26.4	5.2
% NARS And Reference Framework	**Min.**						**8.00**	**2.00**	**25**	**4.00**	**25.00**	**25.00**	**4.00**
	Max.						**12.00**	**4.00**		**6.00**	**30.00**	**30.00**	**6.00**

Summary of Courses Specifications

First Year-First Semester:

Course title	Engineering Mathematics-3			Course Code	BAS151
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	40	110		

Ordinary Differential Equations (ODE)

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undesemesterined coefficients method and variation of parameters method for finding the particular solution) – Cauchy-Euler ODE (homogeneous and nonhomogeneous) – System of ODE– Laplace transform – Inverse Laplace transform –Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables

Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems – Mathematical modeling using partial differential equations.

References:

- *S. A. Wirkus, and R. J. Swifi, "A Course of Ordinary Differential Equations", Taylor & Francis Group, LLC, 2015.*

Course title	Electric Circuits (1)			Course Code	ELE141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	20	20	110		

Circuit Variables; Circuit Elements; Circuit Sources, source transformations; Circuit Equations; Kirchhoff's Laws; writing circuit equations; circuit topology; circuit analysis; Resistive Circuits; simple circuits, star-delta and delta-star transformations; the Mesh-Current Method; The Node-Voltage Method; The application of SPICE; The Operational Amplifier; Response of First-Order RL and RC Circuits; Sinusoidal Steady-State Analysis Sinusoidal Steady-State Power Calculations; Superposition; Thevenin and Norton Equivalents; Maximum Power Transfer; The principle of impedance matching; Three-Phase Circuits; Balanced Three-Phase Voltages; phase sequence; Three-Phase loads balanced and unbalanced; Resonance in electric circuits; Series and parallel resonance.

References:

- Izadian*, Afshin, " Fundamentals of Modern Electric Circuit Analysis and Filter Synthesis", Springer International Publishing, 2019.*

Course title	Solid State and Electronic devices			Course Code	ECE141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	40	10	100		

Crystals in solids, properties; Quantum theory of solid; Electron and hole properties in semiconductors, doping of semiconductors, Fermi Dirac; Semiconductors in equilibrium. Doping, electric conductivity, PN Junction: Operation, forward bias, reverse bias; Metal-Semiconductor Junction. Diodes Characteristics – Zener and Schottky Barrier Diode - Diode SPICE Model. Diode Circuits Analysis. Field-Effect Transistors MOS Characteristics.The NMOS Transistor Characteristics- Mode MOSFETS – MOSFET Circuit Symbols – MOSFET Modeling in SPICE. The Junction Field-Effect Transistor – Bipolar Junction Transistors – Physical Structure – the NPN Transistor model – The Complete Transport Model Equations for Arbitrary Bias Equivalent Circuit Representations, The Operating Regions of the BJT, Biasing, PNP and other Devices.

References:

- *Sedra, Adel S., et al. Microelectronic circuits. Oxford University Press, 2016.*
- *Krishna Battula, "Electronic Devices and Circuits", Pearson education, 2008.*

Course title	Programming language			Course Code	CSE 141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to structure programming – Data types – Variables and constants declarations – Control statements – Arrays – Collections – Loops – Functions – Pointers – Recursion – Exception handling – Structs – Enumerations – Threading – Object oriented programming (OOP) – Classes and objects – Encapsulation – Polymorphism – Inheritance – Constructors – Destructors – Overloading – Overriding – Abstraction – Access modifiers – Interfaces – By value vs by reference – Garbage collection – File handling – Database connections and handling – Testing – Design patterns.

References:

- ***Matt Weisfeld, Object oriented through process (4th edition). Addison Wesley, 2013.***
- ***Harper, Robert. Practical foundations for programming languages. Cambridge University Press, 2016.***
- ***Steve McConnell, Code Complete: A Practical Handbook of Software Construction, Second Edition***
- ***Eric Matthes, Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming Paperback***

Course title	Engineering Thermodynamic			Course Code	ENG233
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Fundamental Concepts; First Law of Thermodynamics; Second Law of Thermodynamics; General Thermodynamic relations (Maxwell), Application of thermodynamic principles to simple engine cycles; Properties of vapours with specific reference to the use of the steam tables; Application to simple Rankine and refrigeration cycles; Properties of mixtures with specific reference to the measurement of humidity; Dimensional Analysis; Buckingham's theorem and derivation of some basic dimensional groups; Heat Transfer: use of the basic laws for simple problems in conduction, convection and radiation.

References:

Yunus A. Cengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill Education; 8 edition (January 7, 2014).

Course title	Professional Ethics			Course Code	MUR115
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
	0	15	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.

References:

- Harris, C. E., Jr., Pritchard, M. S., & Rabins, M. J. Engineering Ethics. Second edition. Belmont, CA: Wadsworth, 2000

- lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson Copyright © 2018.

First Year-Second Semester

Course title	Engineering Mathematics (4)			Course Code	BAS155
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	40	110		

Partial Differential Equations (PDE)

Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE) – Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.

Complex Analysis

Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping.

References:

- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***
- ***J. Brown, and R. Churchill, "Complex Variables and Applications, 8th Edition", McGraw-Hill, 2009.***

Course title	Logic and Digital Circuits			Course Code	CSE 143
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Digital systems, concepts, and information – Data representation – Number systems – Binary logic and gates – Arithmetic operations – Decimal codes – Alphanumeric codes – Gray codes – Combinational logic circuits and analysis – Boolean algebra – Simplification of logic functions – Standard forms – Map manipulation – Two-level circuit optimization – Karnaugh map (sum of product) minimization – Karnaugh map (product of sum) minimization – Adders – Subtractors – Encoders – Decoders – Multiplexers – Demultiplexer – Parity generators – Code converters – Comparators – Implementation of digital combinational circuit using TTL integrated circuits.

References:

- ***M. Morris R. Mano, Logic & Computer Design Fundamentals, 5th Edition, 2016.***
- ***Thomas L. Floyed, Digital fundamentals, Pearson international edition, 11th Edition, 2019.***

Course title	Electrical Measurements			Course Code	ELE243
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	15	35	100		

Basics and concepts of electrical measurements - Principle and types of analog and digital voltmeters and ammeters - Measurement devices for AC&DC power and power factor in single and three phase system- Measuring frequency –Instrument transformers – Instruments for measurement of frequency and phase. - D.C & A.C potentiometers, D.C & A.C bridges, measuring resistance and inductive reluctance- Multiple earth and earth loops – Grounding techniques - Transducers and Data Acquisition Systems: Classification of transducers- Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers.

References:

-Kirkham, H., Measurement and Instrumentation. Pacific Northwest National Lab.(PNNL), Richland, USA, 2018.

- Morris, A.S. and R. Langari, Measurement and instrumentation: theory and application, Academic Press, 2012

- Hauschild, W. and E. Lemke, High-voltage test and measuring techniques, Springer, 2014

Course title	Signals and systems			Course Code	ECE142
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	50	100		

Continuous-time signals; Discrete-time signals; Linear time invariant systems for Continuous-time signals; Linear time invariant systems for Discrete-time signals; Time Domain Analysis; Convolution (continuous); Convolution (discrete); System properties; Fourier Series; Continuous Fourier Transformation; Discrete (and Fast) Fourier Transforms; Circular Convolution (discrete); Laplace transform; Z Transform; Analog Filters design.

References:

Lizhe Tan Jean Jiang, "Digital Signal Processing Fundamentals and Applications", cademic Press, 9th November 2018.

Course title	Technical Report Writing			Course Code	ENG111
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

In part one; students will learn the principles of writing research papers. First, they will learn what research is, and how the process of research is revealed in the structure of research papers. Next, they will look at software tools and corpora that can assist them in the writing of research papers. Moreover, students will create their own corpus of research papers and will use throughout the remainder of the course. In Part two, students will write a full research paper: title, abstract, introduction, materials/methods, results and discussion, and conclusion.

References:

Daniel G. Riordan, "Technical Report Writing Today", Cengage Learning US, Edition 10, 2014.

Course title	Research and analysis skills			Course Code	MUR221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
	0	15	35		

Critical thinking - Assess and develop your thinking skills – Identifying arguments - Argument and non-argument - How well do they say it? Clarity, internal consistency and structure - Reading between the lines: Recognising underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and Note making: Critical selection, interpretation and noting of source material - Critical, analytical writing, Critical thinking when writing – Evaluating critical writing.

References:

Stella Cottrell, "Critical Thinking Skills, Developing Effective Analysis and Argument", PALCRAVE MACMILLAN, 2005.

Second Year-First Semester

Course title	Enginnering Mathematics (5)			Course Code	BAS251
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	40	110		

Numerical Methods

Curve fitting – Interpolation – Numerical integration – Numerical solution of algebraic and transcendental equations – Iterative methods for solving system of linear algebraic equations – Numerical differentiation – Numerical solution of ordinary differential equations – Numerical solution of partial differential equations– Finite difference method.

Applied Probability and Statistics

Introduction to probability – Discrete random variables – Special discrete distributions – Continuous random variables – Special continuous distributions – Multiple random variables – Sampling distribution and estimation theory – Test of hypotheses – Correlation theory – Analysis of time series.

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.***

Course title	Electric circuits (2)			Course Code	ELE241
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	20	20	110		

The Laplace Transform in Circuit Analysis; Sinusoidal Steady-State Response; Introduction to Frequency Selective Circuits; State Variables Analysis; Two Port Networks: (its analysis; admittance, impedance, hybrid, inverse hybrid, transmission and inverse transmission parameters; Network models; Conversion Among Parameter Sets; Reciprocity And Symmetry; Interconnected Two-Ports; Networks Terminated ;Impedance Converters and impedance inverters; Matching Two-Ports ;The Scattering Parameters), Analysis of Multi-Terminal Linear Active Networks (The Indefinite Admittance Matrix ; Network Functions of a Multi-pole ; Circuits Containing Operational Amplifiers; Analysis of Passive Ladder Networks).

References:

Izadian, Afshin, " Fundamentals of Modern Electric Circuit Analysis and Filter Synthesis", Springer International Publishing, 2019.

Course title	Digital Design			Course Code	ECE211
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

Overview and Introduction to the course, ROMs, Introduction to Programmable Logic Devices: SPLDs, CPLDs, and FPGAs, Introduction to Hardware Description Languages, VHDL data types, and operators, Combinational Logic Design Using VHDL, Analysis of clocked sequential circuits. Derivation of state graphs and tables, Reduction of state tables, state assignment, Sequential circuit design, VHDL for Sequential Logic Design, State Machine Design with SM Chart, VHDL for digital system design, Serial Adder with accumulator, Parallel Multiplier.

References:

M. Morris R. Mano, Michael D. Ciletti, " Digital Design", Prentice Hall; 4 edition (December 25, 2006)

Course title	Communication and Presentation Skills			Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	40	60		

Introduction to communication - communication process - communication skills - oral and non-verbal communication and report writing - letter writing and interview - planning a management presentation - everyday management presentations - advantages and disadvantages of presentations- four-stage presentation planning process (identify your aim, profile your audience, define your key message statement, and outline the scope.) - Audience profiling -presentation environment - management presentation planning guidelines.

References:

- Paul Newton & Helen Brstoll, "Planning a presentation", Free – management – ebook.

- Varinder Kumar, Raj Bodh, "Business Communication", Kalyani Publishers, New Delhi, 2001.

Course title	Automatic Control System (1)			Course Code	CSE 142
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to control systems - Open and closed loop control systems – Laplace transformation and transfer function - Block diagram reduction – Signal flow graph - Modeling of systems: (Electrical circuits, Mechanical systems, DC motors, AC servo motors, Synchro, Potentiometers, stepper motors – Hydraulic servo motor – Thermal systems – liquid level systems) – Linearization of nonlinear mathematical model – Time response analysis: (First order systems – second order systems – steady state error) – Stability of control systems: (Routh stability analysis – Determining relative stability using Routh) – Applications of the previous topics using MATLAB/Simulink toolboxes.

References:

- Farid Golnaraghi, Benjamin Kuo, "Automatic Control Systems", McGraw-Hill Education, 10 edition, 2017

- Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.

Course title	Engineering Economy			Course Code	ENG221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

The course studies cover three groups of topics: Introduction. Concepts of quality management. Quality dimensions of goods and services. Quality management evolution and works of quality gurus. Quality policy and quality organizations. National quality policy. International. System of assessment of quality conformity. Management systems and quality management principles for excellence. Quality control methods. Quality audit and certification of management systems. Sustainable development. Environment management systems. Occupational health and safety management system. Eco-labelling. Total quality management.

References:

Marco Sartor, Guido Orzes, "Quality Management: Tools, Methods and Standards", Emerald Publishing Limited, May 2019.

Second Year-Second Semester

Course title	Analog Communications Systems			Course Code	ECE241
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Introduction, Amplitude Modulation (DSB-SC), Generation and Demodulation of DSB-SC, Pilot carrier system, Amplitude Modulation Large Carrier (DSB-LC), Carrier and Sideband power in A.M, Generation and Demodulation of DSB-LC, Envelope Detection, AM Receiver, TRF Receiver, Super heterodyne Receiver, FDM. Amplitude Modulation Single-Side Band (SSB): Angle Modulation, Narrow Band F.M, Comparison between N.B. F.M and A.M, Wide Band F.M, Average Power in Angle Modulation, Phase Modulation, Pulse Amplitude Modulation, Sampling, Time-Division Multiplexing, Pulse shaping and ISI.

References:

K.C. Raveendranathan, "Analog Communications Systems: Principles and Practices", Orient Blackswan (September 23, 2008).

Course title	Electronic Circuits (1)			Course Code	ECE242
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Diode Circuit Analysis and Applications, Rectifier Circuits, Peak-Inverse-Voltage (PIV), Diode Power Dissipation, Clipping and Clamping Circuits, Power Generation from Solar Cells, AMPLIFICATION, Circuit MODELS FOR AMPLIFIERS-Impedance level transformation; VOLTAGE, current, Power gain; Frequency Response of Amplifiers, SINGLE-TRANSISTOR AMPLIFIERS; SMALL-SIGNAL MODELING AND LINEAR AMPLIFICATION; The BJT Amplifier. The MOSFET Amplifier Coupling and Bypass Capacitors Circuit Analysis Using dc and ac Equivalent circuits, Multistage ac-Coupled Amplifiers, Tuned Amplifiers, Current Source Circuits. Current Mirror Circuits. Differential Amplifiers.

References:

Ulrich Tietze, Christoph Schenk, Eberhard Gamm "Electronic Circuits: Handbook for Design and Application", Springer; 2nd edition (March 11, 2008).

Course title	Measurements and Instruments			Course Code	ECE231
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

Ac signal sources, Oscillators, Selection of an Oscillator, Barkhausen criteria. Audio and Radio frequency oscillator, Crystal oscillator. Signal and Sweep frequency generator, Pulse and Square wave generator, Function Generator, Attenuators. Harmonic analysis, Frequency spectrum of waveform, Harmonic distortion. Harmonic Analyzing Instruments, Harmonic distortion analyzer. Wave analyzer, spectrum analyzer. Transducers, classification of transducers, Selecting of Transducer, Different types of Transducers. Data acquisition system, Signal-conditioning circuit. Digital to Analog and Analog to Digital converters.

References:

Prithwiraj Purkait Budhaditya Biswas Santanu Das, "Electrical and Electronics Measurements and Instrumentation", McGraw Hill Education India Pvt Ltd; 1st edition (January 1, 2013).

Course title	Electric power and Machine Systems			Course Code	ELE247
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	50	100		

Generation distribution and Transmission of Electric Power, protection systems, Secondary stations, Stations devices, Transmission lines, Transmission/distribution system parameters: overhead lines, resistance, inductance, capacitance; underground cables, resistance, inductance and capacitance, Steady and transient models of short and long transmission lines, Transformers, Principles of electrical machines AC and DC machines - speed control linear motors, induction motors, synchronize motors, Special motors - Transformers AC and DC distribution systems.

References:

Isaak D Mayergoyz, Patrick McAvoy, " Fundamentals of Electric Power Engineering", WSPC (November 13, 2014)

Course title	Electromagnetic Fields			Course Code	ECE243
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Review of Vector Algebra and Calculus, Coulomb's Law and the Electric Field Intensity, Electric Flux and Flux Density Gauss's Law, Electrostatic potential, Conductors, Dielectrics, and Capacitance, Boundary conditions for electrostatic fields, Uniqueness, Method of Images, Simple Boundary value problems, Conformal Mapping Technique, Electrostatic Energy, The Steady Magnetic Field, Biot-Savart law, The Vector magnetic potential, Magnetic materials, Boundary Conditions, Inductance, Magnetic energy, Magnetic Forces, and Torque: Lorentz force, Time Varying Fields and Maxwell's Equations: Introduction.

References:

Salam, Md. Abdus, "Electromagnetic Field Theories for Engineering", Springer Singapore, 2014.

Course title	Summer Training (1)			Course Code	ENG112
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
	50	0	0		

Students promoted to the 2nd year are to carry out professional training inside the faculty.

Third Year-First Semester

Course title	Digital Communications Systems			Course Code	ECE321
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Introduction to Digital Communications, Digital Modulation, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Differential Phase Shift Keying (DFSK), Quadrature PSK, Eight Phase Shift Keying (8-PSK); Satellite Communication, Orbital Satellite, Geostationary Satellites, Satellite System Parameters, Satellite System Link Equations. Review of probability and random processes; Information and uncertainty, Entropy; Source coding, Shannon first theorem; Discrete memory less channels, Mutual information; Shannon second theorem, Channel capacity; Rate distortion theory, Differential Entropy, Gaussian Channel; Geometric representation of signals in the signal space; Block codes, Syndrome decoding; Cyclic codes; Hamming codes, BCH codes, Reed Solomon codes; Convolutional codes; Maximum likelihood decoding.

References:

Yeung, Raymond W, "Information Theory and Network Coding", Springer US, 2008.

DR. J. S. CHITODE, "DIGITAL COMMUNICATION", Technical Publications; 1st edition, 2011.

Course title	Electronic Circuits -2			Course Code	ECE311
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Cascode Stages and Current Mirrors.Differential amplifiers. Frequency Response: relation between transfer function and frequency response, transfer function poles and zeros, estimation of lowfrequency and high frequency poles and zeros, bode plot, high frequency model of BJTs and MOSFETs, Miler's theorem, frequency response of differential amplifiers. Feedback: loop gain, negative feedback properties as gaindesensitization, bandwidth extension, types of amplifiers, polarity of feedback, feedback topologies, and stability of feedback systems as phasemargin and frequency compensation.

References:

Ulrich Tietze, Christoph Schenk, Eberhard Gamm "Electronic Circuits: Handbook for Design and Application", Springer; 2nd edition (March 11, 2008).

Course title	Microprocessors Design and Architecture			Course Code	CSE 341
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Computer organization and design – Designing an arithmetic and logic unit – Computer components and data transfers via buses – Different types of computer busses – Getting familiar with the different types of busses – Microprocessor design and programming – Microprocessor classes and families –Designing a microprocessor – Hardwired control unit, design, and implementations – Designing a control unit – Micro-programmed control unit – Implementation via modern description language (VHDL) – Memory organization – Pipeline and vector processing – Computer arithmetic – Input and output organization.

References:

- *Mano, M. Morris, and Charles R. Kime. Logic and computer design fundamentals. Pearson Higher Education, 2015.*

Course title	Microwave Electronics			Course Code	ECE331
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	15	20	90		

Introduction; O type tubes; Two cavity Klystron; Reflex Klystron; M-type tubes-bMagnetron: Construction and Principle of operation of 8 cavity cylindrical travelling wave magnetron, o/p characteristics, Applications; Slow wave devices: Advantages of slow wave devices, Helix TWT: Construction and principle of operation, Applications; Microwave Solid State Devices: Microwave bipolar transistor, FET, MESFET, Varactor Diode, PIN Diode, Shottky Barrier Diode, Tunnel Diode, Gunn Diodes, IMPATT diode and TRAPATT diode. Principle of operation, various modes, specifications, and applications of all these devices; Theory of lasers Oscillator.

References:

Nguyen, Cam. Radio-frequency integrated-circuit engineering. John Wiley & Sons, 2015.

Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", 2nd Edition, 2003.

Course title	Digital Signal Processing			Course Code	ECE312
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

Sampling and Reconstruction of continuous time signals, Characterization and properties of discrete time signals and systems, Computation of the discrete time Fourier transform and its properties, Computation of the discrete Fourier transform and its properties, Fast Fourier transform algorithms, The Z-transform and its properties, Transform analysis of linear time invariant systems, Implementation of structures for discrete time systems, Digital filter design techniques, Homomorphic filtering, Applications of DSP in speech and image processing.

References:

Lizhe Tan Jean Jiang, "Digital Signal Processing Fundamentals and Applications", cademic Press, 9th November 2018.

Course title	Discrete Mathematics			Course Code	BAS351
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Logic and logical equivalence- Methods of proofs- Mathematical induction- Algorithms- Basic counting techniques- Advanced counting techniques- Recurrence relations- Binary relations- Graphs - Shortest path algorithm- Trees- Minimum spanning trees.

References:

Kenneth H Rosen, "Discrete mathematics and its applications", New York, NY: McGraw-Hill, 2019.

Third Year-Second Semester

Course title	Wireless Communications			Course Code	ECE322
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	15
	10	40	100		

Path Loss and Shadowing; Transmit and receive Signal models; Statistical Multipath Channel Models; Narrowband fading models; wideband fading models; Diversity; selection combining; Threshold combining; maximal ration combining; equal-gain combining; transmitter; Multiple antenna systems; MIMO cahnnel capacity; beam forming; smart antennas; Multi carrier modulation; single carrier frequency division multiple Access (SC-FDMA); filter bank multi-carrier modulation (FBMC); Wireless Channel Propagation; Spread Spectrum systems; THSS Modulation; Hybrid systems; Spreading and Scrambling Codes; Multicarrier systems; MIMO OFDM; Channel Capacity; Diversity.

References:

Andrea Goldsmith, "Wireless Communications", Cambridge University Press; 1 edition (August 8, 2005).

Course title	Power Electronics (1)				Course Code	ELE144
Teaching hours	Lectures	Tutorial		Practical	Contact hours	5
	3	2		0		
Course grades	Oral	Practical	Sem. work	Final Exam.	Total grads	150
	0	0	50	100		

Mono stable Multi vibrators –Bi stable Multi vibrators- Flip Flops based counters - Use of counters as pulse circuits - Control methods of pulse circuits by frequency and pulse width - Decoding circuits - Microcontroller programming - applications of Microcontrollers in power electronics.

Single-phase uncontrolled rectifier circuits – Three-phase uncontrolled rectifier circuits – Single-phase controlled rectifier circuits – Three-phase controlled rectifier circuits – power switches protection –Thyristor firing circuits – Firing pulse amplifiers – Thyristor commutation circuits and techniques – DC choppers – Applications of DC choppers.

References:

- ***Mohamed Rashid, Narendra Kumar, Ashish R. Kulkarni, "Power Electronics Circuits, Devices and Applications'' Pearson-Hall, 4 ed, 2014.***
- **Daniel W. Hart, "Power Electronics", McGraw-Hill, 2011.**

Course title	Electronic Circuits (3)			Course Code	ECE313
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	10	25	90		

Analog Electronics: Power Amplifiers Class-A Amplifiers Efficiency of Class-A Amplifiers Class-B Push-Pull Amplifiers Class-AB Amplifiers Nonlinear Distortion ,Thermal considerations; Feedback amplifiers, Effect of FB on ;Nonlinear Distortion and Noise, Input and Output Impedances, Gain and Frequency Response, Feedback Networks, Phase Locked Loops (PLL); Oscillators; The Barkhausen Criteria for Oscillation ,Phase Shift Oscillators, Wien Bridge Oscillators, LC Oscillators and Crystal Oscillators, wave generators.

References:

Ulrich Tietze, Christoph Schenk, Eberhard Gamm "Electronic Circuits: Handbook for Design and Application", Springer; 2nd edition (March 11, 2008).

Course title	Opto-Electronics			Course Code	ECE314
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	10	25	90		

Optoelectronics: Wave Nature of Light, Dielectric Waveguides and Optical Fibers, Light-Emitting Diodes, Stimulated Emission Devices: Optical Amplifiers and Lasers, Photodetectors and Image Sensors, Polarization and Modulation of Light.

References:

John P. Dakin, Robert Brown, "Handbook of Optoelectronics: Concepts, Devices, and Techniques", CRC Press Published October 11, 2017.

Course title	Electromagnetic Waves			Course Code	ECE323
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Review of Maxwell's equations; Uniform Plane waves, Waves in unbounded lossless media , Polarization of plane waves, Phase velocity and group velocity, Waves in Lossy media; Reflection, Refraction, and Diffraction; Electromagnetic Theorems; Wave propagation on a transmission line; Smith Chart, impedance mismatches and reflections; TEM, TE and TM electromagnetic waves, parallel-plate waveguide; Rectangular waveguide and cylindrical waveguide; Planar transmission lines; Microwave Network Analysis; Impedance Matching and Tuning; Microwave Resonators; Microwave Passive Components.

References:

Bansal, Rajeev. Fundamentals of engineering electromagnetics. CRC press, 2018.

Carlo G. Someda, "Electromagnetic Waves ", CRC Press; 2 edition (January 13, 2006).

Course title	Elective Cource (1)			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

ECE315 Digital Image processing

Introduction to image processing and computer vision, Image processing basics, MATLAB basics, The Image Processing Toolbox, Image sensing and acquisition, Arithmetic and logic operations, Geometric operations, Image enhancement in the spatial domain, Frequency domain filtering, Image restoration, Morphological image processing, Edge detection, Image segmentation, Color image processing, Feature extraction and representation, Visual pattern recognition.

References:

John C. Russ "The Image Processing Handbook" 7th Edition CRC Press; (2015)

ECE316 Digital VLSI Circuits Design

Introduction; VLSI Design Parameters VLSI Design Styles; ASIC; Programmable Logic Devices (PLD); System-on-Chip (SoC); VLSI Design Flow: Top-Down Design; Bottom-up Design; Design Domain; Static MOS inverters: NMOS, CMOS, Pseudo NMOS; Dynamic MOS inverters; Domino; NORA CMOS; Programmable Logic Design; Field Programmable Gate Array (FPGA); FPGA structure; Programming Technology; Commercially Available FPGA; System Design using: MentorGraphics Tools and Xilinx ISE Tools.

References:

Kaeslin, Hubert. Top-down digital VLSI design: from architectures to gate-level circuits and FPGAs. Morgan Kaufmann, 2014.

ECE317 Error Control Coding

Introduction for the theoretical and historical motivation behind modern error control coding, Introduction to linear block codes, gene; Properties of linear block codes; Convolutional codes; Reed-Solomon codes trellis-coded modulation; Decoding of convolutional codes-I: Viterbi algorithm; Decoding of convolutional codes-II:BCJR algorithm; Some simple linear block codes; Bounds on size of codes; Low density parity check codes; Decoding of low density parity check codes; Applications of linear block codes.

References:

Imai, Hideki, ed. Essentials of error-control coding techniques. Academic Press, 2014.

ECE318 Biomedical Electronics

Introduction to Biological Instrumentations, Biological Signals Types and Functions, Biological Systems, Biological Sensors and Transducers, Biological Amplifiers, Design of Biomedical Instrumentation, Electrocardiogram analysis and its circuits, Electroencephalogram, Electromyogram, Fluorescence Microscopy, Medical Image Modalities, Statistics of Medical Signals, Medical Signal and Image Analysis, Applied Project: Biomedical System design.

References:

- ***John C. Russ "The Image Processing Handbook" 7th Edition CRC Press; (November 11, 2015)***
- ***Shih-Chii Liu, Jorg Kramer, Giacomo Indiveri, "Analog VLSI: Circuits and Principles", A Bradford Book (November 15, 2002).***
- ***Shu Lin, Daniel J. Costello, " Error Control Coding", Pearson; 2 edition (June 7, 2004)***
- ***G S Sawhney, "Biomedical Electronics and Instrumentation", I.K.International Publishing House; 1st Edition 2011 edition (November 29, 2011).***
- ***G S Sawhney, "Biomedical Electronics and Instrumentation", I.K.International Publishing House; 1st Edition 2011 edition (2011)***

Fourth Year-First Semester

Course title	Mobile Communications			Course Code	ECE421
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	0	35	90		

Global System for Mobile Communications (GSM): Introduction to cellular Fundamentals; General Packet Radio Service (GPRS) and EDGE; Universal Mobile Telecommunications System (UMTS) and HighSpeed Packet Access (HSPA); GSM network protocols, planning, and optimization, architecture, air interface, signal processing and transmission; WCDMA system, WCDMA modulation and demodulation, WCDMA air links, Link protocol, types of codes in WCDMA, power control in WCDMA, handoff, WCDMA capacity; LTE network protocols, planning, and optimization, architecture, air interface, signal processing and transmission; Mobile Propagation (Path loss) models and empirical models.

References:

Alexander Kukushkin, "Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G", 1st Edition, Wiley; 2018.

Course title	Integrated Circuits			Course Code	ECE411
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	10	25	90		

Introduction; IC Overview: History of IC; IC Evolution; Why CMOS; CMOS Trends; New CMOS Structure: FinFET Transistor; Silicon-on-Insulator (SOI); NAND Flash Cell; Solid State Drive (SSD); IC Fabrication; Design Rules and Layout; MOS Scaling and Short Channel Effects (SCEs); Analog and Digital MOS Switch; Designing for Low Power; BiCMOS Circuits.

References:

D. Widmann, H. Mader, H. Friedrich, "Technology of Integrated Circuits", Springer-Verlag Berlin Heidelberg, 1 edition, 2000.

Course title	Antenna and Wave Propagation			Course Code	ECE422
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	2	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

Basic Antenna Parameters; Dipole, Monopole antennas, Loop antennas; Traveling wave antennas; Broadband Antennas, Helical, Yagi-Uda, Log-periodic antennas; Antenna Arrays; Overview of Aperture antennas: Horn and Reflector antennas; Overview of Microstrip antennas; Basic propagation modes, free space, ground reflection and diffraction; Ground wave propagation. Sky wave propagation; Atmospheric effects on radio wave propagation; Space wave propagation; Propagation models in mobile radio systems. Channel modelling, statistical modelling, empirical modelling, multipath fading; Basic diversity combining techniques.

References:

U. A. BAKSHI, "ANTENNA & WAVE PROPAGATION", Technical Publications; 1st edition, 2011.

Course title	Elective Course (2)			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

ECE426 Satellite Communications:

Fundamental and practical aspects of satellite communications systems; historical perspective of how satellite systems are designed and deployed; Orbital aspects of satellite communication; Satellite link design; Modulation and multiplexing techniques for satellite links: Analog telephone transmission and multiplexing, analog TV transmission SNR calculations, Digital transmission and reception, TDM, BER & SER calculations; Multiple access: FDMA, TDMA, CDMA.

ECE413 Multimedia Processing:

Fundamentals of multimedia processing, computer vision, machine learning, and multimedia computing. The basics of image, video and audio formation and processing, the basics of multimedia compression and representation. The students will be exposed to dealing with image and video data through programming assignments using Java and Matlab.

ECE414 Electronics for Instrumentations:

Electronic indicating, display, recording and analysis instruments, signal generators, frequency synthesizer, counters, elements of design, grounding and shielding, electronic circuits manufacturing technology, metrology, standards in quality management, instrumentation in hazardous area, industrial communication techniques.

ECE427 Nano-Photonics:

Introduction: Photonics and Optoelectronics: why nano? – Nano-photonics overview; Materials for Nano photonics: Quantum effect for electronic confinement: quantum dots, Nano-particles – from semiconductor to organic, Microcavity effect for photonic confinement: photonic crystals; Building Blocks for Nano-photonics: Nano-lasers, Nano-detectors, Nano-sensors, Nano-channels; System Integration for Nano-photonics: Photonic crystal Nano-PIC, Silicon PIC, Other approaches.

ECE415 Computer Vision:

Introduction to computer vision; fundamentals of image formation; camera imaging geometry, Image statistics, edges, and texture; Image motion estimation and tracking; Stereo, image classification, scene understanding, and deep learning with neural networks; depth recovery from stereo, camera calibration, image stabilization, Optical flow (image motion): affine flow, regression, dense flow; Robust statistics; Segmentation and grouping; automated alignment, tracking, boundary detection, and pattern recognition. Bayesian inference; Principal component analysis and eigen-models of object.

References:

- *Louis J. Ippolito Jr., "Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance" 1st Edition , Wiley; (October 13, 2008)*
- *John C. Russ "The Image Processing Handbook" 7th Edition CRC Press; (November 11, 2015)*
- *Michael Collier, Jade Zheng, "Electronic Instrumentation and Measurement: Theory and Applications (Technology Today Series) ", CreateSpace Independent Publishing Platform (May 1, 2014)*
- *Sergey V. Gaponenko, "Introduction to Nanophotonics" 1st Edition, Cambridge University Press; 2010.*
- *Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer; 2011.*

Course title	Graduation Project-1			Course Code	ECE431
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	1	2	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	25	100	0		
Prepare and submit technical proposal for the senior design ("Capstone") project to be executed. Discuss issues relating to the engineering profession, including such topics as: intellectual property, sources of technical information, engineering codes and standards, professional organization, professional registration.					

Course title	Energy, water and climate change issues			Course Code	MUR232
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	75
	0	25	50		
The Energy Crisis; Non-Renewable Energy Sources; Renewable Energy Sources; Nuclear Power; The Safety of Energy Sources; Pollution of the Environment; Climate Change; Politics, Psychology and Education; The Needs of the Developing Countries; Moral Problems and Responses. **References:** ***Peter E Hodgson, "Energy, the Environment and Climate Change", Imperia College Press, 2010.***					

Course title	Summer traning (2)			Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
	50	0	0		
Students promoted to the 4th year are to carry out field training inside the university or at specialized training sectors, or related organizations/companies under supervision from the department faculty. Students trained outside the country should be approved by the Department Councils.					

Fourth Year-Second Semester

Course title	Projects Management			Course Code	ENG214
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	·		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Overview of Projects Management; Projects Management Growth: Concepts and Definitions; Organizational Structures [used in Projects Management]; Organizing and Staffing the Project Office and Team; Management Functions [in a Projects Environment]; Management of Your Time And Stress; Conflicts; Special Topics [in Projects Management]; The Variables for Success; Working With Executives; Planning; Network Scheduling Technique; Projects Graphics; Pricing and Estimating; Cost Control; Trade-Off Analysis in a Projects Environment; Risk Management; Learning Curves; Contract Management; Quality Management.

References:

Nigel J. Smith, "Engineering Project Management", 2nd Edition, 2002.

Course title	Communication Networks			Course Code	ECE423
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10	40	100		

This course introduces the underlying concepts behind networking using the Internet and its protocols. The course covers the network stack from the application layer to the physical layer. Review of the OSI model and TCP/IP. Introduction to queueing systems and network calculus. Routing, flow control, and media access. Traffic modeling. Packet radio networks. Design philosophy of wireless networking standards and protocols. Emerging wireless technologies. Wired/wireless signal transmission, computer network design, construction and operation, information processing, security and other telecommunication systems technologies. Basic knowledge of communication networks such as communication engineering, communication protocols, and information processing. Education and research programs on the Internet, mobile systems, and security are designed for students to learn the basics of communications systems design and networks configurations.

References:

Roger L. Freeman , "Telecommunication System Engineering", Fourth Edition, Wiley; May 2004.
Doug Lowe' "Networking All-in-One For Dummies", For Dummies; 7 edition (April 10, 2018)

Course title	Embedded Systems			Course Code	CSE 343
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to microcontrollers– microcontrollers' architectures- microcontroller configurations – I/O programming - Advanced Programming Application (Buttons-LCD-Keypad-ADC-PWM-Motor control-LEDs-EEPROM-Interrupt) Embedded system architecture. Processor examples: AVR, ARM, DSP. Peripherals on chips. Real-time operating systems. Software for embedded systems design.

References:

Ibrahim, Dogan. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC 18F Series. Newnes, 2016.

Course title	Elective Course (3)			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	10	20	70		

ECE416 Robotics Design:

Introduction to robotics; Major design components; actuators, sensors and drives; Control Components; Embedded Robot Controller, I/O Interface, and PWM Amplifier; Controller Software and Sensor Inputs; Implement Basic Sensor-based Controls; Plan Strategy for De-mining Task ;Kinematics; Refine De-mining Operations; Differential Motion; Rescue Robot; Hybrid Position-force Control; Compliance, End-effector Design; Non-holonomic Systems; Legged Robots, Multi-fingered Hands; Navigation; Computer-based design, analysis and hands-on project assignment; Tele-robotics and Virtual Reality.

References:

- *Mihelj, Matjaž, Bajd, Tadej. Šlajpah, Sebastjan, "Robotics", SpringerLink, 2nd edition, 2019.*

ECE428 Broadband Wireless Communications

Introduction to broadband wireless communication techniques; Wireless channel characteristics and modeling; Modern diversity techniques; Error control coding and decoding; Equalization; Antenna arrays; Multiple-input/multiple output channel modeling in the angular domain and statistical models; Smart antennas techniques; Multiple-input/multiple-output communications systems; Spatial multiplexing; Space-time processing and coding; Multiuser detection and receiver designs; Multiple access and interference management; Cooperative relaying; Opportunistic communications; Multiuser water-filling.

References:

- *Luise, Marco, and Silvano Pupolin, eds. Broadband Wireless Communications: Transmission, Access and Services. Springer Science & Business Media, 2012.*
- *Chilamkurti, Naveen, Sherali Zeadally, and Hakima Chaouchi, eds. Next-generation wireless technologies: 4G and beyond. Springer Science & Business Media, 2013.*

ECE429 Optical Communications

Optical Fiber Transmission; Lasers; Optical Modulators and Modulation Schemes; Optical Receivers; Optical Amplifiers; Transmission System Design; Performance Analysis; Channel Multiplexing Techniques; Nonlinear Effects in Fibers; Digital Signal Processing.

References:

- *Rongqing Hui, "Introduction to Fiber-Optic Communications 1st Edition", Academic Press Elsevier, 2019.Analog*

ECE417 VLSI Circuits Design:

Basic and advanced aspects of analog integrated circuit design; General-purpose operational amplifiers and oscillators, and including frequency response, noise, feedback, and stability. The course will enhance students understanding of the trade-offs involved in analog circuit design and switched capacitor circuits design. Introduce 'real-world' design issues like robustness for process, voltage and temperature variations. Use design project to let the student step through the different stages of an analog integrated circuit (block) design; Basic hand-calculations and computer aided analysis using SPICE (simulation program with integrated circuit emphasis), or Cadence, will be used to refine a design.

References:

- *Ismail, Mohammed, and José E. Franca, eds. Introduction to analog VLSI design automation. Vol. 95. Springer Science & Business Media, 2012.*

Course title	Graduation Project (2)			Course Code	ECE432
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	0	2	3		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	100	50	0		

Continuation and completion of the project based on the proposal approved in the first semester. Progress of the project is monitored by the instructor with demonstrations and presentations at given due dates of the regularly scheduled course. An oral presentation and demonstration of the project by the student team must be given and a written report submitted at the end of the course. Successful projects are approved for the presentation at the Senior Design Project Workshop in the presence of students, faculty and industry representatives.

Course title	Operation Research			Course Code	ENG211
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Operational research provides tools and theories to solve real-world problems by finding the optimal solutions to the models subject to constraints of time, labor, resource, material, and business rules. With Operations Research, people make intelligent decisions to develop and manage their processes and businesses. Operations Research is composed of the following areas: (1) Linear programming, (2) Nonlinear programming, (3) Dynamic programming, (4) Stochastic modeling and simulation, (5) Network programming, (6) Computer simulation, (7) Queuing, (8) Time-series analysis, and (9) Applications in engineering, science, economics, and management.

References:

- *Mano, M. Morris, and M. D. Ciletti. "Digital Design." New Jersey, Pearson Education Inc (2015).*
- *A. Ravi Ravindran, " Operations Research Applications", CRC Press, 2008.*

Computer and Control Systems Engineering Program

Computer and Control Systems Engineering Program

Program description

The Computers and Control Systems Engineering field is one of the fastest-growing branches of engineering. The Computers and Systems Engineering program is concerned with the analysis, design and evaluation of computer systems, both hardware and software. The program emphasizes computer organization and architecture, systems programming, operating systems and digital hardware design. This field of study not only focuses on how computer systems work, but also how they integrate into the larger picture.

Program LO (specialized)

In addition to the competencies for all engineering programs (Level A) and the competencies for the BASIC **Electrical** engineering discipline (Level B), the **Computer and Systems Engineering Program** graduate must be able to (Level C):

C1. Demonstrate a high level of competence in identifying, defining and solving Computers and Control Systems Engineering problems.
C2. Select and apply appropriate mathematical tools, computing methods, design techniques and tools in Computers and Control Systems Engineering disciplines, for modeling and analyzing computer and systems;
C3. Evaluate different techniques and strategies for solving Computers and Control Systems Engineering problems;
C4. Maintain a sound theoretical approach in dealing with new and advancing technology;
C5. Select and apply appropriate IT tools to a variety of Computers and Control Systems Engineering problems.
C6. Generate an innovative design to solve a problem containing a range of commercial and industrial constraint.

Required Courses

In order to get a Bachelor of Science Degree in this program, and to satisfy the program LO, the following set of courses need to be completed.

List of Computer and Systems Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requirements
	Faculty of Engineering Requirements
	Electrical engineering Requirements
CSE 211	Automatic Control Systems 2
CSE 221	Advanced Digital & Logic Circuits Design
CSE 212	Nonlinear Control Systems
CSE 311	Digital Control Systems
CSE 321	Database Systems
CSE 312	Automatic Control System 3
CSE 313	Programmable logic controllers
CSE 314	Machine learning
CSE 322	Advanced Networking
CSE 411	Artificial Neural Networks
CSE 421	Computer architecture
CSE 422	Web Development
CSE 423	Distributed Systems
CSE 324	Advanced Concepts of Database systems
CSE 431	Graduation Project 1
CSE 432	Graduation Project 2
-	Elective Course 1
-	Elective Course 2
-	Elective Course 3

Elective Courses	
Code	**Elective Course (1)**
	Control system field:
CSE161	FPGA Prototyping using HDL
CSE162	Advanced topics in control systems
CSE163	Intelligent Transportation Systems
CSE164	Smart Grids
	Computer engineering field:
CSE171	Wireless and optical communications
CSE172	Computer System Security
CSE173	Multimedia
CSE174	Image Processing
CSE175	Software Engineering
Elective Course (2)	
	Control system field:
CSE261	Computer vision
CSE262	Fuzzy and predictive control systems
CSE263	Robotics Modeling & Control
	Computer engineering field:
CSE271	Real time operating systems
CSE272	Geographic Information Systems
CSE273	Advanced Topics in Programming Language
CSE274	Business Information Systems
CSE275	Cyber Security
Elective Course (3)	
	Control system field:
CSE361	Deep learning
CSE362	Nanotechnology
CSE363	Advanced topics in microcontrollers
CSE364	Optimal & Robust Control
CSE365	Internet of things
	Computer engineering field:
CSE371	Computer Game Architecture and Virtual Reality
CSE372	Information and decision-making systems
CSE373	Satellite image processing and remote sensing
CSE37٤	Wireless Networking and Mobile Computing
CSE375	Selected Topics in Computer Engineering

Program courses and subject area:

In addition to the courses of preparatory year, the students of Computers and Systems engineering program should study the following courses:

First Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical/oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 151	Engineering Mathematics 3	3	2		5	10	3	40		110	150			5				
ECE 242	Electronic circuits (1)	2	1	1	4	8	3	40	10	100	150					3	1	
CSE 141	Programming language	2	1	2	5	10	3	30	20	100	150			2		3		
CSE 142	Automatic Control System (1)	3	1	1	5	10	3	30	20	100	150				2	3		
ENG 251	Operating systems	2	0	1	3	6	2	20	10	70	100			3				
MUR 221	Research and analysis skills	2	0	0	2	4	2	15	0	35	50	2						
Total		14	5	5	24	48	16	175	60	515	750	2	0	10	2	9	1	0

First Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 155	Engineering Mathematics 4	3	2		5	10	3	40		110	150			5				
ELE 141	Electric circuits (1)	3	1	1	5	10	3	20	20	110	150			3		2		
ELE 243	Electrical Measurements	2	1	1	4	8	3	35	15	100	150			2		2		
CSE 143	Logic and Digital Circuits	2	1	1	4	8	3	30	20	100	150			2		2		
ENG 252	Sensors	2		1	3	6	2	20	10	70	100			3				
MUR115	Professional Ethics	2	0	0	2	4	2	15		35	50	2						
Total		14	5	4	23	46	16	165	70	515	750	2	0	15	0	6	0	0

Second Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 251	Engineering Mathematics 5	3	2		5	10	3	40		110	150			5				
CSE 241	Data structure and algorithms	3	1	1	5	10	3	30	20	100	150			2		3		
ELE 241	Electric circuits (2)	3	1	1	5	10	3	20	20	110	150					2	3	
CSE 211	Automatic Control Systems (2)	2		1	3	6	3	20	15	90	125						3	
CSE 221	Advanced Digital & Logic Circuits Design	2		1	3	6	3	20	10	70	100						3	
MUR114	Communication and presentation skills	2	2	0	4	8	2	25		50	75	4						
Total		15	6	4	25	50	17	155	65	530	750	4	0	7	0	5	9	0

Second Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ELE 144	Power Electronics (1)	3	2		5	10	3	50		100	150					2	3	
ECE 243	Electromagnetic fields	3	2		5	10	3	40	0	110	150			3		2		
ECE 241	Analog Communication Systems	3	2		5	10	3	50		100	150					5		
CSE 242	Intro. to Computer Networks	3	1	1	5	10	3	30	20	100	150				3	2		
CSE 212	Nonlinear Control Systems	2	1	1	4	8	3	30	20	100	150					2	2	
Total		14	8	2	24	48	15	190	50	510	750	0	0	3	3	13	5	0

Third Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ECE 142	Signals and Systems	3	2		5	10	3	40	10	100	150					5		
CSE 341	Microprocessor design and architecture	3	1	1	5	10	3	20	15	90	125						5	
CSE 342	Artificial intelligence	3	1	1	5	10	3	20	15	90	125				2	1	2	
CSE 311	Digital Control Systems	2	1	1	4	8	3	20	10	70	100						4	
CSE 321	Database Systems	2		1	3	6	3	20	10	70	100					1	2	
ENG 212	Quality control	2	1		3	6	2	30		70	100		3					
ENG 112	Summer Training (1)			2	2	0		10	15	25	50							2
Total		15	6	4	25	50	15	165	80	505	750	0	3	0	2	7	13	2

Third Year-Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
CSE 343	Embedded systems	2	1	2	5	10	3	30	20	100	150					2	3	
CSE 312	Automatic Control System (3)	2	1	1	4	8	3	20	15	90	125						4	
CSE 313	Programmable logic controllers	2	1	1	4	8	3	20	15	90	125					2	2	
CSE 314	Machine learning	2	1	1	4	8	3	20	15	90	125						4	
CSE 322	Advanced Networking	2	1	1	4	8	3	20	15	90	125					2	2	
ENG 111	Technical Report writing	2	1		3	6	2	30		70	100	3				0	0	
Total		12	6	6	24	48	17	145	85	520	750	3	0	0	0	6	15	0

Fourth Year-First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester oral Work	Practical Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
CSE 411	Artificial Neural Networks	2	1	2	5	10	3	20	15	90	125						5	
CSE 421	Computer architecture	2	1	1	4	8	3	20	15	90	125						4	
CSE 422	Web Development	2	1	1	4	8	3	20	15	90	125						4	
-	Elective Course 1	2	1	1	4	8	3	20	15	90	125						4	
CSE 431	Graduation Project 1	1	1	2	4	8	0	20	15	90	125		1					3
MUR233	Environmental issues	2	1	0	3	6	2	25		50	75	3						
ENG 113	Summer Training (2)			2	2	0		10	15	25	50							2
Total		11	6	7	24	48	14	135	90	525	750	3	1	0	0	0	17	5

Fourth Year-Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Total Hours			Semester Work	Practical oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
CSE 423	Distributed Systems	2	1	1	4	8	3	30	20	100	150					2	2	
CSE 424	Advanced Concepts of Database systems	2	1	1	4	8	3	20	15	90	125					1	3	
-	Elective Course 2	2	1	1	4	8	3	20	15	90	125						4	
-	Elective Course 3	2	1	1	4	8	3	20	15	90	125						4	
ENG 214	Project Management	2	1		3	6	2	30		70	100	2	1					
CSE 432	Graduation Project 2	1	1	2	4	10		20	15	90	125							4
Total		11	6	6	23	48	14	145	85	520	750	2	1	0	0	3	13	4

Total teaching hours and subject's distribution over the subject areas according the Reference Framework and NARSE

Semester		Teaching Hours				Student Work Load (SWL)	Subject Area						
		Lectures	Tutorial	Practical /oral	Total Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/ 1st		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2nd		12	8	5	25	50	0	0	12	3	10	0	
First year/1st semester		14	5	5	24	48	2	0	10	2	9	1	0
First year/ 2nd semester		14	5	4	23	46	2	0	15	0	6	0	0
Second year/1st semester		15	6	4	25	50	4	0	7	0	5	9	0
Second year/ 2nd semester		14	8	2	24	48	0	0	3	3	13	5	0
Third year/1st semester		15	6	4	25	50	0	3	0	2	7	13	2
Third year/ 2nd semester		12	6	6	24	48	3	0	0	0	6	15	0
Fourth year/1st semester		11	6	7	24	48	3	1	0	0	0	17	5
Fourth year/ 2nd semester		11	6	6	23	48	2	1	0	0	3	13	4
Total of Five Years		132	64	45	241	486	21	5	62	10	63	73	11
% of Five Years							8.5	2	25.1	4	27.6	29.7	4.4
% NARS And Reference framework	Minimum						8.0	2.0	25	4.0	25	25	4.00
	Maximum						12	4.0		6.0	30.0	30.0	6.00

Summary of Courses Specification

First Year-First Semester:

Course title	Engineering Mathematics (3)			Course Code	BAS151
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical/ Oral	Semester work	Final Exam.	Total grades	150
	0	40	110		

Ordinary Differential Equations (ODE)

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undesemesterined coefficients method and variation of parameters method for finding the particular solution) – Cauchy-Euler ODE (homogeneous and nonhomogeneous) – System of ODE– Laplace transform – Inverse Laplace transform –Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables

Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems –Mathematical modeling using partial differential equations.

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.***

Course title	Electronic circuits (1)			Course Code	ECE 242
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	10	40	100		

Diode Circuit Analysis and Applications, Rectifier Circuits, Peak-Inverse-Voltage (PIV), Diode Power Dissipation, Clipping and Clamping Circuits, Power Generation from Solar Cells, amplification, Circuit models for amplifiers-Impedance level transformation; VOLTAGE, current, Power gain; Frequency Response of Amplifiers, single-transistor amplifiers; small-signal modeling and linear amplification; The BJT Amplifier. The MOSFET AmplifierCoupling and Bypass Capacitors Circuit Analysis Using dc and ac Equivalent circuits, Multistage ac-Coupled Amplifiers, Tuned Amplifiers, Current Source Circuits. Current Mirror Circuits. Differential Amplifiers.

References:

- ***Ulrich Tietze, Christoph Schenk, Eberhard Gamm "Electronic Circuits: Handbook for Design and Application", Springer; (2018).***

Course title	Programming language			Course Code	CSE 141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to structure programming – Data types – Variables and constants declarations – Control statements – Arrays – Collections – Loops – Functions – Pointers – Recursion – Exception handling – Structs – Enumerations – Threading – Object oriented programming (OOP) – Classes and objects – Encapsulation – Polymorphism – Inheritance – Constructors – Destructors – Overloading – Overriding – Abstraction – Access modifiers – Interfaces – By value vs by reference – Garbage collection – File handling – Database connections and handling – Testing – Design patterns.

References:

- ***Castagna, Giuseppe. Object-Oriented Programming A Unified Foundation. Springer Science & Business Media, 2012.***
- ***Matt Weisfeld, Object oriented through process (4th edition). Addison Wesley, 2013.***
- ***Harper, Robert. Practical foundations for programming languages. Cambridge University Press, 2016.***
- ***Steve McConnell, Code Complete: A Practical Handbook of Software Construction, Second Edition***
- ***Erich Gamma, Design Patterns: Elements of Reusable Object-Oriented Software, 1st Edition***
- ***Eric Matthes, Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming Paperback***

Course title	**Automatic Control System (1)**			**Course Code**	CSE 142
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	3	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	150
	20	30	100		

Introduction to control systems - Open and closed loop control systems – Laplace transformation and transfer function - Block diagram reduction – Signal flow graph - Modeling of systems: (Electrical circuits, Mechanical systems, DC motors, AC servo motors, Synchro, Potentiometers, stepper motors – Hydraulic servo motor – Thermal systems – liquid level systems) – Linearization of nonlinear mathematical model – Time response analysis: (First order systems – second order systems – steady state error) – Stability of control systems: (Routh stability analysis – Determining relative stability using Routh) – Applications of the previous topics using MATLAB/Simulink toolboxes.

References:

- ***Farid Golnaraghi, Benjamin Kuo, "Automatic Control Systems", McGraw-Hill Education, 10 edition, 2017***
- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.***

Course title	**Operating systems**			**Course Code**	ENG 251
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	0	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	100
	10	20	70		

Introduction to operating system, background, and basics – Operating system history, and design issues – File systems – Study of different data access methods – System resources management – Managing and scheduling tasks (CPU scheduling) – Memory hierarchy – Memory types – Different memory implementations – Memory management techniques – Secondary storage management – Cache memory implementation – Implement simple cache memory using a programming language – Sequential execution – System selection consideration – Study of recent operating systems – Process synchronization – Threads – Interrupts – Deadlock detection methods – Deadlock prevention and system recovery methods – Virtual memory concepts, paging, segmentation and address mapping – Virtual storage management and page replacement strategies – Distributed systems, structures, file systems, and distributed coordination – Secondary storage management, disk components, disk scheduling, and swap-space management – UNIX process control and management.

References:

- ***Silberschatz, Abraham, Greg Gagne, and Peter B. Galvin. Operating system concepts. Wiley, 2018.***
- ***Andrew Tanenbaum and Herbert Bos, Modern Operating Systems, 4th Edition.***
- ***Harvey M. Deitel, An introduction to operating systems. Addison-Wesley.***
- ***Abraham Silberschatz et al., Operating System Concepts, 9th Edition.***

Course title	Research and analysis skills			Course Code	MUR 221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	50
	0	15	35		

Critical thinking - Assess and develop thinking skills – Identifying arguments - Argument and non-argument - Clarity, internal consistency and structure - Reading between the lines: Recognizing underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and note-making: Critical selection, interpretation and noting of source material – Critical thinking when writing – Evaluating critical writing.

References:

- S. Cottrell, Critical Thinking Skills, 3rd Edition, published by Macmillan Study Skills, 2017

First Year-Second Semester:

Course title	Engineering Mathematics (4)			Course Code	BAS155
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	0	40	110		

Partial Differential Equations (PDE)

Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE)– Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.

Complex Analysis

Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping.

References:

- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***
- ***J. Brown, and R. Churchill, "Complex Variables and Applications, 8th Edition", McGraw-Hill, 2015.***

Course title	Electric Circuits (1)			Course Code	ELE 141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	20	110		

Basic DC Electric circuit elements-basic laws of electrical circuits-Ohm's law-Kirchhoff current law - Kirchhoff voltage law – methods of electric circuits analysis: Thevenin's theory - Norton theory-conversion of sources-maximum power transfer and superposition theorem. Electric charge storage in electric field- capacitance and capacitor dimensions. AC circuits: Generation of A.C, definitions of AC basic elements - Inductance and capacitors in AC circuit – analysis of AC circuits- Three – phase circuits, voltage generation in balanced and unbalanced 3-phase system, star and delta connected loads.

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.***

Course title	Electrical Measurements			Course Code	ELE 243
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	15	35	100		

Basics and concepts of electrical measurements - Principle and types of analog and digital voltmeters and ammeters - Measurement devices for AC&DC power and power factor in single and three phase system-Measuring frequency – Instrument transformers – Instruments for measurement of frequency and phase. - D.C & A.C potentiometers, D.C & A.C bridges, measuring resistance and inductive reluctance- Multiple earth and earth loops – Grounding techniques - Transducers and Data Acquisition Systems: Classification of transducers- Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers.

References:

- ***Kirkham, H., Measurement and Instrumentation. Pacific Northwest National Lab.(PNNL), Richland, USA, 2018.***
- ***Morris, A.S. and R. Langari, Measurement and instrumentation: theory and application, Academic Press,2012***
- ***Hauschild, W. and E. Lemke, High-voltage test and measuring techniques, Springer, 2014***

Course title	Logic and Digital Circuits			Course Code	CSE 143
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Digital systems, concepts, and information – Data representation – Number systems – Binary logic and gates – Arithmetic operations – Decimal codes – Alphanumeric codes – Gray codes – Combinational logic circuits and analysis – Boolean algebra – Simplification of logic functions – Standard forms – Map manipulation – Two-level circuit optimization – Karnaugh map (sum of product) minimization – Karnaugh map (product of sum) minimization – Adders – Subtractors – Encoders – Decoders – Multiplexers – Demultiplexer – Parity generators – Code converters – Comparators – Implementation of digital combinational circuit using TTL integrated circuits.

References:

- ***M. Morris R. Mano, Logic & Computer Design Fundamentals, 5th Edition, 2016.***
- ***Thomas L. Floyed, Digital fundamentals, Pearson international edition, 11th Edition, 2019.***

Course title	Sensors			Course Code	ENG252
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2		1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	100
	10	20	70		

Introduction to Measurements and its fundamentals - operational amplifiers - operational amplifier circuits using negative or positive feedback; operational amplifier circuits using diodes- analog signal detection- conditioning and conversion- difference amplifiers- active filters - voltage to current converters- signal isolation - temperature sensors (Thermocouple – RTD and NTC – IC temperature sensors) - Mechanical and electrical pressure sensors – Speed sensors (Tachometers – Rotary encoders) – Gyro sensor – Position sensors (potentiometer- LVDT – Synchro) – Capacitive and inductive proximity sensors - Relays – Electrical and mechanical switches – Servo motors – Stepper motors.

References:

- ***Kilian, Christopher T. Modern control technology: components and systems. Delmar/Thomson Learning, 2016.***
- ***Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", Springer, 5th edition, 2016***

Course title	Professional Ethics			Course Code	MUR 115
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	50
		15	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.

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***

Second Year-First Semester:

Course title	Engineering Mathematics (5)			Course Code	BAS 251
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2			
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
		40	110		

Numerical Methods

Curve fitting – Interpolation – Numerical integration – Numerical solution of algebraic and transcendental equations – Iterative methods for solving system of linear algebraic equations – Numerical differentiation – Numerical solution of ordinary differential equations – Numerical solution of partial differential equations– Finite difference method.

Applied Probability and Statistics

Introduction to probability – Discrete random variables – Special discrete distributions – Continuous random variables – Special continuous distributions – Multiple random variables – Sampling distribution and estimation theory – Test of hypotheses – Correlation theory – Analysis of time series.

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.***

Course title	Data Structure and algorithms			Course Code	CSE 241
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction – Algorithm's representations and analysis – Algorithm's complexity – Divide and conquer concepts – Greedy strategy – Array-based lists – Linked lists – Skip lists – Stacks – Queues – Priority queues – Hash tables – Recursion – Trees, Binary trees – Scapegoat trees – Red-black trees – Heaps – Graphs – Directed graphs – Sorting Algorithms (e.g., merge sort, heap sort, quick sort, selection sort, bubble sort, insertion sort, etc.) – Searching algorithms (e.g., sequential searching, binary searching, search trees, etc.) – Dynamic programming.

References:

- ***Thomas H. Cormen, Introduction to Algorithms, 3rd Edition***
- ***Robert Sedgewick, Algorithms, 4th Edition***

- ***Robert Lafore, Data Structures and Algorithms in Java, 2nd Edition***
- ***Allen Weiss Mark. Data structures and algorithm analysis in C++. Pearson Education India, 2007.***
- ***Narasimha Karumanchi, Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles, Fifth Edition 5th Edition, 2017.***

Course title	**Electric Circuits (2)**			**Course Code**	ELE 241
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	3	1	1		
Course grades	**Practical / Oral**	**Sem. work**	**Final Exam**	**Total grades**	150
	20	20	110		

Introduction to electrical circuits - Electrical circuits in switching on/off mode and instantaneous behavior- Solution of the first order electrical circuits– Solution of the second order electrical circuits –Magnetically linked circuits – Analyse circuits in frequency mode – Resonance in electric circuits – The two port electrical networks – Analyse electrical circuits by using Laplace transform - Use Fourier analysis for solving electric circuits - Circuit analysis using Matlab program.

References:

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

Course title	**Automatic Control System (2)**			**Course Code**	CSE 211
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	0	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	125
	15	20	90		

Development of root locus technique - stability analysis using root locus using - time domain analysis vs frequency domain - correlation between time response and frequency response- bode diagram- graphical representation of transfer functions: (Bode plots - Polar Plots - Log Magnitude vs Phase Plots) – Nyquist Contour - Nyquist Stability Criterion - Relative Stability - Adjustment of Gain K for desired values of gain and phase margins using polar plots - Nichols Charts - compensator design (lag, lead, lead-lag using Root locus and Bode plot)- cascade compensation in frequency domain - Using Matlab to determine stability in frequency domain.

References:

- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.***

Course title	Advanced Digital & Logic Circuits Design			Course Code	CSE 221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	0	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	100
	10	20	70		

Latches – Flip-flops – SR Flip flops – D Flip flops – JK flip flops – T Flip flops – Edge triggered flip flops – Sequential circuit design and analysis – Analysis of clocked sequential circuits – State behavior of synchronous sequential circuits – State tables – State diagrams - State reduction – Flip flop excitation tables – The design space and procedures – Registers – Shift registers – Counters – Ripple counters – Modulo counters – Synchronous counters – Random access memory (RAM) – Memory decoding – Algorithmic state machine (ASM) – ASM timing considerations – ASM control implementation – Design with multiplexers – Practical experiments using TTL logic chips.

References:

- ***M. Morris R. Mano, Logic & Computer Design Fundamentals, 5th Edition, 2016.***
- ***Thomas L. Floyed, Digital fundamentals, Pearson international edition, 11th Edition, 2019.***

Course title	Communication and presentation skills			Course Code	MUR 114
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	100
	0	40	60		

Introduction to communication - communication process - communication skills - oral and non-verbal communication and report writing - letter writing and interview - planning a management presentation - everyday management presentations - advantages and disadvantages of presentations- four-stage presentation planning process (identify your aim, profile your audience, define your key message statement, and outline the scope.) - audience profiling -presentation environment - management presentation planning guidelines

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 Course 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

Second Year-Second Semester:

Course title	Power electronics (1)			Course Code	ELE 144
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	0	50	100		

Introduction to power electronics - using diodes as electronic switch with RLC - Single-phase uncontrolled rectifier circuits – Three-phase uncontrolled rectifier circuits – Single-phase controlled rectifier circuits – Three-phase controlled rectifier circuits – power switches protection –Thyristor firing circuits – Firing pulse amplifiers – Thyristor commutation circuits and techniques – DC choppers – Applications of DC choppers- Triac - Diac - DC/DC converters using PWM (step up - step down - step up/down)- AC/DC converters (half wave - full wave) - DC/AC converters.

References:

- Mohamed Rashid, Narendra Kumar, Ashish R. Kulkarni, "Power Electronics Circuits, Devices and Applications" Pearson-Hall, 4 ed, 2014.

- Daniel W. Hart, "Power Electronics", McGraw-Hill, 2011

Course title	Electromagnetic fields			Course Code	ECE 243
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
		40	110		

Review of Vector Algebra and Calculus, Coulomb's Law and lhe Electric Field Intensity, Electric Flux and Flux Density Gauss's Law. Electrostatic potential, Conductors, Dielectrics, and Capacitance, Boundary conditions for electrostatic fields, Uniqueness, Method of images, Simple Boundary value problems, Conformal Mapping Technique, Electrostatic Energy, The Steady Magnetic Field, Biot-Savart law, The Vector magnetic potential, Magnetic materials, Bow1dary Conditions, Inductance, Magnetic energy, Magnetic Forces, and Torque: Lorentz force, Time Varying Fields and Maxwell's Equations: Introduction.

References:

Salam, Md. Abdus, "Electromagnetic Field Theories for Engineering", Springer Singapore, 2014.

Course title	Analog Communication Systems			Course Code	ECE 241
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	0	50	100		

Introduction, Amplitude Modulation (DSB-SC), Generation and Demodulation of DSB-SC, Pilot carrier system, Amplitude Modulation Large Carrier (DSB-LC), Carrier and Sideband power in A.M, Generation and Demodulation of DSB-LC, Envelope Detection, AM Receiver, TRF Receiver, Super heterodyne Receiver, FDM. Amplitude Modulation Single-Side Band (SSB): Angle Modulation, Narrow Band F.M, Comparison between N.B. F.M and A.M, Wide Band F.M, Average Power in Angle Modulation, Phase Modulation, Pulse Amplitude Modulation, Sampling, Time-Division Multiplexing, Pulse shaping and ISI.

References:

K.C. Raveendranathan, "Analog Communications Systems: Principles and Practices", Orient Blackswan (September 23, 2008).

Course title	Introduction to Computer Networks			Course Code	CSE 242
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to computer networks – NIC and cable installing – Introduction to data communication – Network components – Network architecture. Computer network classification and types – Protocol stacks and layering – Network layered model for communication and different communication protocols – Socket's programming – Network design techniques and modeling – The 7 layers model (ISO-OSI) – OSI (reference model) vs. TCP/IP (protocol model) – Application layer protocol – Wireless networks and mobile systems – Transmission layer protocol – TCP and UDP semantics and syntax – Network layer protocol – Routing algorithms – Link-state and distance vector routing – Interference between Bluetooth and 802.11b – Security – Switching and bridging – Data encoding – Network troubleshooting – Error detection – Multiple access protocols – IEEE 802.3 Ethernet – Networking futures.

References:

- ***Mosharraf, Firouz. Computer Networks: A Top-down Approach. McGraw-Hill, 2016.***
- ***Mike Meyers, CompTIA Network+ Certification All-in-One Exam Guide, 7th Edition.***
- ***James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition.***
- ***Andrew S. Tanenbaum, Computer Networks, 5th Edition.***
- ***Edward Tetz, Cisco Networking All-in-One For Dummies, 1st Edition.***

Course title	Nonlinear control systems			Course Code	CSE 212
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to Nonlinear Systems - Analysis of Nonlinear Systems: Linearization, Describing functions - stability of Nonlinear Systems: Nyquist method - phase plane analysis.

References:

- ***D. Atherton, "An Introduction to Nonlinearity in Control Systems", Bookboon.com, 1 edition, 2012***

Third Year-First Semester:

Course title	Signals and Systems			Course Code	ECE142
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	0	50	100		

Continuous-time signals; Discrete-time signals; Linear time invariant systems for Continuous-time signals; Linear time invariant systems for Discrete-time signals; Time Domain Analysis; Convolution (continuous); Convolution (discrete); System properties; Fourier Series; Continuous Fourier Transformation; Discrete (and Fast) Fourier Transforms; Circular Convolution (discrete); Laplace transform; Z Transform; Analog Filters design.

References:

Lizhe Tan Jean Jiang, "Digital Signal Processing Fundamentals and Applications", cademic Press, 9th November 2018.

Course title	Microprocessors Design and Architecture			Course Code	CSE 341
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Computer organization and design – Designing an arithmetic and logic unit – Computer components and data transfers via buses – Different types of computer busses – Getting familiar with the different types of busses – Microprocessor design and programming – Microprocessor classes and families –Designing a microprocessor – Hardwired control unit, design, and implementations – Designing a control unit – Micro-programmed control unit – Implementation via modern description language (VHDL) – Memory organization – Pipeline and vector processing – Computer arithmetic – Input and output organization.

References:

- ***Mano, M. Morris, and Charles R. Kime. Logic and computer design fundamentals. Pearson Higher Education, 2015.***

Course title	Artificial Intelligence			Course Code	CSE 342
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction – Features of intelligence – AI search – Level of intelligence - AI problems – Intelligent agents – Knowledge classification – Search techniques – Types of search algorithms – Blind search – Depth first search – Breath first search – Iterative deepening – Finding best solution – Hill climbing – Heuristic functions – Branch and bound – Best first algorithm – A* algorithm – Probability in AI - Bayes rule – Dependence – Bayes network – D separation – Problem-solving through search – Planning – Decision making – Meta-logic programming – Meta-interpreters – Inductive logic programming - Introduction to Genetic algorithms, encoding, selection methods, elitism, crossover, mutation, termination criteria, application.

References:

- ***Russell, Stuart J., and Peter Norvig. Artificial intelligence: a modern approach. Malaysia; Pearson Education Limited, 4th Edition, 2020.***
- ***Devangini Patel, Hands on Artificial Intelligence for search, 2018.***

  Hands-On Genetic Algorithms with Python: Applying Genetic Algorithms to Solve Real-world Deep Learning and Artificial Intelligence Problems by Eyal Wirsansky, 2020.
- ***Genetic Algorithm Essentials by Oliver Kramer, 2017.***

Course title	Digital Control systems			Course Code	CSE 311
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	100
	10	20	70		

Introduction to discrete time control systems – Impulse sampling and holding – pulse transfer function – Mapping between S-plane and Z plane –closed loop transfer function using SFG – Stability analysis of closed loop systems in Z plane – Transient and steady state response analysis – design based on root locus method – design based on frequency response analysis - state space representation of discrete time systems – solving discrete time state space equations – pulse transfer function matrix – discretization of continuous time state equations – Lyapunov stability analysis .

References:

- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.***

Course title	**Database Systems**			**Course Code**	CSE 321
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2		1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	100
	10	20	70		

Introduction to database concepts – Data structure handling and file systems – Database management systems (DBMSs) operation and components – Handle the different types of a DBMS – Data modeling ANSI/SPARC – Client server handling model – Relational databases (indexing, keys, and sorting) – Tables' relationships – Structured query language (SQL) – Schema design and normalization – Normalization – ER modelling – Database programming – NoSQL – Concurrency control – Distributed databases – Replication – Transactions – Relational algebra – Views – Triggers – Security – Recovery – Atomicity – Durability – Getting familiar with DBMSs (e.g. MySQL, SQL Server, SQLite, MongoDB, etc.).

References:

- ***Jukic, Nenad, Susan Vrbsky, and Svetlozar Nestorov. Database systems: Introduction to databases and data warehouses. Prospect Press, 2016.***
- ***Hector Garcia-Molina et al., Database Systems: The Complete Book, 2nd Edition.***

Course title	**Quality Control**			**Course Code**	ENG 212
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	**0**		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	100
	0	30	70		

Fundamentals of statistical quality control; control charts for variables and attributes; process capability analysis; sampling plans and techniques; introduction to design of experiments.

References:

- ***B. S. Ramírez, and J. G. Ramírez, "Statistical Quality Control," SAS Institute, 2018.***

Course title	**Summer Training (1)**			**Course Code**	ENG 112
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	2
			2		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	50
	15	10	25		

Students promoted to the 2nd year are to carry out professional training inside the faculty, or in specialized training centers

Third Year-Second Semester:

Course title	Embedded Systems			Course Code	CSE 343
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Introduction to microcontrollers– microcontrollers' architectures- microcontroller configurations – I/O programming - Advanced Programming Application (Buttons-LCD-Keypad-ADC-PWM-Motor control-LEDs-EEPROM-Interrupt) Embedded system architecture. Processor examples: AVR, ARM, DSP. Peripherals on chips. Real-time operating systems. Software for embedded systems design.

References:

Ibrahim, Dogan. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC 18F Series. Newnes, 2016.

Course title	Automatic Control System 3			Course Code	CSE 312
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction – state variables – state equation for linear systems - canonical forms of state models of linear systems - state space representation of transfer function – diagonalization - solving the time invariant state equation - controllability - observability - duality- Lyapunov stability (1^{st}, 2^{nd}) – Introduction to observer design and pole placement method - using Matlab to solve state space problems.

References:

- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2009.***

Course title	Programmable logic controllers			Course Code	CSE 313
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction to PLC: interface and communication - Analog and Digital Devices (Input and Output Devices) - PLC structure and Operation - PLC programming Methods - HMI programming Methods - Automated Systems - SCADA System Design - Automated System Communication (Fieldbus) - DCS Systems - CNC machines and Programming - Applications

References:

- ***Bolton, William. Programmable logic controllers. Newnes, 2015.***

Course title	Machine Learning			Course Code	CSE 314
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction – Learning theory – Supervised learning – Unsupervised learning – Reinforcement learning – Applications of supervised learning – Linear regression – Gradient descent – Stochastic gradient descent – Underfitting and overfitting – Parametric and nonparametric algorithms – Locally weighted regression – Probabilistic interpolation of linear regression – Motivations of logistic regression – Logistic regression perceptron and newton's method – KNN – k-means – Intelligent modeling – Fuzzy logic modeling – SVM – Clustering – PCA – Decision trees – Ensemble methods – Autoencoders – VC dimension – Markov and Hidden Markov models – Programming machine learning models (e.g. MATLAB, Python, R) - Intelligent modeling - fuzzy logic modeling and control using Matlab.

References:

- ***Mohri, Mehryar, Afshin Rostamizadeh, and Ameet Talwalkar. Foundations of machine learning. MIT press, 2018.***
- ***Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.***
- ***Fuzzy Systems, Modeling and Identification", by Robert Babuka***
- ***"Fuzzy Logic with engineering applications", by Timothy J. Ross, 4th edition, 2016.***

Course title	Advanced Networking			Course Code	CSE 322
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Routers and routing – Router fundamentals – Basic router configurations – Routing basics – Static routing – Dynamic routing protocols. Wireless networks –WAN characteristics and devices – WAN connection options – Point to point linking – Frame relay mechanism – Integrated services – Digital networks – Leased lines – Digital subscriber lines – ATMs in the WAN – Cloud computing introduction – Spread spectrum wireless transmission – Personal area networks – Gadgets and wireless network connections – Fog computing introduction – Internet of things (IoT) introduction – IoT in smart cities.

References:

- ***Comer, Douglas E. The Internet book: everything you need to know about computer networking and how the Internet works. Chapman and Hall/CRC, 2018.***
- ***Cisco Networking Academy. Routing and Switching Essentials Companion Guide. Pearson Education, 2014.***

Course title	Technical Report Writing			Course Code	ENG 111
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	100
	0	3	70		

Introduction to technical writing - elements of writing strategy - planning technical reports – writing a technical report: using illustrations, organizing and numbering, writing reference lists and appendices. Formal reports: categories of formal reports, structure of formal reports - Applications in report writing: laboratory report, field report, periodic reports, proposal, theses and dissertations - Ethical considerations and plagiarism - making presentation - writing a successful CV.

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

Fourth Year-First Semester:

Course title	Artificial Neural Networks			Course Code	CSE 411
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

McCulloch-Pitts model, ANN Applications and Capabilities, simple neuron model (perceptron), Activation Functions , Modeling a Neuron (Building Logic Gates), Learning Paradigms and Rules, Delta learning rule, Widrow-Hoff learning rule, Perceptron Learning rule, unsupervised learning (Hebbian and Competitive Learning), reinforcement learning, binary classification, multi-category classification, Multilayered feedforward neural networks – Backpropagation algorithm – Momentum backpropagation algorithm – Training examples – Radial basis functions - restricted Boltzmann machines - recurrent neural networks and convolutional neural networks. Several advanced topics like deep reinforcement learning, neural Turing machines, Kohonen self-organizing maps, and generative adversarial networks.

References:

- ***Neural Networks and Deep Learning: A Textbook by Charu C. Aggarwal, 2018.***
- ***Artificial Neural Networks: A Practical Course by Luisa Helena Bartocci Liboni, Danilo Hernane Spatti, 2016.***

Course title	Computer Architecture			Course Code	CSE 421
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Introduction–addressing modes- Data movement instructions- Arithmetic and logic instructions- program control instructions – using assembly with C/C++- Hardware specifications of microprocessors - Memory interface- Basic I/O interface – interrupts – DMA controllers - Embedded Systems Architecture - Embedded Processing - Interrupts- Operation Modes - Power Management - Communication Systems – Topology- Arbitration, Synchronization - Memory Hierarchy for Performance Improvement.

References:

- *Ahmet Bindal, "Fundamentals of Computer Architecture and Design", Springer; 2nd ed. 2019 edition (January 31, 2019).*

- *Brey, Barry B. The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions: Architecture, Programming, and Interfacing. Pearson Education India, 2016.*

Course title	Web Development			Course Code	CSE 422
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

HTML – CSS– JavaScript –ECMAScript, Angular, Frontend frameworks for designing (e.g. Bootstrap) – Frontend JavaScript frameworks (e.g. React) – Web servers – Local web servers (e.g.XAMPP) – SQL – NoSQL – Database servers – Database management systems (e.g. Mongo DB,MySQL, SQL Server, SQLite, etc.) – Responsive web design – deprecation – Version control and Git – Getting familiar with GitHub and GitLab – Hosts and domains – Testing – Deployment – Design patterns – Backend frameworks (e.g. nodeJs) – Web trends.

References:

- ***Robbins JN. "Learning web design: A beginner's guide to HTML, CSS, JavaScript, and web graphics". O'Reilly Media, Inc., Fifth edition , 2018.***

Course title	Elective Course 1			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Control system field:

CSE 161: FPGA Prototyping using HDL

Introduction of VLSI - FPGA programming technologies - FPGA architecture - FPGA programming using VHDL or Verilog - (combinational circuits- regular sequential circuit - finite state machine - finite state machine with data path)- Applications.

CSE 162: Advanced topics in control systems

Performance index - Pole-placement - state observers - design of state observers - design of servo systems- Quadratic Optimal Regulator- adaptive control systems-Model reference adaptive control-self tuning regulators – Optimal control systems- Variable structure systems- ` State Space Theory –Neural control –state estimation – Kalman filters.

CSE 163: Intelligent Transportation Systems

Introduction to Intelligent Transportation Systems ITS - Advanced Traveler Information - System ATIS - Advanced Traveler Management System ATMS - Advanced Public Transport System - ITS and the Environment -Applications.

CSE 164: Smart Grids

General considerations for a Smart Grid - Characteristics of Smart Grid - Smart Grid technologies - Smart Grid Elements : electric grid, control elements, communications infrastructure, applications layer - Smart Grid Control Elements: elements required to monitor and control the grid, such as smart meters, sensors, and phasor measurement units - Smart Grid Operations: control and management functions, operations architectures, and information models.

Computer Engineering field:

CSE 171: Wireless and optical communications

Introduction-noise-leaser filters and optical amplifiers - components of optical communications-technologies of multiple communications-architecture of networks-used protocols-network management- algorithms-types of wireless computer networks-satellite communication systems.

CSE 172: Computer System Security

Computer security systems and networks - Information security concepts - Risk types - Protection procedures - Insurance policy - Advanced algorithms in analogue and telematics encryption - Personal verification methods - Practical applications for securing information in different systems - - threat models – Security architecture – User authentication- Buffer overflow attacks and defenses (Experimental) – Privilege separation (Experimental) – Foot printing and Reconnaissance – Software fault isolation –Mobile phone security – Symbolic execution (Experimental) – Hacking Webserver and Hacking Web Applications – Browser security (Experimental) – Network security & protocols – SSL and HTTPS – "Side-channel" attacks – Cryptography introduction – SQL injection introduction.

CSE 173: Multimedia

Introduction to Multimedia - Elements of multimedia systems - Recording and transmission of audio - Photography and quality of photographs - Record and tone of video signals - Digital methods of dealing with audio, video and video - Data compression methods - Data compression applications for voice, Requirements for multimedia systems - Examples of multimedia archiving systems and the Egyptian National Archives.

CSE 174: Image Processing

Introduction – Digital image representation – Mathematical tools for image processing – Image enhancement – The frequency domain – Image processing in frequency domain – Image denoising – Image segmentation – Feature extraction – Image reconstruction and projections – Image transforms – The fast Fourier transform – The convolution theorem – Digital filtering – Color representation – Histograms – Edge detection – Image enhancements – Spatial filtering – Image morphing – Dilation and erosion – Haar transforms.

CSE 17٥: Software Engineering

Software development process - Agile Software Development - requirements engineering- system design and modelling- Architecture Design- Software testing process – software system maintenance - quality control - specifications of some case studies of practical life applications.

Course title	**Graduation Project 1**			**Course Code**	CSE 431
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	1	1	2		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	125
	15	20	90		
Survey - Data processing and analysis - Main professional and practical part - Conclusions and recommendations - Writing the project document					

Course title	Environmental issues			Course Code	MUR233
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	75
	0	25	50		

Environment pollution and the natural balance - Air pollution - Disasters and environmental phenomena- air pollutants (source- effects - methods of control)- Important considerations about dealing with air pollutants - Water pollution and methods of control- Water pollution by oil and petroleum materials - Solid wastes pollution - Noise and morale pollution.
Lab.: None
Mini Project: None

References:

- ***Gilbert M. Masters, Wendell P. Ela, Introduction to Environmental Engineering and Science, Pearson, 3rd Ed., 2007.***

Course title	Summer Training (2)			Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0		2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	50
	15	10	25		

Students promoted to the 4th year are to carry out field training in specialized training sectors.
Students trained outside the country should be approved by relevant Department Councils, The student will not be able to obtain his/her B.Sc. Graduation Certificate until Professional and Field Training are both accomplished successfully. The executive regulation of students' training is issued by the University Council based on advices from Scientific Departments, and the Council of Education and Students' Affairs

Fourth Year-Second Semester:

Course title	Distributed Systems			Course Code	CSE 423
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	150
	20	30	100		

Ch/s and evolution of DS - foundational concepts of distributed systems. H/W and S/W concepts of DS- Architectures- overlay networks - Type of communications in DS and processes communication. Experimental: Implementation of TCP chat application and UDP chat Application - Thread and multiple Task-synchronization, mutual exclusion - Experimental: Designing Multi-Threaded Application - Parallel programming and scheduling- Distributed File systems- Distributed Information systems - Experimental: Design distributed database system.

References:

- ***van Steen, Maarten, and Andrew S. Tanenbaum. "A brief introduction to distributed systems." Computing 98.10 (2016): 967-1009.***

Course title	Advanced Concepts of Database Systems			Course Code	CSE 424
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Transactions - Concurrency control – Deadlock management – Security – Integrity – Distributed database – Data processing cycle – Data warehouse design and ETL tools – Data pre-processing – Data mining techniques – Classification and clustering methodologies – Regression approaches – Introduction to big data – Characterizing of big data and dimensions of scalability – Hadoop and MapReduce – Big data storage and analytics – Big data analytics machine learning algorithms – Machine learning, streams, and database on Spark – Linked big data – Graph computing and Analytics – Graphical models and Bayesian networks – Big data visualization.

References:

- ***Jukic, Nenad, Susan Vrbsky, and Svetlozar Nestorov. Database systems: Introduction to databases and data warehouses. Prospect Press, 2016***

Course title	Elective Course 2			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grades	125
	15	20	90		

Control system field:

CSE 261: Computer Vision

Image formation – Image processing – Feature detection – Segmentation – Feature-based alignment – Structure from motion – Stereo correspondence – 3D reconstruction – Image wrapping – Lighting – Linear algebra – Edge detection – Binary image analysis and processing – Feature analysis – Pattern classification and recognition – Fourier transform – Colors – Clustering – Filters – Motions and tracking.

CSE 262: Fuzzy and predictive control systems

Introduction in fuzzy logic and reasoning - fuzzy control - linear fuzzy PID - nonlinear fuzzy PID - self organizing fuzzy controller. Introduction to Predictive Control Theory - Digital State Space Theory - Standard Formulation of Predictive Control - Unconstrained Predictive Control and Predictive Control with Constraints - Set Point Tracking - Applications and Case Studies**.**

CSE 263: Robotics Modeling & Control

Robot Configuration Space and degree of freedom - Classification of Robotic Manipulators - Robotic Systems - kinematic arrangements of manipulators - Representing positions - representing rotations - rotational transformations - rigid motions - homogeneous transformations - forward kinematics - kinematic chains - inverse kinematics – Dynamics of robotics arm: (Euler's equations-Lagrange-. Iterative Newton–Euler Dynamic Formulation- Linear control of manipulators- Force Control)

Computer engineering field:

CSE 271: Real time operating systems

Introduction to concepts- RT kernel architectures - Scheduling-control of shared resources-shared resources and contention issues- inntertask communication - memory usage and management-multiprocessor systems-distributed system-testing and debugging of multitask software-using RTOS in critical systems.

CSE 272: Geographic Information Systems

Introduction to Geographic Information Systems (GIS)- GIS data types, structures and topology - GIS data input and editing - Coordinate systems and projections - GIS data management - GIS data output - GIS data analysis - Analytical modelling in GIS - Data quality issues.

CSE 273: Advanced Topics in Programming Language

Interfaces - Nullable Types - Anonymous Type - Namespaces, dealing with different type of files -exception handling, attributes – properties - indexers – lists - collections – dictionary - hash table – generics - delegates, event handler - Lambda Expressions - LINQ, Asynchronous Programming with Async / Await.

CSE 274: Business Information Systems

Organizations and Information Technology - Concepts of Enterprise Information Systems, Concepts of Business Processes - Types of Business Information Systems – Business Process Types, Building and Management of Business Information Systems.

CSE 275: Cyber Security

Cyber security Fundamentals - Cyber Security Breaches - Types of Cyber Attacks - Prevention Software - Risk Assessment - Ethical Hacking - Social Engineering - Attack and Defense Strategies - and Cyberwarfare.

Course title	**Elective Course 3**			**Course Code**	-
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	125
	15	20	90		

Control system field:

CSE 361: Deep Learning

Introduction – Matrix operations – Probability and information theory – Bayes' rule – Structured probabilistic method – Numerical computation – Learning algorithms – Deep feedforward networks – Regulations for deep leaning – Optimization for training deep models – Hyperparameter tuning – Batch normalization – Convolutional neural networks – Deep convolutional models – Transfer learning – Recurrent neural networks – Autoencoders – Getting familiar with programming (e.g., Python or MATLAB).

CSE 362: Nanotechnology

Introduction to Nanotechnology, fundamentals of nanoelectronics and mesoscopic physics - Transistors fundamentals, Transistor electrostatics -Ballistic MOSFETs, Transmission theory of the MOSFET- Applications.

CSE 363: Advanced topics in microcontrollers

Interrupt priorities- controlling advanced peripherals (Timers-EEPROM-Flash memory-CCP-USB-CAN-SPI-USART-Hardware multipliers)- RTOS -ARM architecture-32 bits microcontrollers.

CSE 364: Optimal & Robust Control

Introduction to Optimal and Robust Control - Principles of Optimal Control Euler, Lagrange, Riccati Equation - Dynamic Programming, Terminal Constraints - Robust Control, Structured Singular Value, Stability Performance, Loop Shaping, H-infinity, state space for robustness analysis. Real and Complex uncertainty - LQ, LQR, LQG - Applications

CSE 365: Internet of Things

Introduction to IoT – IoT hardware platforms and operating systems – Wireless communication technologies for IoT – IP-connected smart objects and networks – Embedded web services and web of things – Tracking industrial networks – Other

relevant standardization bodies and protocols - Basics of Networking – Sensor networks – Interoperability in IoT – Introduction to Arduino programming – Machine-to-machine communications – Implementation of IoT with single board computers – Cloud computing - Fog computing, smart cities, and smart homes – Connected vehicles, smart grid, industrial IoT – Case studies (e.g., agriculture and healthcare).

Computer engineering field:

CSE 371: Computer Game Architecture and Virtual Reality

Game Theory Motivation and Background – Software architecture for computer games – 2D and 3D rendering – Event driven programming – Game engines – Introduction to Virtual Reality – Virtual Reality (Input Devices – Output Devices) – Computing Architectures for Virtual Reality (OpenGL Introduction – 2D drawing – Shading) – Modelling OpenGL 3D drawing – Animation – Lights

CSE 372: Information and decision-making systems

Types of information systems-information technologies-decision making systems-systems' components-applications of decision-making systems using software packages such as: Microsoft, ActiveX.

CSE 373: Satellite image processing and remote sensing

Introduction to remote sensing - Methods of obtaining satellite images and remote sensing - Methods of analysis of satellite images and remote sensing - Different frequencies and methods of image analysis Representation of images in the computer - Methods of operation of images - Improving remote sensing images - Registering sites - Getting reports

CSE 374: Wireless Networking and Mobile Computing

Overview of fundamental challenges in wireless networking and potential techniques • Wide area wireless networks: Mobile IP • Wireless local area networks (WLAN): MAC design principles, 802.11 (WiFi) • Wireless person area networks (WPAN): 802.15.4 (ZigBee), Bluetooth • Mobile ad hoc and sensor networks • Mobile computing and applications.

CSE 375: Selected Topics in Computer Engineering

Advanced and recent topics on computer engineering and computer information systems not covered by other courses.

Course title	**Project Management**			**Course Code**	ENG 214
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grades**	100
	0	30	70		

Projects and project management - Modern Administrative Thought - Management Levels and Types - Management Functions - Organization - Leadership - Motivation - Financial and Moral Incentives - Control - Concept and importance of project management - Life cycle of engineering projects - Strategies and types of project planning - Feasibility study - Project resource management - Project implementation - Project evaluation - Practical models for small projects management - Engineering ethics and rules of practicing the engineering profession in Egypt.

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.

Course title	Graduation Project 2			Course Code	CSE 432
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	1	1	2		
Course grades	Practical / Oral	Semester work	Discussion	Total grades	125
	15	20	90		
The student completes the practical analysis for the project after the exams of the second semester.					

Mechanical Power Engineering Program

Mechanical Power Engineering Program

Program Description

Mechanical Power Engineering gains importance progressively due to the increased level of prosperity and technology that consume extra power. This discipline is mainly concerned with thermo-fluid sciences that are the basis for energy conversion and power generation. In addition, Mechanical Power engineers are concerned with other important issues like the pollution control, energy management, heating, ventilation and air-conditioning, transport phenomena, combustion, fluid flow,…etc.

Program LO (specialized)

In addition to the competencies for all engineering programs (Level A) and the competencies for the Mechanical power engineering discipline (Level B), the Mechanical power engineering graduate must be able to (Level C) :

C1. Evaluate mechanical power and energy engineering designs, processes and performances and propose improvements.

C2. Analyze and interpret data, and design experiments to obtain new data.

C3. Evaluate the power losses in the fluid transmission lines and networks

C4. Analyze the performance of the basic types of internal combustion engines and hydraulic machines

C5. Analysis of fluid power systems, subsystems and various control valves and actuators.

Required Courses

In order to get a Bachelor of science Degree in this program, and to sattisfay the program LO, the following set of courses need to be completed.

List of Mechanical Power Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requirements
	Faculty of Engineering Requirements
	Mechanical engineering Requirements
MPE 211	Thermodynamics (2)
MPE 215	Fluid mechanics (2)
MPE 221	Computer applications in mechanical power engineering
MPE 321	Energy conversion
MPE 311	Heat Transfer (2)
MPE 323	Computational fluid dynamics
MPE 324	Gas dynamics
MPE 325	Combustion engines
MPE 326	Automatic control of energy systems
MPE 421	Hydraulic machines
MPE 422	Refrigeration and air conditioning
MPE 423	Design of energy systems
MPE 424	Turbo machines
MPE 425	Power plants
MPE 431	Graduation Project 1
MPE 432	Graduation Project 2
-	Elective course 1
-	Elective course 2

-	Elective course 3
-	Elective course 4
	Total contact H. 74

Elective Courses	
Code	**Elective Course (1)**
MPE131	Water Treatment
MPE132	Natural Gas Technology
MPE133	Pipe Lines
MPE134	Steam Technology
MPE135	Fuel Cell
Elective Course (2)	
MPE231	Computational Fluid Dynamics
MPE232	Biomass
MPE233	Hydraulic Control
MPE234	Solar Energy
MPE235	Two Phase Flow
MPE236	Water Desalination
Elective Course (3)	
MPE331	Design of Heat Exchange
MPE332	Fire Fightning
MPE333	Advanced Refrigeration System
MPE334	Advanced Energy Conversion
MPE335	Refrigeration and Air Conditioning
Elective Course (4)	
MPE433	Thermoelectric System
MPE434	Energy efficiency
MPE435	Fuel System
MPE436	Sensors in Mechanical Systems
MPE437	Heat operated refrigeration Systems

Program courses and subject area:

In addition to the preparatory courses, the students of mechanical power engineering should study the following courses:

First Year-First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 151	Engineering Mathematics (3)	3	2		5	10	3	40		110	150			5				
BAS 152	Applied mechanics	2	2		4	8	2	35		90	125			4				
MPE 141	Thermodynamics (1)	3	1	1	5	10	3	30	20	100	150			3	0	2		
PDE142	Mechanical engineering drawing	1	4	0	5	10	4	50		100	150					5		
ENG232	Electrical & Electronic Engineering	2	1	0	3	5	2	30		70	100				3			
MUR235	Energy issues and environment	2	1	0	3	4	2	25		50	75	3						
Total		13	11	1	25	47	16	210	20	520	750	3	0	12	3	7	0	0

First Year -Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 155	Engineering Mathematics (4)	3	2		5	10	3	50		100	150			5				
PDE 143	Materials strength & Stresses analysis	3	2		5	10	3	35		90	125			2		3		
MPE 144	Fluid mechanics (1)	2	1	1	4	8	3	25	20	80	125			2		2		
MPE 145	Computer-aided mechanical drawing	1	0	2	3	8	3	40	10	75	125					1	2	
PDE 146	Production and material engineering	3	2		5	8	3	35		90	125			2	1	2		
ENG111	Technical reports writing	2	1		3	5	2	30		70	100	3						
Total		14	8	3	25	49	17	215	30	505	750	3	0	11	1	8	2	0

Second Year -First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 241	Machine Design (1)	3	2		5	10	3	35		90	125					3	2	
MPE 211	Thermodynamics (2)	3	1	1	5	10	3	25	25	100	150					2	3	
MPE 242	Measurements and measuring devices	3	1	1	5	10	3	40	20	90	150			2		3		
MUR115	Professional Ethics	2	0	0	2	4	2	15		35	50	2						
PDE 243	Theory of machines (1)	3	2		5	8	3	35		90	125				3	2		
CSE253	Automatic control systems	2	1		3	6	2	30		70	100					3		
ENG112	Summer Training (1)			2	2	4		10	15	25	50							2
Total		16	7	2	25	48	16	190	60	500	750	2	0	2	3	13	5	2

Second Year -Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 252	Numerical methods and statistics	3	2		5	10	3	40		110	150			5				
MPE 215	Fluid mechanics (2)	2	1	1	4	10	3	30	20	100	150					2	2	
MPE 245	Heat transfer (1)	3	1	1	5	10	3	30	20	100	150			3		2		
MUR221	Research and analysis skills	2	0	0	2	4	2	15		35	50	2						
PDE 246	Advanced mechanical systems	3	2		5	8	3	35		90	125					2	3	
MPE 221	Computer applications in mechanical power engineering	2		1	3	8	3	35	20	70	125					1	2	
Total		15	6	3	24	50	17	185	60	505	750	2	0	8	0	7	7	0

Third Year -First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
MPE 321	Energy conversion	2	1	1	4	10	3	40	20	90	150				0	1	3	
MPE 311	Heat transfer (2)	2	1	1	4	10	3	40	20	90	150					1	3	
CSE 341	Microprocessors Design and Architecture	3	1	1	5	8	3	40	20	90	150					2	3	
MUR114	Communication & Presentation skills	2	2	0	4	5	2	40		60	100	4						
-	Elective course 1	1		2	3	8	2	20	30	50	100						3	
MPE 323	Computational fluid dynamics	2		1	3	8	2	30	20	50	100					1	2	
Total		12	5	6	23	49	15	210	110	430	750	4	0	0	0	5	14	0

Third Year -Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
MPE 324	Gas dynamics	2	2		4	10	3	50		100	150					1	3	
MPE 325	Combustion engines	2	1	1	4	8	3	25	10	90	125					1	3	
ELE 342	Power & Electrical machines	3	2		5	10	3	50		100	150					1	4	
-	Elective course (2)	1		2	3	8	2	20	30	50	100						3	
MPE 326	Automatic control of energy systems	2	1	1	4	8	2	25	10	90	125					1	3	
ENG 221	Engineering economy	2	1		3	5	2	30		70	100		3					
Total		12	7	4	23	49	15	200	50	500	750	0	3	0	0	4	16	0

Fourth Year -First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
MPE 421	Hydraulic machines	3	1	1	5	10	3	35	15	100	150					3	2	
ENG 212	Operation research	2	1		3	10	2	30		70	100		1	2				
MPE 422	Refrigeration and air conditioning	3	1	1	5	10	3	40	20	90	150					1	4	
MPE 423	Design of energy systems	2	1		3	6	3	25	15	60	100					1	2	
-	Elective course (3)	1		2	3	6	2	20	30	50	100						3	
MPE 431	Graduation Project 1	1	3	0	4	8		50	50		100							4
ENG113	Summer Training (2)			2	2			10	15	25	50							2
Total		12	7	4	23	50	13	210	145	395	750	0	1	2	0	5	11	6

Fourth Year -Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
MPE 424	Turbo machines	3	1		4	8	3	35	15	100	150						4	
MPE 425	Power plants	3	1		4	8	3	40	20	90	150						4	
MPE 322	Modelling & Simulation of dynamic systems	3	2	0	5	10	3	35	15	90	150						5	
-	Elective course (4)	1		2	3	6	2	20	30	50	100						3	
ENG231	Project management	2	1	0	3	5	2	30	0	70	100	2	1					
MPE 432	Project 2		1	2	3	10		25		75	100							3
Total		12	6	4	22	47	13	185	80	475	750	2	1	0	0	0	16	3

Contact Teaching Hours and Subject's Distribution Over the Subject are According the Reference Framework and NARS

Semester		Teaching Hours				Student Work Load (SWL)	Subject Area						
		Lectures	Tutorial	Practical	Contact Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory Semester / 1st Semester		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory Semester / 2nd Semester		12	8	5	25	50	0	0	12	3	10	0	
First Year /1st Semester		13	11	1	25	49	3	0	12	3	7	0	0
First Year / 2nd Semester		14	8	3	25	49	3	0	11	1	8	2	0
Second Year /1st Semester		16	7	2	25	48	2	0	2	3	13	5	2
Second Year / 2nd Semester		15	6	3	24	50	2	0	8	0	7	7	0
Third Year /1st Semester		12	5	6	23	49	4	0	0	0	5	14	0
Third Year / 2nd Semester		12	7	4	23	49	0	3	0	0	4	16	0
Fourth Year /1st Semester		12	7	4	23	50	0	1	2	0	5	11	6
Fourth Year / 2nd Semester		12	6	4	22	47	2	1	0	0	0	16	3
Contact		132	74	33	239	491	21	5	62	10	63	71	11
%							8. 6	2.05	25.4	4.1	26.3	29.1	4.51
% NARS and Reference framework	minimum						8	2	25	4	25	25	4
	maximum						12	4		6	30	30	6

Summary of Courses Specification

First year -First Semester:

Course title	Engineering Mathematics (3)			Course Code	BAS151
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	0	40	110		

Ordinary Differential Equations (ODE)
Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients System of ODE– Laplace transform – Inverse Laplace transform –Applications of Laplace transform – Series solution of ODE.
Functions of Several Variables
Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems –Mathematical modeling using partial differential equations.
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.***

Course title	Applied Mechanics			Course Code	BAS152
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2			
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

Kinetics of a Particle: Force and Acceleration; The Equation of Motion in: Rectangular Coordinates, Normal and Tangential Coordinates, Cylindrical Coordinates. Work and Energy; Principle of a Work and Energy, Conservative Forces and Potential Energy, Conservation of Energy, Power and Efficiency. Linear Impulse and Momentum: Conservation of Linear Momentum for a System of Particles, Impact. Moment of Inertia: Radius of Gyration, Moments of Inertia of Thin Plates, Moment of Inertia of a Three-Dimensional Body, Composite Bodies. Planar Kinematics of Rigid Bodies: Translation, Rotation, General Plane Motion, Absolute General Plane Motion Analysis, Relative-Motion Analysis: Velocity, Acceleration. Planar Kinetics of Rigid Body: Force and Acceleration, Equations of Motion; Translation, Rotation About a Fixed Axis, General Plane Motion.

References:

- ***Hannah, J., Hillier, M. J., Applied Mechanics, Longman Pub Group, 3rd Ed., 1996.***

Course title	Thermodynamics 1			Course Code	MPE141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	30	100		

Basic concepts -Energy concepts -Pure substance - The First law of thermodynamics - The Second law of thermodynamics - Entropy -Exergy and thermodynamic equilibrium.
Lab.:2-3 Experiments
Mini Project: Report/Discussion
References:

- ***Yunus A. Cengel, Introduction To Thermodynamics and Heat Transfer, McGraw-Hill Science/Engineering/Math, 2nd Ed., 2007.***

Course name	Mechanical Engineering Drawing				Course Code	PDE 142
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	1	4	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Types of joints -Bolted joints drawings and types of bolts - Key, Pin joints drawing and its applications- Welded, Riveted joints drawing and its applications- Screw jack drawing- Fits, Tolerance, Machining remarks and application on machine element drawing- Sliding bearing drawing- Gear drawing and applications.

References:

- ***R.K.Dhawan, " Fundamentals of Engineering Drawing," S. Chand Publishing, 2014.***

Course title	Electrical & Electronic Engineering			Course Code	ENG232
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Basic elements of electrical circuits - The direct current - Electrical circuits theories - Delta and star junctions and the conversion between them- Continuous sinusoidal AC circuits solving using time vectors- Conductors and semiconductors - Diodes and its applications - Bipolar transistor - Basic amplifier circuits.

References:

- ***M. S. Kalavathi, R. Pilla, S. R. Ch, and G. Suresh, "Basic Electrical and Electronics Engineering," Pearson, 2017.***

Course title	Energy Issues and Environment				Course Code	MUR235
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	75
			25	50		

Importance of Energy, Overview of energy resources, Basic energy problems -Conventional and unconventional reserves and resources - industry overview - Environmental impacts of Electric industry - The evidence for and emerging impacts of climate change - Renewables energy resources: Biofuels - Wind Energy - Solar Energy - Other Renewables: Geothermal and Ocean Energy- Hydro and Nuclear Energy -Nuclear Waste -Domestic and International Energy Policies

References:

- R. A. Hinrichs, Energy: Its Use and the Environment, Fourth edition, Thompson Learning, 2006.

- R. A. Ristinen and J. J. Kraushaar, Energy and the Environment, 3rd Edition, Wiley, 2015

First year -Second Semester:

Course title	Engineering Mathematics (4)			Course Code	BAS155
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	0	50	100		

Partial Differential Equations (PDE)
Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE)– Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.
Complex Analysis
Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping.
References:

- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***
- ***J. Brown, and R. Churchill, "Complex Variables and Applications, 8th Edition", McGraw-Hill, 2009.***

Course title	Materials Strength & Stresses Analysis			Course Code	PDE143
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

Review of statics -The concept and relationship between stress and strain. -Normal stresses, statically indeterminate systems-Bearing stresses, factor of safety and stress concentration-Thermal stresses and statically indeterminate problems-Shearing stress and strain & Direct shearing stress-Bending of beams-Stresses in beams -Beam deflections-Combined stresses-Principal stresses - Maximum shearing stress - (MOHR'S circle)-Combined normal loads & Eccentricity loads - Columns - Pressure vessels - Mechanical properties of materials and materials testing
Lab.:2-3 Experiments
Mini Project: None
References:

- ***Richard G Budynas, Advanced Strength and Applied Stress Analysis, McGraw-Hill Education, 2nd Ed., 1998.***

Course title	Fluid Mechanics 1			Course Code	MPE144
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	20	25	80		

Fluid definition, fluid properties, dimensions and units - Fluid statics-Kinematics of fluid motion, continuity equation, circulation and vorticity- Flow of an ideal incompressible fluid-Theory of momentum and its applications - Fluid flow in pipes -Dimensional analysis and similarity - Fluid measurements.- Stability of immersed and floating bodies-Fluid masses subjected to acceleration-Major and minor losses-Force on plane and curved surfaces
Lab.: 5 experimental testes
Mini Project: None
References:

- ***Som, S. K., Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Private Limited, 2010.***

Course title	Computer-aided Mechanical Drawing			Course Code	MPE145
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	1	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	10	40	75		

Introduction to computer aided drawing-AutoCAD – Solid work- Piston & connecting rod - Eccentric - Safety valves–Lever safety valve-Stop valve - Spring relief valve – 20& 75mm cock - Drain valve - Three-way stop valve - Non-return valve - Cam shaft pump - Worm screw pump.
Lab.:None
Mini Project:None
References:

- ***Rana, R. Roop, A Textbook of Engineering Drawing [Along with an introduction to AutoCAD 2015], I K International Publishing House, 2015.***

Course title	Production and Material Engineering			Course Code	PDE146
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

Cast iron production in blast furnaces - Steel production - Production of nonferrous metals- Properties of metals and alloys- Crystal structure of materials - Phase theory and phase diagram of binary systems -Iron-carbon diagram - Heat treatment - Techniques and equipment of shaping and machining of metals (casting - welding - blanking - piercing- rolling – bending - forging - turning - extrusion).
Lab.:None
Mini Project: Non
References:

- ***R. S. Hingole, and K. P. Kolhe, "Elements of Metal Forming: Bulk Forming Processes: Topics in Mining, Metallurgy and Materials Engineering," 1st Edition, Springer, 2018***
- ***William D. Callister, David G. Rethwisch, Materials Science and Engineering: An Introduction, Wiley, 9th Ed., 2013.***

Course title	Technical Reports Writing			Course Code	ENG111
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1			
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Introduction -Types of technical reports -Writing the report – Using fields and templates - Choosing the right words - Polishing a report - References - Appendices
Lab.:None
Mini Project:None
References:

- ***Gerald J. Alred, Charles T. Brusaw, Walter E. Oliu, The Handbook of Technical Writing, Bedford/St. Martin's, 11th Ed., 2015.***

Second year -First Semester:

Course title	Machine Design (1)			Course Code	PDE241
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

The Nature of mechanical design - Materials in mechanical design-Stress and deformation analysis - Combined stresses-loading-Columns - Shaft design-Types of gears, and gear forces - Belt and chain drives-Keys and couplings - Power screw - Fasteners and bolted connections - Riveted joints - Welded joints - Pressure vessels - Liquid and gas pipe lines -Separation and transmission of motion (brakes-clutches).
Lab.: None
Mini Project: None
References:

- ***Eric Constans, Karl B. Dyer, Introduction to Mechanism Design, CRC Press, 2018.***

Course title	Thermodynamics 2			Course Code	MPE211
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	25	25	100		

Gas power cycles - Steam power cycles -Efficiency analysis of thermal power plant –- - Combustion of fuels- Application of the first and second law of thermodynamics on combustion processes Chemical equilibrium - Chemistry of combustion; (Rate of reaction - Order of reaction - Elementary reaction - Chain Reaction - Global Reaction)- Properties of moist air (psychometrics) -Basic air conditioning processes- Thermodynamics of fluid flow - Air compressors
Lab.:2-4 Experiments
Mini Project:Report/Discussion
References:

- ***Yunus A. Cengel, Michael A. Boles, Thermodynamics: An Engineering Approach, Mcgraw-Hill College, 4th Ed., 2001.***

Course title	Measurements and Measuring Devices			Course Code	MPE242
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		

Basic principle of measurement – Classification of instruments – measurement errors - Instruments calibration using slip gauges and accessories – Linear measurements – Angle measurement – Comparators (mechanical-electrical-pneumatic and optical) – Pressure measurement - Flow measurement -Temperature measurement - Force , Torque and power measurement – Fits and tolerances according to ISO system
References:

- ***Sawhney, A. K., Sawhney, P. "A Course in Mechanical Measurements and Instrumentation", Dhanpat Rai&Co., Delhi, 1998.***

Course title	Proffesional Ethics			Course Code	MUR115
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	50
	0	15	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - enginELErs as responsible

experimenters - codes of ethics - a balanced outlook on law, The code of ethics for enginELErs – NSPE guidelines - Fundamental principles.

References:

- ***Lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an enginELEr", Published by Pearson 2018.***
- ***Harris, C. E., Jr., Pritchard, M. S., & Rabins, M. J. Engineering Ethics. Second edition. Belmont, CA: Wadsworth, 2000***

Course title	Theory of Machines 1			Course Code	PDE243
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

Positions and displacements - Velocity and acceleration -Design of Cams - Gears and their types - Analysis of dynamic forces - The balance - Reciprocating engine dynamics - Torsional moment - Flywheels - Gear train - Gyroscopic forces - Applications.

Lab.: None

Mini Project: None

References:

- ***Amitabha Ghosh, Asok K. Mallik, Theory of Mechanisms and Machines, EWP, 3rd Ed., 2008.***

Course title	Automatic Control Systems			Course Code	CSE253
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Introduction to control systems - Open and closed loop control systems – Laplace transformation and transfer function - Block diagram reduction – Signal flow graph - Modeling of systems: (Electrical circuits, Mechanical systems, DC motors, AC servo motors, Synchro, Potentiometers, stepper motors – Hydraulic servo motor – Thermal systems – liquid level systems) – Linearization of nonlinear mathematical model – Time response analysis: (First order systems – second order systems – steady state error) – Stability of control systems: (Routh stability analysis – Determining relative stability using Routh) – Applications of the previous topics using MATLAB/Simulink toolboxes.

References:

- ***Farid Golnaraghi, Benjamin Kuo, "Automatic Control Systems", McGraw-Hill Education, 10 edition, 2017***
- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015***

Course title	Summer Training (1)			Course Code	ENG112
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	50
	15	10	25		

Students promoted to the 2nd Semester are to carry out professional training inside the faculty, or in specialized training centers under supervision of department stuff members.

Lab.:None

Mini Project:None

Course title	Numerical Methods and Statistics			Course Code	BAS252
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	0	40	110		

Numerical Methods

Curve fitting – Interpolation – Numerical integration – Numerical solution of algebraic and transcendental equations – Iterative methods for solving system of linear algebraic equations – Numerical differentiation – Numerical solution of ordinary differential equations – Numerical solution of partial differential equations– Finite difference method.

Applied Probability and Statistics

Introduction to probability – Discrete random variables – Special discrete distributions – Continuous random variables – Special continuous distributions – Multiple random variables – Sampling distribution and estimation theory – Test of hypotheses – Correlation theory – Analysis of time series.

Lab.: None

Mini Project: None

References:

- ***Hans Petter Langtangen, Svein Linge, Finite Difference Computing with PDEs: A Modern Software Approach, Springer, 2017.***

Second year- Second Semester

Course title	Fluid Mechanics 2			Course Code	MPE215
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	30	100		

Control volume analysis -Differential equations of fluid motion–Boundary layer theory- Ideal fluid flow.

Lab.:2-3 Experiments

Mini Project:None

References:

- ***Frank M White, Fluid Mechanics, McGraw-Hill Education, 8th Ed., 2015.***

Course title	Heat Transfer 1			Course Code	MPE245
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	30	100		

Principles of heat transfer -Conduction heat transfer -One, two, three-dimensional Heat Transfer-Numerical heat transfer, two-dimensional steady heat conduction -Fins - Transient heat conduction equations- External forced convection -Internal forced convection -Natural convection

Lab.:2-3 Experiments

Mini Project:None

References:

- ***Incropera, F.P., and Dewitt, D.P., Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 6th Ed., 2006.***

Course title	Research and analysis skills			Course Code	MUR221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	50
	0	15	35		

Critical thinking - Assess and develop thinking skills – Identifying arguments - Argument and non-argument - Clarity, internal consistency and structure - Reading between the lines: Recognising underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and note-making: Critical selection, interpretation and noting of source material – Critical thinking when writing – Evaluating critical writing.

References:

- S. Cottrell, Critical Thinking Skills, 3rd Edition, published by Macmillan Study Skills, 2017

Course title	Advanced Mechanical Systems			Course Code	PDE246
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	0	35	90		

PID controllers, design of control systems, distributed control systems, SCADA, application to energy systems: refrigeration and air conditioning, power plants, water plants …

References:

- ***Norman S. Nise, Control Systems Engineering, Wiley, 7th Ed., 2015.***

Course title	Computer Applications in Mechanical Power Engineering			Course Code	MPE221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	0	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	20	35	70		

Introduction - Error analysis - Linear algebraic equations - Roots of equations - Optimization-Curve fitting - Differentiation - Quadrature - Solving ordinary differential equations - Applications in mechanical power engineering (thermodynamics – heat transfer – fluid mechanics).

Lab.:

Mini Project:None

References:

- ***Steven Chapra, Raymond Canale, Numerical Methods for Engineers, McGraw-Hill Education, 7th Ed., 2014.***

Third year- First Semester

Course title	Energy Conversion			Course Code	MPE321
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		

Introduction-growth rate-Energy conversion matrix-Principles of Solar radiation-solar angles-solar thermal processes-Introduction to nuclear energy- production of electrical energy using :solar cell, thermoelectric generator-fuel cell-Magnetohydrodynamic generator-Wind energy

Lab.: Experiments include (measurement of solar radiation with comparison of radiation models, Evaluation of the performance solar cell, fuel cell and wind turbines

Mini Project: Students presents a mini project in the form of prototype and report by the end of the semester.

References:

- ***Archie W Culp, " Principles of Energy Conversion", McGraw – Hill, Singapore, 1991.***

Course title	Heat Transfer 2			Course Code	MPE311
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		

Forced convection- Free or natural convection-Heat transfer by radiation-Condensation, evaporation, and boiling heat transfer- Heat exchangers- Mass transfer by molecular diffusion- Convective mass transfer.
Lab.:2-3 Experimets
Mini Project:None
References:

- ***Yunus A. Cengel, Afshin J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill Education, 5th Ed., 2014.***

Course title	Microprocessors Design and Architecture			Course Code	CSE341
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		

Computer organization and design – Designing an arithmetic and logic unit – Computer components and data transfers via buses – Different types of computer busses – Getting familiar with the different types of busses – Microprocessor design and programming – Microprocessor classes and families –Designing a microprocessor – Hardwired control unit, design, and implementations – Designing a control unit – Micro-programmed control unit – Implementation via modern description language (VHDL) – Memory organization – Pipeline and vector processing – Computer arithmetic – Input and output organization.

References:

- ***Mano, M. Morris, and Charles R. Kime. Logic and computer design fundamentals. Pearson Higher Education, 2015.***

Course title	Communication & Presentation Skills			Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	40	60		

Introduction to communication - communication process - communication skills - oral and non-verbal communication and report writing - letter writing and interview - planning a management presentation - everyday management presentations - advantages and disadvantages of presentations- four-stage presentation planning process (identify your aim, profile your audience, define your key message statement, and outline the scope.) - audience profiling -presentation environment - management presentation planning guidelines
Lab.:None
Mini Project: None
References:

- ***Ian Tuhovsky, Wendell Wadsworth, Communication Skills: A Practical Guide to Improving Your Social Intelligence, Presentation, Persuasion and Public Speaking, CreateSpace Independent Publishing Platform, 2015.***

Course title	Elective Course 1			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	1		2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	30	20	50		

The elective courses are mainly term projects. The project effort and the final report consists of a description of the idea/concept/design, with reference to the relevant literature, followed by analysis and conclusions. Analysis should use material covered in class and/or related tools. Maximum number of students in project team is 10 students. Students are asked to select one of the following subjects:

PME131 **Water treatment**

PME132 **Natural gas technology**

PME133 **Pipelines**

PME134 **Steam technology**

PME135 **Fuel cell**

Course title	Computational Fluid Dynamics			Course Code	MPE323
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2		1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	20	30	50		

Governing equations of fluid flow and heat transfer -Construction of mathematical models for mechanical power engineering applications-Numerical solution and programming of systems of initial value problems in ordinary differential equations-Numerical solution and programming of systems of boundary value problems in ordinary differential equations-Numerical solution and programming of Diffusion process problem by FDM and FVM -Numerical solution and programming of Diffusion-Convection process problem by FDM and FVM -Numerical solution and programming of time dependent Diffusion-Convection processes problem by FDM and FVM
Lab.: None
Mini Project: Simulate a complex 3D flow problem with or without heat transfer.

Third year- Second Semester

Course title	Gas Dynamics			Course Code	MPE324
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Oral	Semester work	Final Exam.	Contact grads	150
	0	50	100		

Basic concepts of compressible fluid flow -Wave propagation in compressible flow -Steady one-dimensional isentropic flow -Normal shock waves -Oblique shock waves- Flow in variable area ducts - Adiabatic flow in constant area ducts (Fanno Flow)-Isothermal flow in constant area ducts with friction - Flow in ducts with heat transfer (Rayleigh Flow) - Generalized one dimensional gas flow
Lab.:2-3 Experiments
Mini Project:Report/Discussion
References:

- ***James E.A. John, Theo G. Keith, Gas Dynamics, Pearson, 3rd Ed., 2006.***

Course title	Combustion Engines			Course Code	MPE325
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	10	25	90		

Introduction - Operating characteristics of internal combustion engines - Actual and standard cycles - Air and fuel induction–Combustion - Engine heat transfer –Engine exhaust - Engine cooling - Engine maintenance and lubrication - Engine performance tests.
Lab.:2-3 Experiments
Mini Project:None
References:

- ***John Heywood, Internal Combustion Engine Fundamentals, McGraw-Hill Education, 2nd Ed., 2018.***

Course title	Power & Electrical Machines			Course Code	ELE342
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	0	50	100		

Principles of electrical machines - AC and DC machines -Induction motors -Synchronized motors - Special motors - Transformers - AC and DC distribution systems - Transmission lines - Secondary stations - Stations devices.
Lab.:None
Mini Project:None
References:

- ***Kothari, D. And Nagrath, I., Electric Machines, McGraw Hill India, 4th Ed., 2010.***

Course title	Elective Course 2			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	1		2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	30	20	50		

The elective courses are mainly term projects. The project effort and the final report consists of a description of the idea/concept/design, with reference to the relevant literature, followed by analysis and conclusions. Analysis should use material covered in class and/or related tools. Maximum number of students in project team is 10 students. Students are asked to select one of the following subjects:

PME231 **computational fluid dynamics**
PME232 **Biomass**
PME233 **Hydrulic control**
PME234 **Solar energy**
PME235 **Two phase flow**
PME236 Water Desalination

Course title	Automatic Control of Energy Systems			Course Code	MPE326
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	125
	10	25	90		

PID controllers, design of control systems, distributed control systems, SCADA, application to energy systems: refrigeration and air conditioning, power plants, water plants …

References:

- ***Norman S. Nise, Control Systems Engineering, Wiley, 7th Ed., 2015.***

Course title	Engineering Economy			Course Code	ENG221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Introduction - Economic Problem - Foundations of Engineering Economy- Terms and Symbols - Role of Economics in Decision Making - A Study of the Engineering Economy -Economic Parity - Demand and Supply -Supply and Demand Flexibility -Theory of consumer behavior - Production theories - Production curve possibilities - Cost theories - Payback period- Simple and compound interest - Lowest attractive rate of return - Interest and internal rate of return -Net present value of the project -Cash flows - Case studies: Calculation of electricity production cost - Electricity tariff.

References:

- D. G. Newnan, T. G. Eschenbach, Engineering Economic Analysis 13th Edition, Oxford University Press; 2017

- Leland Blank , P. E., Anthony Tarquin , P. E.," ENGINEERING ECONOMY", 7th edition, McGraw-Hill, 2012.

Fourth year -First Semester

Course title	Hydraulic Machines			Course Code	MPE421
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	15	35	100		

Basic theory of turbo-machines- Dimensional analysis and similitude of turbo-machines-Cascade mechanics - Pumps-Turbines -Fans, blowers and compressors- Volumetric machines -Theory of cavitation in centrifugal pumps.

Lab.:

Mini Project:

References:

- ***Bansal, R., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2005.***

Course title	Operation Research			Course Code	ENG212
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1			
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Linear programming - Transportation problem - Assignment problem -Simulation and Modeling - Analysis of stochastic models in OR –markovseries-Networks-Queuing theory -Sequencing and scheduling -Inventory control - Integer linear programming- Dynamic programming.

Lab.: None

Mini Project: None

References:

- ***Frederick Hillier, Introduction to Operations Research, McGraw-Hill Education, 2014.***

Course title	Refrigeration and Air Conditioning			Course Code	MPE422
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		

Gas Refrigeration cycles - Vapor compression cycle- Working fluids - Multi pressure cycles – Compressor-Condenser-Expansion devices Evaporators - Complete vapor compression refrigeration system - Psychometric chart and air conditioning processes - Vapor absorption cycle - Applications in air conditioning- Designing considerations - Load estimation - Air transport and distribution -Design of air conditioning apparatus - Control units - Non-conventional cooling systems.
Lab.:
Mini Project:
References:

- ***Arora, C., P., Refrigeration and Air Conditioning, McGraw-Hill, 2009.***

Course title	Design of Energy Systems			Course Code	MPE423
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	15	25	60		

This special course may include a wide range of special topics in energy systems such as: Fundamentals of energy conversion/utilization, Basic requirements for an energy system . Main components of energy system, sizing and selection of system components. Advanced topics in Bio-mass energy, advanced topics in Geothermal energy and advanced topics in Agricultural and organic waste energy and related topics, case studies
Lab.:None

Mini Project: At the end of the course, the student will prepare a small project to design an integrated energy system
References:

- ***Travis Bradford, The Energy System: Technology, Economics, Markets, and Policy, The MIT Press, 2018.***

Course title	Elective Course 3			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	1	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	30	20	50		

The elective courses are mainly term projects. The project effort and the final report consists of a description of the idea/concept/design, with reference to the relevant literature, followed by analysis and conclusions. Analysis should use material covered in class and/or related tools. Maximum number of students in project team is 10 students. Students are asked to select one of the following subjects:

PME331 **Design of heat exchangers**
PME332 **Fire fighting**
PME333 **Advanced refrigeration systems**
PME334 **Advanced energy conversion**
PME335 **Refrigeration and air conditioning control**

Course title	Graduation Project 1			Course Code	MPE431
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	1	3	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	50	50	0		
The student completes the practical analysis for the project after the exams of the second semester. Lab.: None Mini Project: None					

Course title	Summer Training (2)			Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	50
	15	10	25		
Students promoted to the 4th Semester are to carry out professional training inside the faculty, or in specialized training centers under supervision of department stuff members. Lab.: None Mini Project: None					

Fourth year - Second Semester:

Course title	Turbo Machines			Course Code	MPE424
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	3	1			
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	15	35	100		
Introduction in Turbo machines - Thermodynamic cycles of turbo machines - Steam flow through steam turbine nozzles - Steam flow through turbine blades - Bleeding and reheat systems in steam turbines - Performance parameters at variable loads - Methods of steam turbine control - Velocity regulation - Gas turbines types - Elements of gas turbines used in power stations and jet engines - Gas turbine performance - Air compressors - Design and methods of cooling of gas turbine blades - Inlet and outlet ports of gas turbines used in airplanes - Diffusers design - Combustion chambers in gas turbines. Lab.: None Mini Project: None References: - *David Japikse, Introduction to Turbomachinery, Concepts Eti, 1994.*					

Course title	Power Plants			Course Code	MPE425
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	3	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	20	40	90		
Engineering economy for power plants -Environmental aspects of power generation-Innovation technologies in the field of power plants-Basics of nuclear power plants- Steam generators and cycles -Water systems in power plants Lab.: None Mini Project: None References: - *Nag, P. K., Power Plant Engineering, Tata McGraw-Hill Education, 2002.*					

Course title	Modelling & Simulation of Dynamic Systems			Course Code	MPE322
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	150
	15	35	100		

Modeling of basic mechanical, fluidic, thermal and electric systems, Transfer function and state space representations, steady state and transient response of first and second order systems, Feedback systems, Routh stability criterion
Lab.: None
Mini Project: Compare a dynamic system transient output with its theoretical model.
References:

- ***Craig A. Kluever, Dynamic Systems: Modeling, Simulation, and Control, John Wiley & Sons, 2015.***

Course title	Elective Course 4			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	1	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	30	20	50		

The elective courses are mainly term projects. The project effort and the final report consists of a description of the idea/concept/design, with reference to the relevant literature, followed by analysis and conclusions. Analysis should use material covered in class and/or related tools. Maximum number of students in project team is 10 students. Students are asked to select one of the following subjects:

PME433 **Thermoelectric systems**
PME434 **Energy efficiency**
PME435 **Fuel systems**
PME436 **Sensors in mechanical systems**
PME437 **Heat operated refrigeration systems**

Lab.: None
Mini Project: None

Course title	Project Management			Course Code	ENG231
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	30	70		

Engineering project and project management -Assessment of environmental impact and project management -The technical and economic feasibility study and project management-Quality and project management-Project planning-Environmental management of projects.
Lab.: None
Mini Project: None
References:

- ***Kathy Schwalbe, An Introduction to Project Management, CreateSpace Independent Publishing Platform, 6th Ed., 2017.***

Course title	Project 2			Course Code	MPE432
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	0	1	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Contact grads	100
	0	25	75		

The student completes the practical analysis for the project after the exams of the second semester.

Production and Mechanical Design Engineering

Production and Mechanical Design Engineering

Program description

Production and Mechanical design engineering is a discipline which covers the fields of solid mechanics, engineering design, production technology, economics and management.

Program LO (specialized)

In addition to the competencies for all engineering programs (Level A) and the competencies for the BASIC **Mechanical** engineering discipline (Level B), the **Production and Mechanical Design Engineering** graduate must be able to (Level C):

C1. Evaluate and appraise designs, processes and products, and propose improvements;
C2. Interpret numerical data and apply analytical methods for engineering design purposes
C3. Use the principles of engineering science in developing solutions to practical mechanical engineering problems.
C4. Select appropriate manufacturing method and materials considering design requirements.

Required courses.

In order to get a Bachelor of science Degree in this program, and to satisfy the program LO, the following set of courses need to be completed.

List of Production and Mechanical Design Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requirements
	Faculty of Engineering Requirements
	Mechanical engineering Requirements
PDE121	Machining Processes and Equipment (1)
PDE211	Forming Processes and Equipment (1)
PDE213	Forming Processes and Equipment (2)
PDE212	Stress Analysis Systems
PDE321	Machine Tool Design (1)
PDE322	Machining Processes and Equipment (2)
PDE331	Facility Planning
PDE323	Machine Tool Design (2)
PDE324	Metrology
PDE325	Theory of Metal Cutting
PDE332	Operation management
PDE422	Production Tools and Equipment Design
PDE423	Theory of Metal Forming
PDE411	Mechanical Maintenance
PDE425	Fine Measurements
PDE441	Graduation project (1)
PDE442	Graduation project (2)
-	Elective course (1)
-	Elective course (2)
-	Elective course (3)
	Total contact H.= 75 Hrs

Elective Courses	
Code	**Elective Course (1)**
PDE161	Robot Arm Engineering
PDE162	Composite Materials
PDE163	Quality Management
	Elective Course (2)
PDE261	Mechatronic
PDE262	Design of Mechanical joints
PDE263	Work Study
	Elective Course (3)
PDE361	Engineering Materials Selection
PDE362	Design and Production of Dies
PDE363	Feasibility Study

Distribution of Program Courses on the semesters:

In addition to the courses of preparatory year, the students of Production and Mechanical Design Engineering should study the following courses:

First Year- First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 151	Engineering Mathematics (3)	3	2	0	5	10	3	40		110	150			5				
BAS 152	Applied Mechanics	2	2	0	4	8	2	35		90	125			4				
MPE 141	Thermodynamics (1)	3	1	1	5	10	3	30	20	100	150			3	2	0		
PDE 142	Mechanical Engineering Drawing	1	4	0	5	10	4	50		100	150			2	0	3		
MUR 115	Professional Ethics	2	0	0	2	3	2	15		35	50	2						
PDE 121	Machining Processes and Equipment (1)	3	1	0	4	8	2	35		90	125				2	2		
Total		14	10	1	25	49	18	200	20	530	750	2	0	14	4	5	0	0

First Year- Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 155	Engineering Mathematics (4)	3	2		5	10	3	50		100	150			5				
PDE 143	Materials strength & Stresses analysis	3	2		5	10	3	35		90	125			2		3		
MPE 144	Fluid mechanics (1)	2	1	1	4	8	3	25	20	80	125			2		2		
MPE 145	Computer-aided mechanical drawing	1	0	2	3	8	3	40	10	75	125					1	2	
PDE 146	Production and material engineering	3	2		5	8	3	35		90	125			3		2		
ENG221	Engineering Economy	2	1		3	5	2	30		70	100	1	2					
Total		14	8	3	25	49	17	215	30	505	750	1	2	12	0	8	2	0

Second Year- First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 241	Machine Design (1)	3	2		5	10	3	35		90	125					3	2	
PDE 211	Forming Processes and Equipment (1)	2	1	1	4	8	3	15	15	70	100					4		
PDE 212	Stress Analysis Systems	2	1		3	6	3	25		75	100					1	2	
MPE 242	Measurements and measuring devices	3	1	1	5	10	3	40	20	90	150			1		2	2	
PDE 243	Theory of machines (1)	3	2		5	8	3	35		90	125			1		2	2	
ENG111	Technical Reports writing	2	1		3	5	2	30		70	100	3						
ENG 112	Summer Training (1)	0	0		2	3	3	10	15	25	50							2
Total		15	8	2	25	47	22	200	50	500	750	3	0	2	0	12	8	2

Second Year- Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 252	Numerical methods and statistics	3	2		5	10	3	40		110	150			5				
ENG212	Operation Research	2	1	0	3	6	2	30		70	100		1	2				
MPE 245	Heat transfer (1)	3	1	1	5	10	3	30	20	100	150			1		2	2	
PDE 215	Machine Design (2)	3	2		5	10	3	50		100	150						5	
CSE 253	Automatic control systems	2	1		3	6	2	30		70	100					3		
PDE 213	Forming Processes and Equipment (2)	2	1	1	4	8	3	35		90	125					2	2	
Total		15	8	2	25	50	16	230	20	500	750	0	1	8	0	7	9	0

Third Year- First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 311	Theory of Machine (2)	3	2		5	10	3	35		90	125					2	3	
PDE 321	Machine Tool Design (1)	2	1		3	8	2	35		90	125					2	1	
PDE 322	Machining Processes and Equipment (2)	2	1	1	4	8	3	30	20	100	150					2	2	
PDE 331	Facility Planning	3	1		4	8	3	40		110	150					1	3	
-	Elective Course (1)	2	1		3	6	3	25		75	100						3	
MUR114	Communication and presentation skills	2	2		4	5	2	40	0	60	100	4						
Total		14	8	1	23	46	19	205	15	530	750	4	0	0	0	7	12	0

Third Year- Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
MUR 234	Industry & Environment	2	1		3	5	2	25		50	75	3						
PDE 323	Machine Tool Design (2)	2	1	1	4	10	3	40		110	150					1	3	
PDE 324	Metrology	3	1	1	5	10	3	30	20	100	150					2	3	
PDE 332	Operation management	2	1		3	6	3	35		90	125		3					
PDE 342	Computer Aided Design/ Computer Aided Manufacturing (CAD/CAM)	2	3		5	10	2	50		100	150						5	
-	Elective Course (2)	2	1		3	6	3	25		75	100						3	
Total		13	8	2	23	47	20	225	20	505	750	3	3	0	0	3	14	0

Fourth Year -First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 421	Computer Numerical Control Machines	2	3		5	10	3	40		110	150					1	4	
PDE 325	Theory of Metal Cutting	3	1		4	8	3	50		100	150					4		
MUR221	Research and analysis skills	2	0	0	2	4	2	15		35	50	2						
PDE 423	Theory of Metal Forming	2	1	1	4	8	3	50		100	150					4		
-	Elective Course (3)	2	1		3	6	2	25		75	100						3	
PDE 441	Graduation Project (1)	1	3		4	8		50	50		100							4
ENG 113	Summer Training (2)				2	4		10	15	25	50							2
Total		12	9	1	22	44	15	250	65	435	750	2	0	0	0	9	7	6

Fourth Year- Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 411	Mechanical Maintenance	2	2		4	8	3	35		90	125						4	
PDE 425	Fine Measurements	2	1	1	4	8	3	30	25	70	125						4	
PDE 422	Production Tools and Equipment Design	3	1		4	8	3	30		70	100						4	
ENG213	Quality Control	2	1		3	6	2	30		70	100				3			
ENG231	Project Management	2	1		3	5	2	30		70	100	1	2					
PDE 442	Graduation Project (2)			4	4	10		100	100		200							4
Total		11	6	5	22	45	15	265	125	360	750	1	2	0	3	0	12	4

Distribution of Program Contact Hours Over the Subject Areas

Semester		Teaching Hours				Student workload (SWL)	Subject Area						
		Lectures	Tutorial	Practical	Total Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/ 1st semester		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2ndsemester		12	8	5	25	50	0	0	12	3	10	0	
First year/1st semester		14	10	1	25	49	2	0	14	4	5	0	0
First year/ 2nd semester		14	7	3	24	49	1	2	11	0	8	2	0
Second year/1st semester		15	8	2	25	47	3	0	2	0	12	8	2
Second year/ 2nd semester		15	8	2	25	50	0	1	8	0	7	9	0
Third year/1st semester		14	8	1	23	46	4	0	0	0	7	12	0
Third year/ 2nd semester		13	8	2	23	47	3	3	0	0	3	14	0
Fourth year/1st semester		12	9	1	22	44	2	0	0	0	9	7	6
Fourth year/ 2nd semester		10	7	5	22	45	1	2	0	3	0	12	4
Total		133	81	24	238	477	21	8	62	10	65	64	12
%							8.2	3.3	25.6	4.1	27.8	26.4	4.9
% NARS And Reference framework	Min.				250		8.0	2.0	25	4.0	25.0	25.0	4.0
	Max.				280		12.0	4.0		6.0	30.0	30.0	6.0

Summary of Courses Specification

First Year – First Semester:

Course name	Engineering Mathematics (3)				Course Code	BAS 151
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	0	0	110		

Ordinary Differential Equations (ODE) course

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undetermined coefficients method and variation of parameters method for finding the particular solution) – Cauchy-Euler ODE (homogeneous and nonhomogeneous) – System of ODE – Laplace transform – Inverse Laplace transform – Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables course

Differentiation of integration – Vector calculus – Multiple integrals (double and triple) and their applications – Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems – Mathematical modeling using partial differential equations.

References:

- ***Shair Ahmad, A. "A Textbook on Ordinary Differential Equations." Springer International Publishing, 2018.***

Course name	Applied Mechanics				Course Code	BAS 152
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Kinetics of a Particle: Force and Acceleration; The Equation of Motion in: Rectangular Coordinates, Normal and Tangential Coordinates, Cylindrical Coordinates. Work and Energy; Principle of a Work and Energy, Conservative Forces and Potential Energy, Conservation of Energy, Power and Efficiency. Linear Impulse and Momentum: Conservation of Linear Momentum for a System of Particles, Impact. Moment of Inertia: Radius of Gyration, Moments of Inertia of Thin Plates, Moment of Inertia of a Three-Dimensional Body, Composite Bodies. Planar Kinematics of Rigid Bodies: Translation, Rotation, General Plane Motion, Absolute General Plane Motion Analysis, and Relative Motion Analysis: Velocity, Acceleration. Planar Kinetics of Rigid Body: Force and Acceleration, Equations of Motion; Translation, Rotation About a Fixed Axis, General Plane Motion.

References:

- ***Hibbeler, R. C, "Engineering Mechanics, dynamics," Upper Saddle River, New Jersey: Published by Pearson Prentice Hall, 2017.***

Course title	Thermodynamics 1			Course Code	MPE141
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	total grads	150
	20	30	100		

Basic concepts -Energy concepts -Pure substance - The First law of thermodynamics - The Second law of thermodynamics - Entropy -Exergy and thermodynamic equilibrium.

Lab.:2-3 Experiments

Mini Project: Report/Discussion

References:

- ***Yunus A. Cengel, Introduction To Thermodynamics and Heat Transfer, McGraw-Hill Science/Engineering/Math, 2nd Ed., 2007.***

Course name	Mechanical Engineering Drawing				Course Code	PDE 142
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	1	4	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Types of joints -Bolted joints drawings and types of bolts - Key, Pin joints drawing and its applications- Welded, Riveted joints drawing and its applications- Screw jack drawing- Fits, Tolerance, Machining remarks and application on machine element drawing- Sliding bearing drawing- Gear drawing and applications.

References:

- ***R.K.Dhawan, " Fundamentals of Engineering Drawing," S. Chand Publishing, 2014.***

Course name	Professional Ethics				Course Code	MUR 115
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	50
	15	0	0	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.

References:

- Harris, C. E., Jr., Pritchard, M. S., & Rabins, M. J. Engineering Ethics. Second edition. Belmont, CA: Wadsworth, 2000

- lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson Copyright © 2018.

Course name	Machining Processes and Equipment (1)				Course Code	PDE 121
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	3	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Safety and safety precautions in production workshops -Concept of metal cutting process - Cutting conditions - Sawing - Turning - Shaper and planner - Drilling - Reaming - Milling - Grinding machines - Cutting tool materials - Workpiece holding devices - holding devices of cutting tools - Computer applications.

References:

- ***Groover, Mikell P., "Fundamentals of modern manufacturing: materials, processes and systems," 7th Edition, 2015.***
- ***Smith, G. T., "Cutting tool technology: industrial handbook," springer, 2018.***
- ***Heinz Tschätsch, "Applied Machining Technology," Springer-Verlag Berlin Heidelberg, 2009.***

First Year – Second Semester:

Course name	Engineering Mathematics (4)				Course Code	BAS 155
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Partial Differential Equations (PDE) course

Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE) – Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.

Complex Analysis course

Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping

References:

- ***Erwin Kreyszig , "Advanced Engineering Mathematics," John Wiley & Sons, 2010.***
- ***C. Henry Edwards, David E. Penney, and David T. Calvis, "Differential Equations and Boundary Value Problems: Computing and Modeling," 5th Edition, Pearson, 2014.***

Course name	Materials Strength & Stresses analysis				Course Code	PDE 143
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Review of statics (force, moment, couples, transfer of force, equilibrium of force system, free-body diagrams) - The concept and relationship between stress and strain - Axial stresses, statically indeterminate systems - Bearing stresses, factor of safety and stress concentration - Thermal stresses and statically indeterminate problems - Shearing stress and strain & Direct shearing stress - Bending of beams: shear and moment diagrams - Stresses in beams - Beam deflections (Double integration & Superposition) - Combined stresses (combined normal & shear), Principal stresses - Maximum shearing stress - (MOHR'S circle) - Combined normal loads & Eccentric loads - Columns: EULER'S column formula - Mechanical properties of materials and materials testing.

References:

- ***Beer, Ferdinand P., "Mechanics of materials," McGraw-Hill, 2012 .***

Course name	Fluid Mechanics (1)				Course Code	MPE 144
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	25	0	20	80		

Thermodynamics

What is thermal systems engineering and the use of energy - Evaluating properties of ideal gas: p-v-T relation- The first law and thermodynamic processes - The second law of thermodynamics: Carnot cycle, 2nd law applications to thermodynamic cycles(I.C.E., Air standard gas cycles) - Properties of pure substance and processes of steam - Classification of boilers, construction and safety devices, Improving Performance- superheat and Reheat steam power cycles - Reversed Carnot cycle & Analysis of vapor refrigeration and heat pump systems; refrigerant, properties and p-H charts - Modes of Heat Transfer; conduction, convection and radiation - Psychrometric applications, moist air properties, A/C processes, and psychrometric chart.

Fluid Mechanics

Fundamental concepts: Definition of a fluid, Dimensions and units. Fluid properties- Fluid static: Pressure and pressure measurements, Hydraulic forces on submerged surfaces, Forces on floating and submerged bodies, Fluid masses under acceleration, Rotating containers - Basic Equations of Fluid Mechanics: kinematics of flow, continuity, momentum, energy and Bernoulli's Equations. Hydraulic and energy gradient lines - Flow in pipes: laminar and turbulent flows, primary and minor losses, pipes in parallel and series and pipe branching.

References: ***Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt, "Fundamentals of Heat and Mass Transfer," 8th Edition, Wiley, 2017.***

Course name	Computer-aided mechanical drawing				Course Code	MPE145
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	0	2			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	40	10	0	75		

Introduction to computer aided drawing-AutoCAD – Solid work- Piston & connecting rod - Eccentric - Safety valves–Lever safety valve-Stop valve - Spring relief valve – 20& 75mm cock - Drain valve - Three-way stop valve - Non-return valve - Cam shaft pump - Worm screw pump.
Lab.:None
Mini Project:None

References:

- ***Rana, R. Roop, A Textbook of Engineering Drawing [Along with an introduction to AutoCAD 2015], I K International Publishing House, 2015.***

Course name	Production and material engineering				Course Code	PDE 146
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Cast iron production in blast furnaces - Steel production - Production of nonferrous metals- Properties of metals and alloys- Crystal structure of materials - Phase theory and phase diagram of binary systems - Iron-carbon diagram - Heat treatment - Techniques and equipment of shaping and machining of metals (casting - welding - blanking -piercing- rolling – bending - forging - turning - extrusion).
References:

- ***R. S. Hingole, and K. P. Kolhe, "Elements of Metal Forming: Bulk Forming Processes: Topics in Mining, Metallurgy and Materials Engineering," 1st Edition, Springer, 2018.***
- ***William D. Callister, David G. Rethwisch, Materials Science and Engineering: An Introduction, Wiley, 9th Ed., 2013.***

Course name	Engineering Economy				Course Code	ENG 221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Introduction – Types of cost – Break-Even analysis – Time value of money – Interest factors – Economic analysis of alternatives – Present worth – Annual worth – Equivalent present cost – Equivalent uniform annual cost – Rate of return – Payback period – Depreciation – Sensitivity and risk analysis – Principles of cost accounting – Balance sheet – Income statement. Job costing, Process costing, Financial ratios.

Reference:

- *Donald, t. j. Engineering Economic Analysis . oxford university press. (2017).*

Second Year – First Semester:

Course name	Machine Design (1)				Course Code	PDE 241
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Introduction to Design Codes and Standards - Theories of Failure - Material Selection - Design of Riveted Joints and Welded Joints - Design of Threaded Fasteners and Power Screws - Design of Couplings, Keys, Pins and Splines - Design of Mechanical Springs - Design of Shafts - Design of Cylinders - Design of Sealing and Gaskets – Design of Power Screw Jack.

References:

- ***Budynas, Richard Gordon, and J. Keith Nisbett. Shigley's "mechanical engineering design", 9th edition, New York: McGraw-Hill, 2012.***
- ***Norton, Robert L. "Machine design: an integrated approach", 3rd edition, Prentice-Hall Inc: NJ, USA, 2006.***

Course name	Forming Processes and Equipment (1)				Course Code	PDE 211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	15	15	0	70		

Introduction to manufacturing technology - Manufacturing economics - Mechanical behavior of metals - Casting processes - Casting defects - Welding processes - Welding inspection and test.

References:

- ***R. S. Hingole, and K. P. Kolhe, "Elements of Metal Forming: Bulk Forming Processes: Topics in Mining, Metallurgy and Materials Engineering," 1st Edition, Springer, 2018.***

Course name	Stress Analysis Systems				Course Code	PDE 212
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	25	0	0	75		

Stress and strain relation, Stress and strain transformation in 2D and 3D, Principal stresses and strains, Mohr's circle for 2D and 3D stresses and strains, Stress and strain analysis using finite element programs, Stress and strain measuring apparatus, Electrical resistance strain gauges, Photoelasticity methods, Moire method, Coating methods.

Reference:

- ***M. Hetenyi, "Handbook of Experimental Stress Analysis," Forgotten Books, United States, 2018.***

Course name	Measurement and measuring devices				Course Code	MPE 242
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	20	0	90		

Basic principle of measurement – Classification of instruments – measurement errors - Instruments calibration using slip gauges and accessories – Linear measurements – Angle measurement – Comparators (mechanical-electrical-pneumatic and optical) – Pressure measurement - Flow measurement -Temperature measurement - Force , Torque and power measurement – Fits and tolerances according to ISO system

References:

- ***Sawhney, A. K., Sawhney, P. "A Course in Mechanical Measurements and Instrumentation", Dhanpat Rai&Co., Delhi, 1998..***

Course name	Theory of machines (1)				Course Code	PDE 243
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Mechanisms and Machines: Classification of Machines, Kinematic Pairs - Velocity Analysis: Analytical, Graphical, Instantaneous center method - Acceleration Analysis: Analytical, Graphical - Epicyclical Gear trains - Cams and followers - Static force analysis - Balancing.

References:

Robert L. Norton, "Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines," 5th edition, McGraw-Hill Higher Education, 2011

Course name	Technical Reports Writing				Course Code	ENG 111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Texts in production engineering - Writing experimental and technical reports - Preparation of abstracts of specialized articles - Discussions and training between students- Preparation of abstracts of read articles.

References:

- ***The Library Academic Engagement Team, Library Services, University of Birmingham., "Research and Study Skills: Academic Writing", 2nd Edition, 2014.***

Course name	Summer Training (1)				Course Code	ENG 112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	0	0	0			
Course grades	Semester Work	Practical	Oral	Discussion	Total grads	50
	10	0	15	25		

Training is carried out according to a program developed by the scientific department annually.

Second Year – Second Semester:

Course name	Numerical methods and statistics				Course Code	BAS 252
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	0	0	110		

Numerical Methods

Curve fitting – Interpolation – Numerical integration – Numerical solution of algebraic and transcendental equations – Iterative methods for solving system of linear algebraic equations – Numerical differentiation – Numerical solution of ordinary differential equations – Numerical solution of partial differential equations – Finite difference method.

Applied Probability and Statistics

Introduction to probability – Discrete random variables – Special discrete distributions – Continuous random variables – Special continuous distributions – Multiple random variables – Sampling distribution and estimation theory – Test of hypotheses – Correlation theory – Analysis of time series.

References:

- ***Richard Khoury and Douglas Wilhelm Harder, "Numerical Methods and Modelling for Engineering," Springer International Publishing, 2016.***
- ***Douglas C. Montgomery, "Applied Statistics and Probability for Engineers," Wiley, 2014.***

Course name	Operation Research				Course Code	ENG 212
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Introduction to operations research- Linear programming: Graphical method, Simplex method - Network models and shortest route problems - Inventory control models - Decision analysis- Queuing theory, Dynamic Programming, Scheduling, and Metaheuristics.

References:

- ***F.S. Hillier and G. J. Lieberman, "Introduction to Operations Research", 10th ed. New York: McGraw-Hill Higher Education, 2015.***

Course name	Heat transfer (1)				Course Code	MPE 245
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	30	20	0	100		

Principles of heat transfer -Conduction heat transfer -One, two, three-dimensional Heat Transfer- Numerical heat transfer, two-dimensional steady heat conduction -Fins - Transient heat conduction equations- External forced convection -Internal forced convection -Natural convection

Lab.:2-3 Experiments

Mini Project:None

References:

- ***Incropera, F.P., and Dewitt, D.P., Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 6th Ed., 2006.***

Course name	Machine Design (2)				Course Code	PDE 215
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Types and kinematics of gears - Design of spur gears - Design of helical gears and double helical gears - Design of bevel gears - Design of worm gears - Types of bearing - Journal bearing design - Rolling bearing design - Reduction speed gear box design and construction drawing- Belt design- Design of brakes and clutches.

References:

- ***Budynas, Richard Gordon, and J. Keith Nisbett. Shigley's "mechanical engineering design", 9th edition, New York: McGraw-Hill, 2012.***
- ***Norton, Robert L. "Machine design: an integrated approach", 3rd edition, Prentice-Hall Inc: NJ, USA, 2006.***

Course name	Automatic control systems				Course Code	CSE 253
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Introduction to control systems - Open and closed loop control systems – Laplace transformation and transfer function - Block diagram reduction – Signal flow graph - Modeling of systems: (Electrical circuits, Mechanical systems, DC motors, AC servo motors, Synchro, Potentiometers, stepper motors – Hydraulic servo motor – Thermal systems – liquid level systems) – Linearization of nonlinear mathematical model – Time response analysis: (First order systems – second order systems – steady state error) – Stability of control systems: (Routh stability analysis – Determining relative stability using Routh) – Applications of the previous topics using MATLAB/Simulink toolboxes.

References:

- Farid Golnaraghi, Benjamin Kuo, "Automatic Control Systems", McGraw-Hill Education, 10 edition, 2017
- Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.

Course name	Forming Process and Equipment (2)				Course Code	PDE 213
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Introduction to metal forming processes - Upset forming processes - Extrusion processes - Cold hobbing process - Coining - Stamping process - Ironing process - Wire drawing process - Tube drawing process - Deep drawing processes - Bending process - Shearing processes - Fine blanking - Types of presses.

References:

- R. S. Hingole, and K. P. Kolhe, " Elements of Metal Forming: Bulk Forming Processes (Topics in Mining, Metallurgy and Materials Engineering)," 1st Edition, Springer, 2018.

Third Year – First Semester:

Course name	Theory of Machine (2)				Course Code	PDE 311
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Introduction to mechanical vibration - Simple Harmonic Motion and classification of mechanical vibrating systems- Single degree of freedom free Undamped system - Single degree of freedom free damped system - Single degree of freedom forced damped system - Applications on single degree forced damped system - Transverse vibration and critical speed of shafts (whirling of shafts)- Torsional vibration in rotating shafts - Vibration of Geared systems- Two degrees of freedom (Newton's Method)- Two degrees of freedom (Lagrange's equation)- Multi-Degree of freedom- Vibration analysis using finite element method (modal, harmonic, transient).

References:

- ***Haym Benaroya, Mark Nagurka, and Seon Han, "Mechanical Vibration: Analysis, Uncertainties, and Control, Fourth Edition," CRC Press, 2017.***

Course name	Machine Tool Design (1)				Course Code	PDE 321
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Classification of metal cutting machine tools – Speed design – Speed change mechanisms – Speed gearbox layout – Optimal structure diagram – Speed flow chart – Calculation of the number of teeth, diameter, and face width for gears – Case studies of speed and feed gearbox design for different machine tools

References:

- ***S. K. Basu, D. K. Pal, "Design of Machine Tools," CBS PUB & DIST PVT Limited INDIA, 2018***
- ***Scott P. Anderson, "Machine Tools: Design, Reliability and Safety," Nova Science Publishers, 2011***
- ***P. H. Joshi, "Machine Tools Handbook: Design and Operation," Tata McGraw-Hill Publishing Company Limited, 2007.***

Course name	Machining Process and Equipment (2)				Course Code	PDE 322
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	30	20		100		

Introduction into nontraditional machining processes - .Mechanical nontraditional machining processes – Electrical nontraditional machining processes – Thermal nontraditional machining processes – Chemical nontraditional machining processes – Hybrid nontraditional machining processes

References:

- ***El-Hofy, H., "Fundamentals of Machining Processes: Conventional and Nonconventional Processes", CRC Press Taylor & Francis Group, Third Edition, ISBN- 9780429443329, 2019.***
- ***Rao, P., N., "Manufacturing Technology—Metal Cutting and Machine Tools," McGraw Hill Education, 4th Edition, Volume II, 2018.***
- ***El-Hofy, H., and Youssef, H.A., "Machining Technology: Machine Tools and Operations", CRC Press Taylor & Francis Group, ISBN-13: 978-1-4200-4339-6, 2008.***

Course name	Facility Planning				Course Code	PDE 331
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	3	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	0	0	110		

Introduction to manufacturing enterprises. Fundamentals in developing efficient layouts for single and multi-story production and service facilities. Manual procedures and computer-based layout algorithms. Algorithms to determine the optimum location of facilities. Process analysis; operation analysis, job design; facility location; facility layout; materials handling systems; storage and warehousing; office layout; design principles and analytical solution procedures; computerized approaches. An analytical approach to the planning and design of manufacturing facilities and material handling systems.

Reference:

M. Moreno, "Enterprise Resource Planning," Willford Press, 2019.

Dileep R. Sule, "Manufacturing Facilities; Location, Planning, and Design," CRC Press, 2008.

Course name	Elective Course (1)				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	25	0	0	75		

Courses:

1.	Robot Arm Engineering
2.	Composite Materials
3.	Quality Management

Robot Arm Engineering:

Introduction on robotics - Homogenous Transformations - Forward Kinematics - Inverse Kinematics - Velocity Kinematics - Trajectory Planning - Dynamics - Introduction to Joints Control - Robot programming and applications

References:

- ***John J. Craig, "Introduction to Robotics: Mechanics and Control," Pearson Higher Education, 2014.***

Composite Materials:

Definition & types of composite materials - Fibers& tissues used to strengthen plastics - Methods of manufacturing composite materials - Analysis of composite materials using properties of their components - Selection techniques of composite materials - Mechanical design with composite materials.

References:

- ***Ever J. Barbero, "Introduction to Composite Materials Design," CRC Press, 2017.***

Quality Management:

Practical application of total quality management concepts from planning through customer acceptance in technology-based organizations, focusing on understanding the concepts of the total supply chain, managerial aspects of quality, and improvement methodologies throughout

References:

- ***John S. Oakland, "Total Quality Management and Operational Excellence," Routledge, 2014.***

Course name	Communication and presentation skills				Course Code	MUR 114
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	40	0	0	60		

Introduction to communication skills - Communication skills - Oral and nonverbal communication skills and writing skills - Writing and writing skills - Presentation planning and management - Present day management presentations - Advantages and disadvantages of presentations - The four phases of presentations Goal Setting - Audience Selection - Core Message Selection - Scope Selection) - Audience Selection Methods - Presentation Environment - Presentation Planning Guidelines.

References:

- ***Paul Newton & Helen Brstoll, "Planning a presentation", Free – management – ebook.***
- ***Varinder Kumar, Raj Bodh, "Business Communication", Kalyani Publishers, New Delhi, 2001.***

Third Year – Second Semester:

Course name	Industry and Environment				Course Code	MUR 234
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	75
	25	0	0	50		

Importance of Industry - Overview of Industrial fields - Basic Industrial problems- Conventional and unconventional reserves and resources - Manufacturing processes and equipment- sustainable manufacturing- Remanufacturing, reuse, and recycling - Innovative energy conversion – Green supply chain and transportation - Environmental Engineering Planning and Impact Analysis – Solid waste management - Air Pollution and Noise Control - Radiation Uses and Protection .

References:

- ***Gu¨nther Seliger, "Sustainable Manufacturing: Shaping Global Value Creation," Springer-Verlag, 2012.***
- ***Josepha A. Salvato, P.E.,Dee, "Environmental Engineering," 5th Edition, Wiley, 2003.***

Course name	Machine Tool Design (2)				Course Code	PDE 323
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	0	0	110		

Functional design of gears - Main spindle design for different machine tools - Functional design of bearings in machine tools - Machine tool frames design - Different types of slide way in machine tools and their design methods – Design of machine tool joints – Machine tool foundation design

References:

- ***S. K. Basu, D. K. Pal, "Design of Machine Tools," CBS PUB & DIST PVT Limited INDIA, 2018***
- ***F. Koenigsberger, J. Tlusty, "Machine tool structures," 2013***
- ***Scott P. Anderson, "Machine Tools: Design, Reliability and Safety," Nova Science Publishers, 2011***

Course name	Metrology				Course Code	PDE 324
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	30	20	0	100		

IT system for engineering tolerance - Limits, fits, and gauges design.(determine GO and NOGO for limit gauges by using measure scope, sigma comparator and optical comparator) - Geometrical and Dimensional tolerance - Surface Texture Tolerances - Metrology of thread.(measuring the major diameter, minor diameter, pitch, helix angle and pitch error by using measure scope, projector, and microscope) - Gauges for Thread. (measuring the effective diameter by floating micrometer) -Metrology of Bearing - Flatness and straightness measurements. (straightness and flatness measurements by using dial indicator, spirit level, and clinometers) - Machine tool tests. (Test for level of installation, Spindle axis parallel to bed, The axial slip or float of the spindle, Tailstock quill movement parallel to bed, Cross-slide perpendicular to spindle axis)

References:

- ***David A. Stephenson and John S. Agapiou, "Metal Cutting Theory and Practice," CRC Press, 2016.***

Course name	Operation management				Course Code	PDE 332
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Development of modern management - Production systems: production management principles, production planning – Materials Requirements planning: capacity planning – Manpower and organizational requirements – Forecasting and setting a production plan: production scheduling and machine loading, control of operations, production information systems, performance evaluation and analysis, productivity, improving productivity, layout of facilities.

References:

- ***Sushil Gupta and Martin Starr, "Production and Operations Management Systems," CRC Press, 2014.***

Course name	Computer Aided Design/Computer Aided Manufacturing (CAD/CAM)				Course Code	PDE 342
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	3	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Importance of computers for engineering applications -Computer Aided Drafting and Design (CAD)- Computer Aided Manufacturing (CAM) - Simulation Using computers - Computer Aided Manufacturing for rapid prototyping - Using PLC in industrial processes - Robot programming and material handling using Automated Guided Vehicles - Programming and simulation of precision controllers.

Principles of CAD- the design process- design benefits- principles of software design- computer graphics- computer aided curve and surface design- solid modeling- analysis and simulation- visualization and synthesis-. Optimum design: single and multi, variable optimization- design methods and computer aided design software- applications Scope and utilization of CAM- data bases needed for manufacturing – languages and codes for CAM- integration between CAD and CAM- software and applications.

References:

- ***P. N. Rao, "CAD/CAM Principles and Applications," 3rd edition, McGraw Hill Education; 2017.***

Course name	Elective Course (2)				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	25			75		

Courses:	
1.	Mechatronics
2.	Design of Mechanical joints
3.	Work Study

Mechatronics:
Introduction to Mechatronics - Sensors and Transducers - Mechanical Actuation Systems - Pneumatic and Hydraulic Actuation Systems - Electrical Actuation Systems - Dynamic Responses of Systems - Closed-Loop Controllers - Microprocessors - Programmable Logic Controllers - Design of Mechatronics Systems.

References:

- ***Musa Jouaneh, "Fundamentals of Mechatronics," Cengage Learning, 2012.***

Mechanical joints:
Basic knowledge on procedures and materials. Gluing and soldering methods. Conventional melting- and compression welding. Innovative bonding technologies such as resistance, ultrasonic, friction, friction stir, laser beam, electron beam and diffusion welding, and on engineering tools of modern joining technology. Optimization of design and joining geometry, bonding of different materials, production and quality assurance including destructive and non-destructive testing as well as process analysis. Examples: Bonding of metals, polymers, aluminum, ultra-thin rolled foils, materials hard to be bonded as ceramics and hard metals.

References:

- ***Alexander Blake, "Design of Mechanical Joints," Marcel Dekker Inc., New York (1985).***

Work Design:
Work study and productivity - The approach to method study - Methods and movements at workplace - General remarks on work measurements - Time study and work measurements - Motion study - Work sampling. Productivity measurement and improvement – Principles of motion economy – Motion study techniques – Ergonomic considerations – Work place design – Time measurement techniques – Rating and allowances systems – Learning curves – Incentive plans. Systems safety analysis and management.

References:

- ***Stephan Konz, "Work Design: Occupational Ergonomics," 7th edition, CRC Press, 2007.***

Fourth Year – First Semester:

Course name	Computer Numerical Control Machines				Course Code	PDE 421
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	3	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	40	0	0	110		

Introduction to CNC machine tools - Components of CNC system - Axis system for CNC machine tools- Classification of CNC machine tools - CNC part programming methods - Preparation of CNC machine tools part program - Cutter Compensation - APT programming language - CNC Economics.

References:

- ***Alan Overby, "CNC Machining Handbook: Building, Programming, and Implementation," McGraw-Hill, 2010.***

Course name	Theory of Metal Cutting				Course Code	PDE 325
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	3	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Mechanics of metal cutting - Cutting forces for machining processes - Methods of measurement of cutting forces - Dynamics of Metal Cutting - Tool Wear - Tool Life - Heat Generation in metal cutting - Cutting Fluids.

References:

- ***D. A. Stephenson and J. S. Agapiou, "Metal Cutting Theory and Practice," CRC Press, 2016.***

Course name	Research and analysis skills				Course Code	MUR 221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	50
	15	0	0	35		

Problem solving/reasoning. Interpreting Data –Planning - Prioritizing - Experimental design - Scientific Method - Informational technology. Graphical Methods - Data Analysis - Time Management. Organizational Skills - Resource Management - Organizing Resources - Scientific Literature. Historical Literature- Top Five Analytical Skills (Communication, Creativity, Critical Thinking, Data Analysis, and Research).

References:

Saeed Moaveni, "Engineering Fundamentals : An Introduction to Engineering," Cengage Learning, 2011

Course name	Theory of Metal Forming				Course Code	PDE 423
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	150
	50	0	0	100		

Principles of plastic - Large strains - Tensile instability - Bending - Membrane analysis of circular shells - Stretching - Drawing - Stretching and drawing - Slab forming.

References:

- ***William F. Hosford and Robert M. Caddell, "Metal Forming: Mechanics and Metallurgy," 4th edition, Cambridge University Press, 2011.***

Course name	Elective Course (3)				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	25	0	0	75		

Courses:

1.	Engineering Materials Selection
2.	Design and Production of Dies
3.	Feasibility Study

Engineering Materials Selection:

Mechanical and physical properties of engineering materials - Factors affecting selection of engineering materials - Techniques of material selection - Functional requirements of engineering materials - Material selection based on strength and fatigue - Material selection based on corrosion - Material selection based on thermal effects - Material selection using computer software - Applications and case studies.

References:

- ***M. Ashby, "Materials Selection in Mechanical Design ", 5th ed., Butterworth-Heinemann, 2016.***

Design and Production of Dies:

Press-working Terminology - Stamping Design - Die engineering Planning and Design - Cutting Dies - Forming Dies - Progressive Dies - Compound and combination Dies - Die sets and components - Ferrous Die materials.

References:

- ***I. Suchy, "Handbook of Die Design", 2nd ed., McGraw-Hill Education, 2005.***

Feasibility Study:

Investment projects - Introduction to feasibility study - Types of feasibility studies - Costs of investments projects - Financing of investments projects - Planning and monitoring the investment projects - Profitability analysis of investments projects - Case study on production project.

References:

- S. Arvanitis, L. Estevez, "Feasibility Analysis and Study ", 1st ed., The Emerald, 2018.

Course name	Graduation Project (1)				Course Code	PDE 441
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	1	3	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	50	50	0	0		
Problem Statement – Design Alternatives selection – Mathematical Analysis – Software Training - Simulation Analysis - Analysis and implementation – Progress Presentations.						

Course name	Summer Training (2)				Course Code	ENG 113
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	0	0	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	50
	10	0	15	25		
Training is carried out according to a program developed by the scientific department annually.						

Fourth Year – Second Semester:

Course name	Mechanical Maintenance				Course Code	PDE 411
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	35	0	0	90		

Maintenance Systems performance measures, types of equipment, scheduled, preventive, and predictive maintenance, work orders, planning, scheduling and control of maintenance operations, equipment safety and reliability, life cycle costing and replacement, spare parts inventory management and cost of maintenance.
Sources of failure in mechanical components - Systems and modes of failure - General & Functional failures - Errors - Fatigue, Creep, corrosion - Failure analysis techniques - Failure prediction techniques - Observation of Machine performance - Failure correction & repair techniques - Importance and types of maintenance systems - Selection and management of maintenance systems - Maintenance and risk.

References:

- ***R. Keith Mobley, MBB, CMRP, "Maintenance Engineering Handbook," 8rd edition McGraw-Hill Education, 2014.***

Course name	Fine Measurements				Course Code	PDE 425
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	1	1			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	125
	30	25	0	70		

Geometrical and Dimensional tolerance- Roundness measurements (v-block method-diametrical method-between two centers) - Surface Finish - Surface Topography. (use surf test to measure roughness R_a, R_q) - Gear measurements (gear rolling test-tooth thickness measurements by pitch circle method, constant chord method and base tangent method-checking involute curve by projector) - Bearing measurements - Automatic measurements - Coordinate Measuring Machines.

References:

- ***J. D. Meadows, "Geometric Dimensioning and Tolerancing Handbook: Applications, Analysis & Measurement", 1st ed. ASME, 2009.***

Course name	Production Tools and Equipment Design				Course Code	PDE 422
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	3	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Purpose of Tool Design and its Design Objectives - Design of single point tools - Design of form Cutting Tools - Design of twist drills - Design of Milling Cutters - Definition and Types of Jigs & Fixtures - Preliminary Analysis & Fixture Planning - Supporting & Location Principles - Clamping & Work Holding Principles - Centralizers, Equalizers, Chip problems, and Loading & unloading parts - Drill bushings.

References:

- *V.Balachandran, "Design of Jigs, Fixtures and Press Tools", 1st ed. New York: Wiley, 2015.*
- *E.G. Hoff man, "Jig and Fixture Design", 5th ed. New York: Delmar, 2005.*

Course name	Quality Control				Course Code	ENG 213
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Fundamentals of statistical quality control; control charts for variables and attributes; process capability analysis; sampling plans and techniques; introduction to design of experiments.

References:

- ***B. S. Ramírez, and J. G. Ramírez, "Statistical Quality Control," SAS Institute, 2018.***

Course name	Project Management				Course Code	ENG 231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Semester Work	Practical	Oral	Written Exam	Total grads	100
	30	0	0	70		

Concepts of Engineering Management, Organizing, Motivation and Leadership, Incentive Plans, Performance evaluation, Project selection and initiation, Engineering Project Planning, Project scheduling, monitoring, control, and evaluation, Resources scheduling, Project management software.

Project Planning: Developing an implementation plan, WBS, MRP, BOM, MPS, JIT, risk analysis, Project Control: Network diagrams, Project Cost: Cost quality issues and tools, including Earned Value Management Robust Engineering: case study.

References:

- ***H. Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling," 12th Edition, Wiley, 2017.***

Course name	Graduation Project (2)				Course Code	PDE 442
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	0	0	4			
Course grades	Semester Work	Practical	Oral	Discussion	Total grads	200
	100	0	0	100		

Cost Evaluation - Production processes- Project Finalizing – Practical Tests – Collecting Results- Data Analysis - Dissertation Preparation – Presentation Preparation – Discussion.

Textile Engineering Program

Textile Engineering Program

Program description

Textile engineering is one of the fields that cover the sciences necessary to provide society and industry with their fundamental needs of textile products. The utilization of textiles in industrial, medical and smart applications greatly attributes to the current industrial boom. Such applications are engineered by professionals having wide knowledge of several basic sciences (physics, chemistry, math, polymers…) as well as machine design, operating systems of production lines, quality control, environmental protection, material usage and waste recycling.

Program LO (specialized)

C1. Creative thinking in textile production system design and operation.
C2. Selecting and applying the special tools and software packages used in textile engineering for modeling and analyzing design and production problems.
C3. Identifying optimization criteria and assessing the delicate balance of cost, quality and effects on the environment in production operations.
C4. Analyzing textile products and manufacturing processes and proposing improvement ideas

Required courses.

In order to get a Bachelor of science Degree in this program, and to satisfy the program LO, the following set of courses need to be completed.

List of Textile Engineering Program Requirements Courses

Code	Course Title
	Mansoura University requirements
	Faculty of Engineering requirements
	Textile Engineering requirements
TXE212	Wool Yarn Manufacturing
TXE 332	Knitting & Garment Technology
TXE 311	Man-Made Yarn Manufacturing
TXE 312	Theory of Spinning 1
TXE 321	Weaving Technology 2
TXE 331	Design of Textile Machineries
TXE 336	Nonwovens
TXE 411	Spinning Mills Organization
TXE 413	Spinning Systems
TXE 423	Weaving Mills Organization
TXE431	Technical Textiles
TXE 352	Computer Applications in Textiles
TXE 434	Graduation Project 1
TXE 439	Graduation Project 2
-	Elective Course 1
-	Elective Course 2
-	Elective Course 3
-	Elective Course 4

Elective Courses	
Code	
Elective Course (1)	
TXE333	Printing Technology
TXE334	Textile Composites
TXE335	Textile Nanomaterials
Elective Course (2)	
TXE433	Knitting and Garment Machines
TXE421	Advanced Fabric Structures
TXE422	Mechanics of Weaving Machineries
TXE412	Mechanics of Spinning Machineries
Elective Course (3)	
TXE435	Advances in Textile Finishing
TXE436	Smart Textiles
TXE413	Maintenance of Spinning Machineries
TXE453	Operation Research for Textiles Industry
Elective Course (4)	
TXE 414	Theory of Spinning 2
TXE 424	Weaving Technology 3
TXE 437	Filtration Fabrics
TXE 438	Knitting and Garments Mill Organization

Distribution of Program Courses on the semesters:

In addition to the courses of preparatory year, the students of Textile engineering program should study the following courses:

First Year- First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 151	Mathematics 3	3	2	0	5	8	3	40	0	110	150			5				
ENG232	Electrical and Electronics Engineering	2	1	0	3	5	2	30	0	70	100			2	1			
TXE 131	Textile Materials	2	1	1	4	8	3	30	20	100	150			4				
PDE 152	Machine Drawing	1	3	0	4	9	3	50	0	100	150					4		
ENG234	Fluid Mechanic & Thermodynamics &Thermodynamics	2	1	0	3	5	2	30		70	100			3				
PDE 153	Strength of Materials	2	2	0	4	8	2	30	0	70	100					4		
Total		12	10	1	23	43	15	210	20	520	750	0	0	14	1	8	0	0

First Year- Second Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 155	Mathematics 4	3	2		5	8	3	40		110	150			5				
BAS 152	Applied Mechanics	2	2		4	8	3	35		90	125			4				
TXE 132	Textile Chemistry	2	1	1	4	8	3	30	20	100	150			٣		١		
MPE 156	Heat Transfer& Conditioning	2	1		3	5	2	30		70	100				1	2		
TXE 133	Textile Physics 1	2	1	1	4	8	3	30	20	70	125			3		1		
MUR114	Communication &Presentation Skills	2	2	0	4	6	2	40	0	60	100	4						
Total		13	9	2	24	43	16	205	40	505	750	4	0	15	1	4	0	0

Second Year- First Semester:

Code	Course Title	Teaching Hours				Student Workload (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
PDE 251	Machine Design	2	3		5	10	3	30	20	100	150					2	3	
TXE 211	Cotton Yarn Manufacturing	4	2		6	10	3	45	20	110	175					3	3	
TXE 221	Fabric Structures	2	2	1	5	10	3	30	20	100	150			1		2	2	0
MUR233	Environmental issues	2	1	0	3	6	2	25		50	75	2			1			
PDE 252	Theory of Machines	2	2		4	8	2	30	0	70	100					2	2	
MUR115	Professional Ethics	2	0	0	2	3	2	15	0	35	50	2						
ENG112	Summer Training (1)	0	0		2		2	15	0	35	50							2
Total		14	10	1	25	47	17	185	75	460	750	4	0	1	1	9	10	2

Second Year- Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
TXE 222	Weaving Technology 1	4	2		6	10	3	30	20	100	150					3	3	
TXE 223	Weaving preparations	3	2		5	8	3	30	20	100	150					3	2	
TXE 231	Textile Physics 2	2	1	1	4	8	3	30	20	100	150			4				
MUR221	Research & Analysis Skills	2	0		2	4	2	15		35	50	2						
TXE 253	Computer Programming	2	0	2	4	8	2	25	20	80	125					4		
TXE 212	Wool Yarn Manufacturing	2	1		3	6	3	25	20	80	125					1	2	
Total		15	6	3	24	44	16	155	100	495	750	2	0	4	0	11	7	0

Third Year- First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
TXE 311	Man-Made Yarns Manufacturing	2	2		4	10	3	30	20	100	150				1	1	2	
TXE 321	Weaving Technology 2	3	2		5	10	3	30	20	100	150					0	5	
TXE 331	Design of Textile Machineries	3	2		5	10	3	30	20	100	150					1	4	
ENG111	Technical reports writing	2	1		3	5	2	30		70	100	3						
TXE 312	Theory of Spinning 1	2	2		4	6	2	30	0	70	100					2	2	
TXE 351	Engineering Measurements	2	1	1	4	8	2	20	10	70	100					2	2	
Total		14	10	1	25	49	15	170	80	500	750	3	0	0	1	6	15	0

Third Year- Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
TXE 332	Knitting & Garment Technology	4	1	1	6	10	3	35	20	120	175					2	4	
TXE 352	Computer Applications in Textiles	2		2	4	8	2	25	20	80	125					2	2	
TXE353	Applied Statistics	2	2		4	8	2	30		70	100			2			2	
-	Elective Course 1	2	2		4	8	2	35	10	80	125					0	4	
TXE336	Nonwovens	2	1	1	4	7	3	25	20	80	125				2		2	
CSE354	Automatic Control	2	1		3	6	2	30	10	60	100					3		
Total		14	7	4	25	47	14	180	80	490	750	0	0	2	2	7	14	0

Fourth Year -First Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
TXE451	Quality Control in textiles	3	1		4	8	3	20	15	90	125	2	2					
TXE431	Technical Textiles	2	1		3	6	2	30		70	100				1		2	
TXE 432	Textile Finishing	2		1	3	6	2	20	20	60	100					1	2	
TXE 411	Spinning Mills Organization	2	3		5	10	3	30	20	100	150	2					3	
-	Elective Course 2	2	2		4	8	2	35	10	80	125					0	4	
TXE 434	Graduation Project 1	1		2	3	8	0	60	40		100							3
ENG113	Summer Training (2)				2	4		10	15	25	50							2
Total		12	7	3	22	46	12	205	120	425	750	4	2	0	1	1	11	5

Fourth Year- Second Semester:

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
TXE 413	Spinning Systems	2	2		4	8	3	35	10	80	125					1	3	
TXE 423	Weaving Mills Organization	2	2		4	8	2	35	10	80	125	2	1				1	
ENG234	Economics and Costs	2	1		3	6	2	30	0	70	100		3					
-	Elective Course 3	2	2	0	4	7	2	35	10	80	125					0	4	
-	Elective Course 4	2	2		4	7	2	35	10	80	125					0	4	
TXE 439	Graduation Project 2	2	1	2	5	14		60	D	90	150							5
Total		12	10	2	24	50	11	230	40	480	750	2	4	0	0	1	12	5

Total Teaching Hours and Subject's Distribution Over the Subject Areas According to the Reference Framework and NARS

Semester	Teaching Hours				SWL	Subject Area						
	Lectures	Tutorial	Practical	Total		Hum. & Soc. Sc.	Business Administration	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/ 1st semester	14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2nd semester	12	8	5	25	50	0	0	12	3	10	0	0
First year/1st semester	12	10	1	23	43	0	0	14	1	8	0	0
First year/ 2nd semester	13	9	2	24	43	4	0	15	1	4	0	0
Second year/1st semester	14	10	1	25	47	4	0	1	1	9	10	2
Second year/ 2nd semester	15	6	3	24	44	2	0	4	0	11	7	0
Third year/1st semester	14	10	1	25	49	3	0	0	1	6	15	0
Third year/ 2nd semester	14	7	4	25	47	0	0	2	2	7	14	0
Fourth year/1st semester	12	7	3	22	46	4	2	0	1	1	11	5
Fourth year/ 2nd semester	12	10	2	24	50	2	4	0	0	1	12	5
Total of Five Years	**132**	**85**	**24**	**241**	**469**	**24**	**6**	**63**	**10**	**61**	**69**	**12**
% of Five Years						9.3	2.4	25.6	4	25.2	28	4.8
NARS % and Reference framework — minimum						8	2	25	4	25	25	4
NARS % and Reference framework — maximum						12	4		6	30	30	6

Summary of Courses Specifications

First Year-First Semester:

Course title	Mathematics-3			Course Code	BAS151
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0	40	110		

Ordinary Differential Equations (ODE)

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undesemesterined coefficients method and variation of parameters method for finding the particular solution) – Cauchy-Euler ODE (homogeneous and nonhomogeneous) – System of ODE– Laplace transform – Inverse Laplace transform –Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables

Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems –Mathematical modeling using partial differential equations.

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.***

Course title	Electrical and Electronics Engineering			Course Code	ENG232
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Conductors and Semiconductors - Diode and its applications - Bipolar transistor and field effect transistor – Transistor circuits - Biasing circuits – Operational Amplifier and its applications.

DC Electric Circuits – Electric Circuits Theories – Steady state AC Circuits – Vector Representation – Power and Power Factor in AC Systems – Three-Phase Systems – Electric Machines – Transformers – Distribution Systems.

References:

- ***John Bird, "Electrical and Electronic Principles and Technology", 6th Edition, Routledge, 2017.***
- ***Nilsson, J.W. and S.A. Riedel, "Electric circuits", Pearson Upper Saddle River, NJ, 2015.***

Course title	Textile Materials			Course Code	TXE131
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10/10	30	100		

Introduction- Properties of textile fibers - Classification of textile fibers - Mechanical Properties of Textile Fibers- Production and Properties of Conventional Fibers - Production and Properties of Un-conventional Fibers- Production and Properties of Fibers out of Mill Waste- Fiber Testing- Exercises on the Field of Textile Fibers.

Experiments:

1. **The Nontechnical Test** (HANDLE TEST, BURNING TESTS)

2. **The Technical Test** (MICROSCOPIC TEST, CHEMICAL TEST)

References:

- ***H. V. Sreenivasa Murthy, "Introduction to Textile Fibres", 1st Edition, Woodhead Publishing Limited, 2015.***

Course title	**Machine Drawing**			**Course Code**	PDE152
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	1	3	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	0	50	100		

Types of joints -Bolted joints drawings and types of bolts - Key, Pin joints drawing and its applications- Welded, Riveted joints drawing and its applications- Screw jack drawing- Fits, Tolerance, Machining remarks and application on machine element drawing- Sliding bearing drawing- Gear drawing and applications.

References:

R.K.Dhawan, " Fundamentals of Engineering Drawing," S. Chand Publishing, 2014.

Course title	**Fluid Mechanics and Thermodynamics**			**Course Code**	ENG234
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0	30	70		

Part (I) Fundamental concepts - Fluid properties - Fluids statics: Fluid static: Pressure and pressure measurements, Hydraulic forces on submerged surfaces, Forces on floating and submerged bodies, Fluid masses under acceleration, Rotating containers - Fluids kinematics: kinematics of flow, continuity, momentum, energy and Bernoulli's Equations. Hydraulic and energy gradient lines - Flow of ideal incomparable fluids - The impulse principle- Pipe flow - Dimensional analysis - Fluids measurements.

Part (II) Basic concepts – Energy concepts – Pure substance (Different phases - Ideal and actual gases - Mixtures of gases) - Thermodynamic properties of materials - The first law of thermodynamics - The basic processes - Vapor processes - Heat flow processes - The second law of thermodynamics - Performance of thermal power plants - Gas power cycles - Steam power cycles - Refrigeration cycles - Moist air

References:

1- ***Margaret B. Bailey , Daisie D. Boettner, Howard N. Shapiro, Michael J. Moran,* "Principles of Engineering Thermodynamics, Wiley, 2015.**

2- ***R E Sonntag, C Borgnakke and G J Van Wylen, "Fundamentals of Thermodynamics", 5th edition, Wiley, 2009.***

Course title	**Strength of materials**			**Course Code**	PDE153
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0	30	70		

Types of loads acting on mechanical components - Force analysis of simple mechanical elements - Axial forces - Shear forces - Bending and twisting moments - Stress, strain and Hooke's law Design stresses and factor of safety - Stress concentration - Thermal stresses - Bearing stresses - Direct and Torsional shear stresses - Bending stresses shear stresses in beams - Deflection in beams - Stress and strain analysis - Stresses in two dimensions - Principal stresses and maximum shear stresses

Mohor stress circle - Power transmission shafts - Eccentric loading - Buckling of columns - Euler equation and empirical equations - Thin walled pressure vessels.

References:

- ***Joshua Pelleg, '' Mechanical Properties of Materials: Solid Mechanics and Its Applications '', Springer Netherlands, 2013.***

First Year-Second Semester

Course title	**Mathematics-4**			**Course Code**	BAS155
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	3	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	0	40	110		

Partial Differential Equations (PDE)

Special functions (Gamma, Beta, Bessel and Legendre) – Fourier series – Fourier integral – Fourier transform – Partial differential equations (PDE) – Separation of variables method (heat equation, wave equation and Laplace equation) – Traveling wave solutions to PDE.

Complex Analysis

Complex Numbers – Functions of complex variable – Complex derivative – Analytic functions – Harmonic functions and their applications – Elementary functions – Complex integration – Cauchy theorems and their applications – Taylor and Laurent series – Residue theorem and its applications – Conformal mapping.

References:

- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***
- ***J. Brown, and R. Churchill, "Complex Variables and Applications, 8th Edition", McGraw-Hill, 2009.***

Course title	**Applied Mechanics**			**Course Code**	BAS152
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	0	35	90		

Dynamics of curvilinear motion of a particle, Dynamics of general motion of a particle space. Moment of inertia, Dynamics of rotational motion of a rigid body about a fixed axis, Gyroscopic motion, Planar motion of a rigid body. General motion of a rigid body in space, The relative movement, Theory of virtual work.

References:

1. ***Hibbeler, "Engineering Mechanics: Statics", Prentice-Hall, New Jersey , 2007.***
2. ***R. C. Hibbeler, "Engineering Mechanics: Dynamics", Prentice-Hall, New Jersey , 2007.***

Course title	**Textile Chemistry**			**Course Code**	TXE132
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	10/10	30	100		

Introduction in polymers textile polymers chemical structure of natural fibers — cellulosic and protein fibers — physical and chemical properties of regenerated fibers— synthetic fibers *(polyester* — polyamide - polyacrilic — polyolefins — polypropylene etc*)* — chemical and physical properties — fiber recognition using chemical methods.

Experiments

Identification of Acid Solids, Identification of Basic Solids, Identification of Textile Fibers by Natural and Chemical methods: Burning Method. Solubility in chemicals and organic reagents.

References:

1- Thomas Bechtold, Tung Pham, "Textile Chemistry", Walter de Gruyter GmbH & Co KG, 2019

2- Q. Fan, "Chemical testing of textiles", Woodhead publishing, 2005.

Course title	Heat Transfer& Conditioning			Course Code	MPE156
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Modes of heat transfer: Conduction: Fourier's law of heat transfer, temperature distribution, electrical analogy, heat transfer conduction through: a plane wall and composite walls – through a hollow and composite cylindrical- Convection: Newton's law of cooling, temperature distribution, combined conduction and convection , and overall heat transfer - Heat Exchangers, LMTD, and design of surface heat exchangers - Radiation - Psychometric applications: moist air properties, A/C processes (humidification and dehumidification, cooling and heating), and psychometric chart - A/C systems - A/C cycles: Summer cycle and its processes, winter cycle and its processes, air handling unit components and their functions

References:

- *John H. Lienhard IV, "Heat Transfer Textbook", Phlogiston Press, 2019.*

Course title	Textile Physics 1			Course Code	TXE133
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	10/10	30	75		

(I) **Textile Fibres:**

Classification of textile fibres - sampling of textile fibres (zoning method) – sample size – geometrical properties of fibres(fibre length- fibre fineness –fibre density) – physical properties of fibres(cotton fibre maturity –moisture of fibres – fibre swelling –optical properties of fibres – static electricity – thermal properties and setting of fibres – impurity content) – mechanical properties of fibres (tensile strength of fibres - creep of fibres – durability of fibres – compression stresses on fibre masses – poisson 's ratio - bending stiffness of fibres – fibre friction – abrasion of fibres).

(II) **Textile Yarns:**

Types of textile yarns - geometrical properties of yarns (yarn number or count – yarn diameter – yarn regularity).

Experiments:

I) - (Fibres): 1-Testing of fibre length,2-Testing of fibre fineness., 3-Testing of fibre density, 4-Testing of fibre maturity of cotton., 5-Testing of fibre moisture., 6-Testing of fibre swelling., 7-Testing of fibre tenacity., 8-Testing of fibre compression.

(II) - (Yarns): 1-Testing of yarn count., 2-Testing of yarn diameter., 3- Testing of yarn regularity., 4- Testing of yarn twist., 5-Testing of yarn hairiness.

References:

- *Morton and Hearle, "Physical Properties of Textile Fibres", 4th Edition, Woodhead Publishing Limited, 2008.*

Course title	Communication & Presentation Skills			Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	40	60		

Introduction to communication - communication process - communication skills - oral and non-verbal communication and report writing - letter writing and interview - planning a management presentation - everyday management presentations - advantages and disadvantages of presentations- Four-stage presentation planning process (identify the aim, profile the audience, define the key message statement, and outline the scope) - audience profiling -presentation environment - management presentation planning guidelines.

References:

- Joan van Emden and Lucinda Becker, "Presentation Skills for Students", 3rd Edition, Red Globe, 2016.

- M. Wa Mutua, S. Mwaniki, P. Kyalo and B. Sugut, "Communication Skills: A University Course Book", Succex -Publishers, 2016.

Second Year- First Semester

Course title	Machine Design			Course Code	PDE251
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	3	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0/20	30	100		

Introduction to machine element design (design steps and consideration) - Variable loads - Failure theory - Selection of materials for design - Factors of safety - Design of joints (Rivets Welds - Interference - Bolts) Design of power screws - Shafts - Key - Pin Couplings - Clutches - Brakes - Pressure vessels - Sealing and - Gaskets - Standards Project for mechanical element structures using computers - Design of springs.

References:

Juvinall, RC &Marshek, KM, "Fundamentals of Machine Component Design", 4th edn, Wiley, 2005.

Course title	Cotton Yarn Manufacturing			Course Code	TXE211
Teaching hours	Lectures	Tutorial	Practical	Contact hours	6
	3	3	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	175
	20	45	110		

Introduction, Raw material. harvesting , ginning. Basic operations in spinning mill. Blow room: Basic operations, Components of machines Machine 's comprising an installation, Accessories and associated equipment. Carding: Tasks, operating regions. autolevelling; card clothing and its maintenance. Drawing: operating principles, operating devices, monitoring devices and autolevelling . Drafting arrangement, , behavior of fibers in the drafting zone, friction fields, distribution of draft. Combing: objectives comber preparation , combing machine, sequence of combing operation. Roving: working of roving frame; bobbin builder mechanism. Spinning: Principle of yarn formation in ring frame-drafting, twisting and winding; mechanism of cop building. Rotor spinning. Basic calculations in spinning mills

References:

B. Purushothama, "Handbook on Cotton Spinning Industry", CRC Press, 2015.

Course title	Fabric Structures			Course Code	TXE221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	2	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10/10	30	100		

Introduction to fabric structure– Plain weaves – Plain weaves derivatives- Twill weaves – Twill weaves derivatives - Sateen and satin weaves –Draft, Denting and Lifting Plan – Brighten honey comb weave – Bedford cord weave - Wadded bedford cord weave –Warp and weft backed weaves – Double fabrics with different binding methods –.interchangeable terry fabrics – Face to face Pile fabrics – Mathematical models for assessing fabric properties

Experiments:

1- Identification of different fabric structures
2- Analysis of basic fabric structures
3- Fabric Geometrical Properties
4- Fabric data sheet
5- Analysis of terry fabrics
6- Carpet Analysis

References:

- ***J. Hayavadana, Woven Fabric Structure Design and Product Planning , Woodhead Publishing India in Textiles, 1st Edition* , 2015.**
- ***A Briggs-Goode and K Townsend, "Textile Design: Principles, Advances and Applications", Woodhead Publishing Limited, 2012.***

Course title	Environmental Issues			Course Code	MUR233
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	75
	0	25	50		

Importance of Energy, Overview of energy resources, Basic energy problems -Conventional and unconventional reserves and resources - Electric industry overview - Environmental impacts of Electric industry - The evidence for and emerging impacts of climate change - Renewables energy resources: Biofuels - Wind Energy - Solar Energy - Other Renewables: Geothermal and Ocean Energy- Hydro and Nuclear Energy -Nuclear Waste -Domestic and International Energy Policies

References:

R. A. Ristinen and J. J. Kraushaar, "Energy and the Environment", 3rd Edition, Wiley, 2015.

Course title	Theory of Machines			Course Code	PDE252
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

Geometry of motion Plane mechanisms Degrees of freedom - Robots and its applications - Velocities - Instantaneous center - Force analysis for static and dynamic mechanisms - Static and dynamic balancing of rotating shafts - Fluctuating energy and flywheels - Planetary gears - Cam kinematics

References:

- ***M. Z. Kolovsky, A. N. Evgrafov, Yu. A. Semenov, A. V. Slousch, "Advanced Theory of Mechanisms and Machines ", Springer Berlin Heidelberg, 2013.***

Course title	Professional Ethics			Course Code	MUR115
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2				
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
		15	35		

Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers – NSPE guidelines - Fundamental principles.

References:

lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson Copyright © 2018.

Course title	Summer Training (1)			Course Code	ENG 112
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	0	0	2		
Course grades	Practical / Oral	Semester work	Final Exam(Discussion)	Total grads	50
	15	10	25		

Successful students who are transferred to the second year must conduct vocational training (practical) within the college or in specialized training centers.

Second Year- Second Semester

Course title	Weaving Technology 1			Course Code	TXE222
Teaching hours	Lectures	Tutorial	Practical	Contact hours	6
	4	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0/20	30	100		

Introduction to textile mechanisms- Introduction to weaving machine primary motions and secondary motions-Classification of weaving machines- Essential parts of weaving machines- Beat up motion- link beat-up mechanisms- cam beat-up mechanisms - special beat-up mechanisms for terry fabrics - weft insertion motion- shuttle weft insertion methods -shuttless weft insertion methods : Rapier - gripper projectile - air and water jet weft insertion methods . Shedding motion: cam shedding mechanism- mechanical and electronic dobby shedding mechanisms- Introduction to Let-off mechanisms and Take-up mechanisms.

References:

1- ***Abhijit Majumdar, "Principles of Woven Fabric Manufacturing" Published June 30, 2020 by CRC Press.***
2- ***Prabir Kumar Banerjee, "Principles of Fabric Formation", Published January 24,2018 by CRC Press***
3- ***Valeriy V. Choogin, Palitha Bandara and Elena V. Chepelyuk, "Mechanisms of Flat Weaving Technology", Woodhead Publishing, 2013.***

Course title	Weaving Preparations			Course Code	TXE 223
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	3	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0/20	30	100		

Winding and plying processes and its aims — winding units – mechanical clearer – electronic clearer – Yarn tension theories and different brake types – principles of winding types – winding calculations and production – Types of plying machines – yarn balance – plying calculations and production - **W**arping process: types and its aims — calculations of power consumed in driving breaking and production calculations — sizing process; theories and its aims — description of sizing stages — drawing-in and reeding processes; types and its developments.

References:

- ***Dr. N. Gokarneshan, "Weaving Preparation Technology", Abhishek Publications, 2009***
- ***Ormerod, A, "Modern Preparations and Weaving Machinery",2004***

Course title	Textile Physics 2			Course Code	TXE231
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	1	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	10/10	30	100		

(I) Textile Yarns:

Physical properties of yarns (yarn twist-yarn hairiness – fibre migration – neps –yarn appearance –yarn luster –mixing or blending in staple yarns) **– mechanical properties of yarns** (yarn tensile strength- yarn deformation due to creep –yarn fatigue due to repeated extension etc.).

(II) Textile Fabrics :

Types of textile fabrics –**geometrical properties of fabrics** (fabric length , width , thickness , weight ,crimp of yarn in fabric ,etc.) – **physical properties of fabrics** (water absorption ,capillarity , permeability " air , water, ,water vapour , dust"water repellency, etc.) –**mechanical properties of fabrics** (tensile strength , deformation due to creep ,fatigue due to repeated extension , fatigue due to repeated bending, tear strength etc.).

Experiments:

((I) - (Yarns):

1-Testing of yarn appearance. 2-Testing of yarn strength. 3-Testing of yarn fatigue due to repeated bending. 4-Testing of yarn friction. 5-Testing of yarn abrasion.

(II)- (Fabrics) :

1-Testing of fabric thickness. 2-Testing of weight per unit area. 3-Testing of yarn crimp.

4-Testing of warp and weft yarn count ends and picks/cm. 5-Testing of fabric air permeability.

6-Testing of fabric repellency. 7-Testing of fabric crease recovery. 8-Testing of fabric stiffness.

9-Testing of fabric drapability. 10- Testing of fabric friction coefficient. 11-Testing of fabric abrasion.

References:

- ***J. Hu , "Fabric testing", Woodhead Publishing Limited, 2008.***
- ***H. M. Behery,"Effect of mechanical and physical properties on fabric hand", Woodhead Publishing Limited, 2005.***

Course title	Research & Analysis Skills			Course Code	MUR221
Teaching hours	Lectures	Tutorial	Practical	Contact hours	2
	2	0	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	50
	0	15	35		

Critical thinking - Assess and develop thinking skills – Identifying arguments - Argument and non-argument - Clarity, internal consistency and structure - Reading betwELEn the lines: Recognising underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and note-making: Critical selection, interpretation and noting of source material – Critical thinking when writing – Evaluating critical writing.

References:

- ***S. Cottrell, "Critical Thinking Skills", 3rd Edition, Macmillan Study Skills, 2017.***

Course title	Computer Programming			Course Code	TXE253
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	20/0	25	80		

Applications on different Types of algorithms- Introduction to MATLAB programming environment – Matrices, and operators - Operator Precedence And Associativity- Programmer's Toolbox – Selections -Loops -Data types- Plotting - Analyzing and coding simple problems in the textile field.

Laboratory

1- MATLAB environment (Current folder- The Command window- Work space window -Command history window)
2- Defining matrices, Accessing parts of a matrix, Matrix Arithmetic and Combining Matrices
3- Operator Precedence and Associativity
4- Creation of script M-files and using MATLAB built-in functions.
5- Writing scripts with decision
6- Writing scripts with loop statements
7- Data types (numerical – string - structure-cell array)
8- Creating Line Plots -Specifying Line Style, Colors, and Markers-

References:

- ***J. Michael Fitzpatrick and Ákos Lédeczi,"Computer Programming with MATLAB", 1st Revised PDF Edition June, 2015.***

Course title	Wool Yarn Manufacturing			Course Code	TXE212
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	0/20	25	80		

Wool fiber specifications — wool types and sources — fiber properties — wool preparation for spinning — fiber sorting — mixing — washing — twisted sliver forming on worsted and woolen systems — sliver doubling and drafting — wool combing-roving — yarn producing on different spinning machine types — blended fibre producing — factors affecting processing and production — technological calculations in different process stages

References:

N. A. G. Johnson and I. Russell, "Advances in wool wechnology", Woodhead Publishing Limited, 2009.

Third Year - First Semester

Course title	**Man-Made Yarns Manufacturing**			**Course Code**	TXE311
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	0/20	30	100		

I- **S**pinning Principles of man-made fibers. Manufacturing and properties of man-made fibers. Tow –to-top conversion. Texturing techniques.

II- Subsequent treatment, Fiber characteristics and their effect on spinning, Purpose of applying spin finish, Requirements to be fulfilled by a spin finish, Components of spin finishes, Processing problems of manmade fibers in the short staple spinning mill. Blending: Purpose, proportions, evenness, possibilities for blending, process outline.

References:

- ***A. R. Bunsell, "Handbook of Properties of Textile and Technical Fibres, 2nd Edition", © Woodhead Publishing, 2018.***
- ***C. Atkinson, "False Twist Textured Yarn", Woodhead Publishing Limited, 2012.***
- ***Carl A. Lawrence, "Fundamentals of Spun Yarn Technology", ", CRC Press, 2003.***

Course title	**Weaving Technology 2**			**Course Code**	TXE321
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	3	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	0/20	30	100		

Jacquard shedding mechanisms and their recent developments- Warp let off mechanisms and their recent developments - Fabric take up mechanisms and their recent developments- **S**econdary motions on shuttles weaving machines : Warp stop motion, Weft controls on shuttles weaving machines, Temples types and Selvedge devices, Weft color selection devices- Carpet weaving - Terry weaving. Power electronics in modern weaving machines

References

1- ***Abhijit Majumdar, "Principles of Woven Fabric Manufacturing" Published June 30, 2020 by CRC Press.***

2- ***Prabir Kumar Banerjee, "Principles of Fabric Formation", Published January 24,2018 by CRC Press***

3- ***Valeriy V. Choogin, Palitha Bandara and Elena V. Chepelyuk, "Mechanisms of Flat Weaving Technology", Woodhead Publishing, 2013.***

Course title	**Design of Textile Machineries**			**Course Code**	TXE331
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	3	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	150
	0/20	30	100		

Design of torsional shaft in Carding Machine – Power Consumption in drafting systems – Eccentricity in drafting systems and its problems – Design of bottom roller in drafting systems – Design of roving flyers – Energy consumption in roving frames – Differential gear trains - **Design** of basic parts in production stages — Driving belts Machine brake in warping, sizing and opening — Gear driving — Design of twisting rod on Sulzer machines — Shedding cams — reed cams — Springs — Fly wheel, levers and rods.

References

- ***Kenneth J. Waldron, Gary L. Kinzel and Sunil K. Agrawal, "Kinematics, Dynamics, and Design of Machinery", Wiley, 2016.***
- ***Ganapathy Nagarajan , "Textile Mechanisms in Spinning and Weaving Machines", Woodhead Publishing, 2015.***

Course title	**Technical Reports Writing**			**Course Code**	ENG111
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0	30	70		

Introduction to technical writing - elements of writing strategy - planning technical reports – writing a technical report: using illustrations, organizing and numbering, writing reference lists and appendices. Formal reports: categories of formal reports, structure of formal reports - Applications in report writing: laboratory report, field report, periodic reports, proposal, theses and dissertations - Ethical considerations and plagiarism - making presentation - writing a successful CV.

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.

Course title	**Theory of Spinning 1**			**Course Code**	TXE312
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0	30	70		

Opening theory – Cleaning efficiency – Blending theory – Blended yarn properties – The yarn properties and fibre characteristics – Spinnability – Theory of opening, Carding and Stripping in Carding Machine – Feed plate characteristics – Tooth angle and height of different organs – Intensity of Carding –Doubling and irregularity – Attenuation – Drafting Force – Movement of Controlled fibers in Drafting Systems – Different types of feeding Systems in Combing – Combing machine production – Combing cycle diagram – Roving bobbin Calculations .

References

- Someshwar and Tasnim, " Engineering Techniques of Ring Spinning", Woodhead Publishing, 2015.

- P. R. Lord , "Handbook of yarn production: Science and economics", Woodhead Publishing Limited, 2003.

- C. A. Lawrence, "Fundamentals of Spun Yarn Technology", CRC Press, 2003.

Course title	**Engineering Measurements**			**Course Code**	TXE351
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	10/0	20	70		

Introduction to measurement systems, Measurement Units, Elements of a Measurement System, Measurement System Applications- Measuring instruments classifications- Performance characteristics of measuring systems (Static and Dynamic characteristics)- Measurement uncertainty (Systematic and Random errors) - Sensor technologies- Capacitive and resistive sensor technologies - Hall-Effect Sensors, Piezoelectric

Transducers, Strain Gauges, Optical Sensors - Applications of different sensor technologies in temperature, pressure and flow measurement. Applications of different sensor technologies in textile testing instruments.

Laboratory:

- Focus on the basic elements in different measuring devices.
- Focus on mechanical measuring instruments
- Focus on different elements of electronic measuring instruments
- Focus on analogue measuring instruments
- Focus on digital measuring instruments
- Focus on different textile testing instrument

References:

Alan S. Morris and Reza Langari, "Measurement and Instrumentation: Theory and Application", Academic Press PA, Elsevier Inc., 2015.

Third Year – Second Semester

Course title	**Knitting and Garment Technology**			**Course Code**	TXE332
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	6
	4	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	175
	10/10	35	120		

Introduction – General classification of knitting – The basic knitting stitches – Loop formation cycles on different knitting machines – The basic knitting structures – Loop transfer technology – Knitted fabric defects – Knitted fabric analysis - The knitting machines productivity. **Ready**-made garments technology — raw material and its assessment human factors — size determining — basic procedures in production: patron design — spreading - marking cutting — sewing finishing and backing sewing stitches — quality control and production calculations — Ready-made garments economics — modern development.

Experiments:

- Production of the basic structures on flat knitting machine (Single Jersey – Rib – Half and Full Cardigan).
- Identify and maintain parts of Circular weft knitting machines and production of single jersey knitted fabrics with different loop lengths.
- Apparel & Garment Testing: Assess the quality of apparel's materials and workmanship, using number of quality control checks and tests, including:
- Determination of sewing elements sizes (Fabric size, sewing thread size, Stich size, sewing needle size, Sewing machine size, Circular knife size, Fasteners sizes).
- Marking efficiency and cutting waste calculations.
- Sewing elements sewability tests
- Seam efficiency test- Seam slippage test - Seam puckering assessment- Seam lubricating content test, - Needle damage check (for knitted garment)
- Colorfastness check.
- Sewing defects measurements
- Burn test (for 100% cotton garment)

References:

- ***K F Au, "Advances in Knitting Technology", Woodhead Publishing Limited, 2011.***
- ***J. Fan and L. Hunter, "Engineering apparel fabrics and garments", Woodhead Publishing Limited, 2009.***
- ***Iyer and Mammel, Circular knitting, (third edition), 2004.***
- ***David J Spencer, Knitting Technology A Comprehensive hand book and practical guide (Third edition), 2001***.

Course title	Computer Applications in Textiles			Course Code	TXE352
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	0	2		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	20/0	25	80		

Advanced matrix operations – advanced plotting – application on conditional Control - application on loop control – creating external functions - Symbolic Math – Curve fitting – Data files processing - coding different applied problems in the textile field.

Laboratory

1- Advanced matrix operations
2- Creating box plots, histograms, stem plots, area graphs, 3D graphs.
3- Using different statistical tools built on the MATLAB for measuring central tendency and dispersion.
4- Application on conditional Control – switch statement.
5- Application on loop Control – While statement.
6- Creation of user-defined functions
7- Solving Basic Algebraic Equations in MATLAB- Solving System of Equations in MATLAB- Expanding and Collecting Equations in MATLAB- Create Symbolic Numbers, Variables, and Expressions- Differentiate Symbolic Expressions- Integrate Symbolic Expressions.
8- Finding the coefficients of a polynomial p(x) of degree n that fits data.
9- Reading and writing Excel files with MATLAB - Opening and closing text file -Writing to a text file- Displaying a text file with MATLAB - Reading data from a text file into variables.
10- Analyzing and coding different applied problems in the textile field

References

J. Michael Fitzpatrick and ÁkosLédeczi, "Computer Programming with MATLAB", 1st Revised PDF Edition June, 2015.

Course title	Applied Statistics			Course Code	TXE353
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0	30	70		

The course discuss statistical methods which are useful for studying and analyzing of textile data and application of statistics on textile data is through problems in sheets and examples.Introduction and need of statistics in textiles, basic concepts, classifications and graphical representations of data, Measures of central tendency, Measures of dispersion, Skewness and kurtosis, Some of probability distributions and applications : Discrete probability distributions, Continuous probability distributions, Correlation and regression, Statistical inference: Estimation and Testing of hypothesis.

References

William Navidi Colorado, "Statistics for Engineers and Scientists " Third Edition, McGraw-Hill, 2010.

Course title	Elective 1			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	0/10	35	80		

Printing Technology	Course Code	TXE333

Industrial debilitates (Dyes — industrial debilitates — starches) — debilitate mix and preparation — fabric preparation for printing — dyes used in printing — printing methods — color pastes and dyes — direct dyes soluble vat dyes — preparation methods of printing templates — printing with slides — methods of design preparation for printing — different ratios for sensitive gelatin making.

References

- Billie J. Collier, Martin Bide and Phyllis G. Tortora, "Understanding Textiles: 7th edition", Prentice Hall, 2008.
- H. Ujiie, "Digital Printing of Textiles", Woodhead Publishing, 2006.

Textile Composites	Course Code	TXE334

Application of Textile Composites, Natural Fiber Properties, Natural Fiber Reinforcement Design, Textile Reinforcement Modification and Matrix Materialization, Some Aspects of Textile Composite Design. Natural Fiber Composites Manufacturing Techniques, Agriculture Waste Composites, Braiding technologies , 3D structures for composites Testing Methods for Composite Materials

References:

Natural Fiber Textile Composite Engineering, 1st Edition, By Magdi El Messiry, ISBN 9781774636602 Published by Apple Academic Press 2017

Nanotechnology in textile	Course Code	TXE335

Nnanoscience and textiles: Introduction , development of nanotechnology, Nanomaterials, nanoparticles, , Nano-chemistry, Nano-biotechnologies, Biochips, Specific role of nanotechnology in textile structures. Electro-spun nanofibers: Introduction, The electrospinning process , Properties of electro-spun nanofibers , Measuring the effects of different spinning conditions and the use of high molecular weight polymers on the properties of electro-spun nanofibers , Improving the properties of electro-spun nanofibers, Controlling fiber orientation , Producing continuous and noncontinuous yarns. Controlling the morphologies of electro-spun nanofibers. Posttreatment of nanofibrous membranes , Advanced centrifugal electrospinning , Blended polymer electrospinning . Nanoparticles and textile technology :Introduction , Nanoparticles preparation , Nanoparticles application in the textile industry , Characterization of nanomaterials in textiles, Application of functionalized nano-fibres.

References

-Nanotechnology in Textiles: Theory and Application (The Textile Institute Book Series) by Mishra, Rajesh, Militky, Jiri, 2019.

Course title	**Nonwovens**			**Course Code**	TXE336
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	1	1		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	10/10	25	80		

Introduction (Definitions - Terminology – SWOT analysis) - Fiber-Fabric Technology - Characteristics of Fibers used in Nonwovens - Batt formation-Batt reinforcement -Nonwovens Finishing-New Trends in Nonwovens - Nonwovens Structure -Technical Fabrics – Quality Control for Nonwovens - Laboratory tests - Exercises (Production Calculations - Feasibility Studies of Nonwovens).

Laboratory

Identification of nonwovens: type of fibers, Batt formation methods, Bonding method. Determination of fabric inzotropy: Determination of nonwovens structure, Subjective assessment. Objective measurements. Compewssional properties of nonwovens. Sound insulation measurements. Thermal insulation characteristics. Fabric vibration characteristics. Fabric Filterability assessment. Fabric Stereology testing

References

- George Kellie, "Advances in Technical Nonwovens", Woodhead Publishing Limited, 2016.
- S.J.Russel , "Handbook of nonwovens", woodhead publishing Limited, 2006.

Course title	**Automatic Control Systems**			**Course Code**	CSE354
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0/10	30	60		

Introduction to control systems - Open and closed loop control systems – Laplace transformation and transfer function - Block diagram reduction – Signal flow graph - Modeling of systems: (Electrical circuits, Mechanical systems, DC motors, AC servo motors, Synchro, Potentiometers, stepper motors – Hydraulic servo motor – Thermal systems – liquid level systems) – Linearization of nonlinear mathematical model – Time response analysis: (First order systems – second order systems – steady state error) – Stability of

control systems: (Routh stability analysis – Determining relative stability using Routh) – Applications of the previous topics using MATLAB/Simulink toolboxes.

References:

- ***Farid Golnaraghi, Benjamin Kuo, "Automatic Control Systems", McGraw-Hill Education, 10 edition, 2017***
- ***Ogata, Katsuhiko. Modern control engineering. Upper Saddle River, NJ: Prentice Hall, 2015.***

Fourth Year – First Semester

Course title	Quality Control in Textiles			Course Code	TXE451
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	3	1	0		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	0/15	20	90		

Spinning mills: Introduction, quality management, statistical description of quality, Six Sigma, control charts, process capability analysis, cotton fibre selection and bale management system. Control of wastes, neps yarn count, strength. Yarn evenness and imperfection. Short-term irregularity. Interpretation and analysis of diagram, spectrogram and CV-L curve. Control of yarn hairiness and Yarn faults. Yarn quality requirements for high-speed machines.

Weaving mills: fault description and its degree in different processing stages in — sample size — knowing the required tests and comparing to quality tables in winding, sizing and final product — product status sheet after determining its quality degree.

References:

- ***Thilagavathi and Karthik, "Process Control and Yarn Quality in Spinning", Woodhead Publishing Limited, 2015.***
- ***Abhijit Majumdar, Apurba Das, R. Alagirusamy and V. K. Kothari, "Process control in textile manufacturing" , Woodhead Publishing Limited, 2013.***

Course title	Technical Textiles			Course Code	TXE431
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	1			
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	0/0	30	70		

Terms and definition of technical fabrics- Systematic classification of technical fabrics [Agrotech (Agro-textiles) - Buildtech (Construction Textiles) - Clothtech (Clothing Textiles) - Geotech (Geo-textiles) - Hometech (Domestic Textiles) - Indutech (Industrial Textiles) - Lifting textiles - Mobiltech (Textiles used in transport; automotive and aerospace) - Oekotech or Ecotech (Ecological Protection Textile) - Packtech (Packaging textiles) - Protech (protective textiles) - Sportech (Sports textiles)] - Specific areas of application (Conveyor belts - Electronics in textiles) - Production and properties of technical fabrics - End uses of technical fabrics - Economics of technical fabrics.

References:

- A. Richard Horrocks and Subhash C. Anand, "Handbook of Technical Textiles: Technical Textile Applications", 2nd Edition, Woodhead Publishing, 2016.

- A. R. Horrocks and S. C. Anand , Handbook of technical textiles, 2007

Course title	Textile Finishing			Course Code	TXE432
Teaching hours	Lectures	Tutorial	Practical	Contact hours	3
	2	0	1		
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	100
	20/0	20	60		

Cellulosic fibers cleaning by desizing boiling, beaching, mercerizing, Hydrocellulose ,Oxicellulose — animal fiber cleaning — man-made fiber processing — sollet theories — dye classification — dye chemistry — dye preparation technology.

Experiments:

Desizing. Scouring. Bleaching by Oxydizing agent ($H_2 O_2$). Dyeing of Direct Dyes. Effect of temperature on dyeing properties. Effect of solids on dyeing properties. Effect of time on dyeing properties. Indenthren dyeing. Reactive Dyes. Azo Dyeing.

References

- Asim Kumar Roy Choudhury, "Principles of Textile Finishing", Woodhead Publishing, 2017.

- W. D. Schindler and P. J. Hauser, "Chemical finishing of textiles" , Woodhead Publishing Limited, 2004.

Course title	Spinning Mills Organization			Course Code	TXE411
Teaching hours	Lectures	Tutorial	Practical	Contact hours	5
	2	3			
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	150
	0/20	30	100		

Textile mill planning and organization: Preliminary consideration, Capital requirements, Choice of suitable site, Trends govern location of a mill , Planning for mill building , Mill design and construction. **Documentation relating to preparatory and spinning machinery:** i) choice of raw materials ii) Spin plans iii) production plan. **Spinning mill projects**: i) Ring spun yarns. ii) Open End yarns "cotton , cotton waste blend, combed yarn. iii) New spinning techniques for producing compact yarn. **Calculation of producing cost:** Capital cost, operating cost and wages cost , calculation of standard time for the operator, machine efficiency % and spindle allocation.

References:

- ***R. Senthil Kumar, "Process Management in Spinning", CRC Press, 2014.***
- ***Computer Service of manufacturing companies: - Schlafhorst Documentation (Germany). Rieter Documentation (Switzerland). - Zinser Documentation (Germany). - Howa Documentation (Japan) – Savio Doc. (Italy) – Murata Doc. (Japan) – Platt Saco Lowell Doc. (UK), till 2014.***

Course title	Elective Course 2			Course Code	-
Teaching hours	Lectures	Tutorial	Practical	Contact hours	4
	2	2			
Course grades	Practical / Oral	Semester work	Final Exam.	Total grads	125
	0/10	35	80		

Knitting and Garment Machines	Course Code	TXE433

Mechanization of knitting process - Warp and Weft knitting machines (flat – circular) – Mechanics of movement transfer from motor to all weft and warp knitting machine parts – The different knitted fabric take-up systems on weft knitting machines - Analysis of the various stresses and forces of the knitting needle – The mechanics of knitting needle selection on flat and circular weft knitting machines – The new development of knitting machines. Introduction to apparel technology – Sewing Machines – Cutting Machines - Inspection machines – Mechanisms of fabric spreading machines – Mechanisms of packing machines – Setting and maintenances of all garment machines - The new development of garment machines.

References

- T. Karthik, P. Ganesan and D. Gopalakrishnan, " Apparel Manufacturing Technology", CRC Press, 2016.

- *N. Gokarneshan, "Mechanics and Calculations of Textile Machinery", Woodhead Publishing India, 2012.*
- *K F Au, "Advances in Knitting Technology", Woodhead Publishing Limited, 2011.*

Advanced Fabric structures	**Course Code**	TXE421

Different crepe weave methods- color effect with basic weaves- Figured extra threads- Mock leno weaves- Velveteen and corduroy weaves – Wadded interchangeable fabrics- Tripple fabric weaves – Braid fabrics – Triaxial Fabrics – Multiaxial fabrics – Advanced fabric structure mathematical models.

References

- ***J. Hayavadana, Woven Fabric Structure Design and Product Planning , Woodhead Publishing India in Textiles, 1st Edition ,* 2015.**
- ***A Briggs-Goode and K Townsend, "Textile Design: Principles, Advances and Applications", Woodhead Publishing Limited, 2012.***

Mechanics of Weaving Machineries	Course Code	TXE422

Study of balance and motion of different weaving machines parts. Analysis and expressing the displacement, velocity and acceleration of the different parts, also study of causes of motions such as forces, moments. Study of shedding mechanisms, picking mechanisms, beat-up mechanisms, knitting mechanisms, tack-up mechanisms.

References:

- ***Ganapathy Nagarajan , "Textile Mechanisms in Spinning and Weaving Machines", Woodhead Publishing, 2015.***
- ***Kenneth J. Waldron, Gary L. Kinzel and Sunil K. Agrawal, "Kinematics, Dynamics, and Design of Machinery", Wiley, 2016.***

Mechanics of Spinning Machineries	**Course Code**	TXE412

Studying balance and motion in different spinning machines - full analysis and description for spinning machines and identifying speeds, accelerations and forces applied on its parts — driving methods — control methods

References:

- ***Ibrahim A. Elhawary, "Mechanics of Rotor Spinning Machines", CRC Press, 2018.***
- ***Kenneth J. Waldron, Gary L. Kinzel and Sunil K. Agrawal, "Kinematics, Dynamics, and Design of Machinery", Wiley, 2016.***
- ***Ganapathy Nagarajan , "Textile Mechanisms in Spinning and Weaving Machines", Woodhead Publishing, 2015.***

Course title	**Graduation Project 1**			**Course Code**	TXE434
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	1		2		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0/40	60	0		
The student makes a survey about the project topic, write a literature review, prepare the work proposal and start the experimental work.					

Course title	**Summer Training (2)**			**Course Code**	ENG 113
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	2
	0	0	2		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam. (Discussion)**	**Total grads**	50
	15	10	25		

Students visit the textile factories for two months: one month for transferring from the second year to the third year and one month for the transferring from the third year to the fourth year. The students prepare a report of the last period and are discussed by a committee formed by the department.

Fourth year- Second Semester

Course title	**Spinning Systems**			**Course Code**	TXE413
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	0/10	35	80		

Old and conventional spinning machines. Non-Conventional spinning systems: Open End, core spun rotor spinning, friction spinning systems, Dref I, Dref II, Dref III, Barmage, Master spinning , Air jet spinning systems, Murata jet spinning (MJS),(MTS), Murata Air vortex(MVS) . Hollow spindle techniques: for producing different structure (wrap, cover and effect yarns). Production of stable fiber yarns using: Twistless spinning Bobtex spinning system, self-twist, fascinated spinning system, and air vortex (Rotofil). Evaluation of new spinning techniques on.

References

Carl Lawerce, "Advances in Yarn Technology", Univ. of Leads. UK, 2013

Course title	**Weaving Mills Organization**			**Course Code**	TXE423
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	0/10	35	80		

Production Calculations –Weaver Loading - Replacement and renewal of weaving machines- Improvement of the weaving environment - Technical specifications of weaving machines - Sections of the weaving mills – Materials Flow - Areal planning of the weaving mills – Factory selling cost- Weaving problems - Increase of weaving efficiency – The change of wrap and style.

References

B. Wulfhorst, T. Gries, D. V. Carl, "Textile Technology", Hanser Publishers, Munich, 2006.

Course title	**Economics and Costs**			**Course Code**	ENG234
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	3
	2	1	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	100
	0	30	70		

Cost accounting: Costing and cost accounting, objective of costing, cost center, cost unit, elements and classification of costs, method and techniques of costing. **Costs theory:** Opportunity costs, explicit cost, fixed, variable, and sunk costs. **Production and costs:** Relationship between production and cost curves, short run costs, (fixed cost, variable costs, total costs) average costs, marginal cost. Cost, volume and profit analysis model. **Breakeven point:** B.E.P analysis, B.E.P analysis for multiple product. **Depreciation:** Purpose, types and methods of calculating depreciation. **Systems of wage payment in textile mills**. **Maintenance. costs studies:** Cost studies in spinning mill and weaving mill**.**

References

- ***R.R. Barthwal , "Industrial Economics: An Introductory Textbook", New Age International Publisher, 2010.***

- E.J. Mishan and Euston Quah, "Cost–Benefit Analysis", 5th edition, Routledge, 2007.

Course title	**Elective Course 3**			**Course Code**	-
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	0/10	35	80		

Advances in Textile Finishing	**Course Code**	TXE435

Nano finishing Classification, Nanostructures, Application of Nano finishing, Different methods to apply the nanomaterials on the textile fabric, Textile Finishing Based on Nanotechnology, antimicrobial, antistatic, soil and stain repellent, water repellent, and flame retardant, Self-Cleaning (Lotus Effect), Superhydrophobic, Oil/Water Separation, UV Protection, Factors affecting UV protection, UV protection finishes, Measurement of UV protection. Finishing Based on Nanometals/ Metal Oxides, Sensing Nano finishes for Textiles. Finishing of textiles using plasma.

References

Nanofinishing of Textile Materials (The Textile Institute Book Series) , by Montazer, Majid, Harifi, Tina, 2018.

Smart Textiles	**Course Code**	TXE436

Smart technology for textiles and clothing , Introduction , Development of smart technology for textiles and clothing , electrically active polymers materials- application of non-ionic polymer gel and elastomers for artificial muscles; heat storage and thermo regulated textiles and clothing, thermally sensitive materials, cross – linked polymers of fibre substrates as multifunctional and multi-use intelligent material; mechanical properties of fibre Bragg gratings, optical responses of FBG (Fibre Bragg grating) sensors under deformation ; smart textile composites integrated with optic sensors . Adaptive and responsive textile structures, bio-processing for smart textiles and clothing, tailor made intelligent polymers for biomedical application. Smart fabrics – passive, active, very smart; classification of smart materials, concept of wearable computing. Electronic textiles basic , structure of fabric used for integrating different electronic sensors. Smart interactive garments for combat training, hospital and patient care; smart garments in sports and fitness activities; smart garments for children; smart home textiles.

References

Smart Textiles and Their Applications (Woodhead Publishing Series in Textiles) Koncar, Vladan, 2016

Maintenance of Spinning Machineries	**Course Code**	TXE413

Types of maintenance, predetermined. planning and organizing maintenance, repair cycle, maintenance singes, lubrication and lubricants. Inspection. Blow room - Inspection for wear and settings of beaters, beater bars, lattices, regulating and lap Forming mechanisms. Card, - Examination and core of card and taker- in-wire, stripping and grinding. Checking and adjusting all settings, can coiling. Draw frames Maintenance of drafting system, stop mechanisms. Comber check cylinder half laps, top combs and brushes for wear, check and adjust all settings, care of drafting system. Speed frames - Maintenance of drafting system, building mechanism, drives to spindles bobbin rail and bobbins. Ring frames - Care and maintenance of drafting systems. Rings and Travelers, Spindles, drive to ring rail.Rotors spinning frame - Maintenance of opening roller rotor, driving systems and suction unit.

References

- ***R.K. Mobley ,"Maintenance Fundamentals",. 2nd . Edition. Elsevier Butterworth-Heinemann, 2015***
- ***STIRA , "Spinning Machinery Maintenance" , 2nd Edition, STIRA publications , 1996***

Operation Research for Textiles Industry	**Course Code**	TXE453

Operational research provides tools and theories to solve real-world problems by finding the optimal solutions to the models subject to constraints of time, labor, resource, material, and business rules. With Operations Research, people make intelligent decisions to develop and manage their processes and businesses. Operations Research is composed of the following areas: (1) Linear programming, (2) Nonlinear programming, (3) Dynamic programming, (4) Stochastic modeling and simulation, (5) Network programming, (6) Computer simulation, (7) Queuing, (8) Time-series analysis, and (9) Applications in engineering, science, economics, and management.

References:

A. Ravi Ravindran, "Operations Research Applications",CRC Press, 2008.

Course title	**Elective Course 4**			**Course Code**	-
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	4
	2	2	0		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam.**	**Total grads**	125
	0/10	35	80		

Theory of Spinning 2	**Course Code**	TXE 414

False twisting process in textile yarn production :The development of false twist in bulking , false twist in bobtex yarn , mechanics of false twist. Friction spinning :The yarn formation, fiber speed and yarn tension, analysis of yarn tension in yarn forming zone, spinning limits of the friction spinning system(Dref III) , false twist in core yarn friction spinning. Theoretical studies on linear textile irregularity . Theoretical studies of predicting strength properties of yarn. Strength of blended yarns. Influences of twist. Twist effect on yarn contraction. Twist insertion and distribution : by means of air jets, wrapping twist in single jet false twisting spinning and siro spun yarns .

References

- ***Someshwar and Tasnim, " Engineering Techniques of Ring Spinning", Woodhead Publishing, 2015.***
- ***P. R. Lord , "Handbook of yarn production: Science and economics", Woodhead Publishing Limited, 2003.***
- ***El-Bealy R.A. " Theory of spinning " , composed from published periodic***

Weaving Technology 3	**Course Code**	TXE 424

Three dimensional weaving – Warp multi-shed weaving – Flat and circular weft multi -shed weaving – Different Leno weaving technologies- Tufted woven fabrics- Seamless woven garments- Recent Developments in weaving technology.

References

- ***Abhijit Majumdar, "Principles of Woven Fabric Manufacturing" Published June 30, 2020 by CRC Press.***
- ***Prabir Kumar Banerjee, "Principles of Fabric Formation", Published January 24,2018 by CRC Press***
- ***Valeriy V. Choogin, Palitha Bandara and Elena V. Chepelyuk, "Mechanisms of Flat Weaving Technology", Woodhead Publishing, 2013.***

Filter fabrics	Course Code	TXE437

Survey on filter fabrics- Mechanism of filtration process - Factors affecting fabric filter performance- Theory of filtration- Particle capture mechanisms- Collection efficiency for each fibre - Filtration efficiency and pressure drop for a single - layer filter - Filtration efficiency of multi - layers filter fabrics - Design of filter fabric - Bag filters and bag houses - Particle size measurement and particle size distribution- Pore size measurement and pore size distribution.

References

- Bhargava Akshey ,« Design of bag filter for the control of dust emissions for a cement plant» April 2016
- Tomasz Rogozinski ,"Wood dust collection efficiency in a pulse - jet fabric filter ",2016
-Prabir Datta ," Dust Collection Technical Handbook " ,2019

Knitting and Garment Mill Organization	**Course Code**	TXE438

Mill site planning and machine distribution - Machine specifications - Planning raw materials handling between the different stages in knitting and garment factories starting from raw materials: Cones for knitting and fabrics in the case of garments - Planning and organizing of different production stages- studying and analyzing machine productivity and efficiency - developing and analyzing production plans for different knitting and garment factories.

References

- T. Karthik, P. Ganesan and D. Gopalakrishnan, " Apparel Manufacturing Technology", CRC Press, 2016.
- N. Gokarneshan, "Mechanics and Calculations of Textile Machinery", Woodhead Publishing India, 2012.
- K F Au, "Advances in Knitting Technology", Woodhead Publishing Limited, 2011.

Course title	**Graduation Project 2**			**Course Code**	TXE439
Teaching hours	**Lectures**	**Tutorial**	**Practical**	**Contact hours**	5
	2	1	2		
Course grades	**Practical / Oral**	**Semester work**	**Final Exam. (discussion)**	**Total grads**	150
	-	60	90		

The student continues preparation of the project, make the theoretical and statistical analysis and complement the project after final term exams.

Civil Engineering Program

Civil Engineering Program

Program description

Civil engineers provide a major contribution to society. They design, construct, operate, and maintain large scale public work projects including roadways, bridges, airports, buildings, dams, harbors and water supply and sewage systems.

Civil engineers are concerned of work vital to the health of communities, such as the water and waste water treatment distribution, and the collection systems. Civil engineers are responsible of humans safety by designing socially, economically and environmentally resilient infrastructure

Program concentration

There are no specified concentration in this program.

Program LO (specialized)

In addition to the competences for all engineering programs (Level A) and the competences for the **Civil** engineering discipline (Level B), the **Civil** engineering graduate must be able to (Level C):

C1. Select appropriate and sustainable technologies for construction of buildings, infrastructures and water structures; 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 Mechanices, Properties and strength of Materials, Surveying, Soil Mechanics, Hydrology and Hydraulics.

C2. Achieve an optimum design of Reinforced Concrete and Steel Structures, Foundations and Earth Retaining Structures, Transportation and Traffic, Roadways and Airports, Railways, Sanitary Works, Hydraulics, Water Resources and Harbors.

C3. Plan and manage construction processes; address construction defects, instability and quality issues; maintain safety measures in construction and materials.

C4. Deal with biddings, contracts and financial issues including project insurance and guarantess; and assess environmental impacts of civil engineering projects.

C5. Use the codes of practice of all civil engineering disciplines effectively and Professionally.

C6. Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.

C7. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.

C8. Define and preserve properties (lands, real estates) of individuals, communities and institutions, through different surveying and GIS tools.

C9. Design and construct structures for protection against dangers of unexpected natural events such as floods and storms.

C10. Manage and supervise a group of designers in construction sites or lab technicians.

Required Courses

In order to get a Bachelor of science Degree in this program, and to satisfay the program LO, the following set of courses need to be completed.

Specific Civil Courses

Code	Title	Lectures	Tutorial	Practical	Contact Hours
STE 432	Reinforced concrete (3)	3	2	0	5
STE 441	Steel constructions (2)	3	2	0	5
STE 351	Soil Mechanices & foundation (1)	4	2	1	7
STE 451	Soil Mechanices & foundation (2)	4	3	0	7
PWE 241	Drinking Water Engineering	2	2	0	4
PWE 321	Highway and Airport Engineering	4	1	0	5
PWE 431	Railroad Engineering	2	1	0	3
PWE 441	Waste Water Engineering	2	1	0	3
IRH 321	Hydraulics 2	2	2	0	4
IRH 411	Design of water structures 2	2	2	0	4
IRH 431	Harbors engineering	2	2	0	4
-	Structure elective 1	2	1	0	3
-	Structure elective 2	2	0	0	2
-	Public work elective 1	2	1	0	3
-	Irrigation elective 1	2	1	0	3
-	Irrigation elective 2	2	0	0	2
-	Graduation Project	1	0	5	6
	Total	41	23	6	70

Elective Courses	
Code	**Sturcture elective (1)**
STE471	Design of earthquake resistant structures
STE472	Structure analysis using Computer
STE473	Special Concretes
STE477	Design of composite steel structures
Code	**Sturcture elective (2)**
STE474	Repair and Strengthening of Structures
STE475	Advanced construction materials
Code	**Public work elective(1)**
PWE371	Public transport systems
PWE372	Solid waste management
PWE373	Advanced sanitary engineering
Code	**Irrigation elective(1)**
IRH371	Advanced irrigation systems
IRH372	Hydraulic analysis of water distribution systems

IRH373	Design of storm drainage networks
Code	**Irrigation elective(2)**
IRH474	Environmental hydraulics
IRH475	Inland navigation
IRH476	Dam engineering
IRH477	Coastal engineering
Code	**Graduation Project**
STE476	Sturcture Graduation Project
IRH478	Irrigation Graduation Project
PWE471	Public work Graduation Project

Distribution of Program Courses

In addition to the preparatory courses, the students of Civil engineering program should study the following courses:

First Year-First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
STE 111	Theory of structures 1	3	2		5	10	3	40	10	100	150			2		3		
IRH 111	Civil Drawing & CAD Applications	2	2	1	5	10	3	50		100	150					3	2	
MUR223	Entrepreneurship and marketing	2	-	-	2	4	2	15		35	50		2					
ENG 222	Law & Economic Engineering	2	1		3	6	2	30		70	100	1	2					
BAS 183	Statistical applications in civil engineering	3	2		5	10	3	50		100	150			5				
BAS 184	Engineering Mathematics 3	3	2		5	10	3	40		110	150			5				
Total		15	9	1	25	50	16	225	10	515	750	1	4	12	0	6	2	0

First year-Second Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
STE112	Theory of structures 2	2	1		3	6	3	20	10	70	100			2		1		
PWE112	Plane survey	4	1	2	7	14	3	40	40	120	200			2		3	2	
STE121	Properties & testing of material	2		1	3	6	3	10	20	70	100			2		1		
MUR114	Communication and Presentation Skills	2	2		4	8	2	40		60	100	4						
IRH121	Hydraulices 1	2	2	1	5	10	3	30	30	90	150			3		2		
STE123	Concrete materials	2		1	3	6	3	10	20	70	100			2		1		
Total		14	6	5	25	50	17	140	120	490	750	4	0	11	0	8	2	0

Second year – First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
STE211	Theory of structures 3	2	1		3	6	3	30	10	60	100			2		1		
PWE211	Topographic surveying & Geodesy	4	1	2	7	14	3	40	40	120	200					3	4	
IRH221	Hydrology	2	1		3	6	3	20	20	60	100			2		1		
ENG244	Building Construction	2	1		3	6	2	25		50	75				3			
STE221	Concrete Technology	4	1	1	6	12	3	35	20	120	175			2		2	2	
ENG111	Technical reports writing	2	1		3	6	2	30		70	100	3						
Total		16	6	3	25	50	16	180	90	480	750	3	0	6	3	7	6	0

Second Year-Second Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
STE212	Theory of structures 4	4	1		5	10	3	50	10	90	150					3	2	
STE231	Reinforced Concrete 1	3	2		5	10	3	50	10	90	150			2		3		
PWE221	Geology & Soil mechanics	2	1		3	6	3	20	10	70	100			1		2		
PWE241	Drinking Water Engineering	2	2		4	8	3	30	10	60	100			2		2		
IRH 211	Irrigation and drainage engineering	2	2		4	8	3	30	10	60	100	1		1		2		
PWE231	Transportation and traffic Engineering	2	1		3	6	3	20		80	100	1			1		1	
ENG112	Summer Trainning (1)			2	2	4		10	15	25	50							2
Total		15	9	0	24	48	18	210	65	475	750	2	0	6	1	12	3	2

Third Year-First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ENG245	Specifications, Quantities & Quality control	2	1		3	6	2	30		70	100			1		2		
STE315	Construction project management	2	2		4	8	2	45		80	125		3		1			
STE331	Reinforced Concrete 2	4	2		6	12	3	50	25	100	175					3	3	
IRH321	Hydraulics 2	2	2		4	8	3	30	15	80	125						4	
PWE321	Highway and Airport Engineering	4	1		5	10	3	40	20	90	150					1	4	
MUR233	Environmental issues	2	1		3	6	2	25		50	75	1			2			
Total		16	9	0	25	50	15	220	60	470	750	1	3	1	3	6	11	0

Third Year-Second Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
IRH 311	Design of water structures 1	2	2		4	8	3	30		70	100					2	2	
STE 341	Steel Constructions 1	4	2		6	12	3	60	20	120	200					2	4	
STE 351	Soil Mechanics & foundation 1	4	2	1	7	14	3	60	20	120	200			1		3	3	
-	Irrigation elective 1	2	1		3	6	3	30	10	60	100					1	2	
-	Public work elective 1	2	1		3	6	3	30	10	60	100					1	2	
MUR115	Professional Ethics	2	0	0	2	4	2	15		35	50	2						
Total		16	8	1	25	50	17	225	60	465	750	2	0	1	0	9	13	0

Fourth Year-First Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
STE451	Soil Mechanics & foundation 2	4	3		7	14	3	40	10	100	150					3	4	
IRH411	Design of water structures 2	2	2		4	8	3	30	10	60	100						4	
STE441	Steel Constructions 2	3	2		5	10	3	40	10	100	150		1				4	
-	Structure elective 1	2	1		3	6	3	30	10	60	100					1	2	
PWE431	Railroad Engineering	2	1		3	6	2	20	10	70	100	1				1	1	
PWE441	Waste Water engineering	2	1		3	6	3	20	10	70	100	1					2	
ENG113	Summer training 2			2	2			10	15	25	50							2
Total		15	10	0	25	50	17	190	75	485	750	2	1	0	0	5	17	2

Fourth Year-Second Semester

Code	Course Title	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester Work	Practical/Oral Exam	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ENG 233	Building Economies & Feasibility Studies	2	1		3	6	2	30		70	100	1	2					
-	Structure elective 2	2			2	4	2	30		70	100						2	
-	Irrigation elective 2	2			2	4	2	30		70	100						2	
IRH 431	Harbors Engineering	2	2		4	8	3	20	5	75	100				1	1	2	
STE 432	Reinforced Concrete 3	3	2		5	10	3	45	15	90	150					1	4	
-	Graduation Project	1		5	6	14		50	50	100	200							6
Total		12	5	5	22	44	12	205	70	475	750	1	2	0	1	2	10	6

Total Teaching Hours and Subject's Distribution Over the Subject Areas According the Reference Framework and NARS of Civil Engineering

Semester	Teaching Hours				Student Work Load (SWL)	Subject Area						
	Lectures	Tutorial	Practical	Contact Hours		Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/1st Semester	14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2ndsemester	12	8	5	25	50	0	0	12	3	10	0	
First year/1st semester	15	9	1	25	50	1	4	12	0	6	2	0
First year/ 2nd semester	14	6	5	25	50	4	0	11	0	8	2	0
Second year/1st semester	16	6	3	25	50	3	0	6	3	7	6	0
Second year/ 2nd semester	15	9	0	24	48	2	0	6	1	12	3	2
Third year/1st semester	16	9	0	25	50	1	3	1	3	6	11	0
Third year/ 2nd semester	16	8	1	25	50	2	0	1	0	9	13	0
Fourth year/1st semester	15	10	0	25	50	2	1	0	0	5	17	2
Fourth year/2st semester	12	5	5	22	44	1	2	0	1	2	10	6
Total of Five Years	145	78	22	245	494	21	10	64	11	69	64	10
% of Five Years						8.4	4	25.6	4.4	28.1	25.7	4
% NARS And Reference framework						**8**	**2**	**25**	**4**	**25**	**25**	**4**
						12	**4**		**6**	**30**	**30**	**6**

Summary of Courses Specification

First year -First Semester:

Course Title	Theory of structures 1				Course Code	STE111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	-			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	10	-	40	100		

Loads and reactions - Statically determinate beams - Statically determinate rigid frames - Cables and Arches - Statically determinate trusses - Influence lines for statically determinate structures and uses of influence lines - Moving Loads for Statically determinate beams.

References:

- ***V.N. Vazirani, M.M. Ratwani, & S.K. Duggal, "Analysis of structures", Khanna publishers, sixteenth edition, 2005.***

Course name	Civil Drawing & CAD Applications				Course Code	IRH111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	2	1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	0	0	50	100		

Introduction to civil drawing and functions– legned – scale - dimensions and general layout of drawings – Earth works and slopes – Types of intersections (simple, compound, intersections at different levels– canal - Retaining walls types – Bricks retaining walls simple, stepped- Plain concrete retaining gravity type - Reinforced concrete retaining walls cantliver, counterfort – Bridges and water structures (arch bridge, reinforced concrete bridge, steel bridges) – Syphon – Culvert – Tail escap – aqudect - Reinforced concrete elements (foundations, columns, beams and slabs) – Steel Structures.

Computer graphics - Overview of computer-aided design and graphics programs for civil engineering applications, taking into consideration the industry graphic standards and their technical visual applications. Introduction to Computer Aided-Design (CAD) to acquire basic techniques and skills to create 2D and 3D construction drawings- Basic tools and functions– Drafting screen – preliminary create, design and layouts for drawings of applied civil engineering projects.

References:

- ***Gurcharan Singh, "Civil Engineering Drawing", Standard publications-Delhi, 2009.***
- ***Yasmin Nighat, "Introduction to AutoCAD 2014 for Civil Engineering Applications", Sdc Publications, 2013.***
- ***K. Venugopal, " Engineering Drawing" New Age International Publisher, ISBN-13: 978-8122436679, 2014***
- ***Autodesk. Autodesk AutoCAD Essentials Courseware (Last available edition). Autodesk, Inc., U.S.A***

Course Title	Entrepreneurship and Marketing				Course Code	MUR223
Teaching hours	Lectures		Tutorial	Practical	Contact hours	2
	2					
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	50
			15	35		

Fundamentals and principles of entrepreneurship and practical applications - The importance of entrepreneurship in marketing - Promoting the culture of free labor - Skills to search for information from different sources - The writing skills for business plan in pilot projects - Marketing cost and profitability analysis - value added - Target area - Marketing before building product - Relationship with customer – Assessment of performance, responsibility and professional ethics in engineering fields.

References:

Sonny N. and Ayantuni G., Entrepreneurship Marketing, CBC press, 2010

Course name	Law & Economic Engineering				Course Code	ENG 222
Teaching hours	Lectures		Tutorial	Practical	Contact hours	3
	2		1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Introduction to the laws and regulations of engineering works - contracts of engineering and arbitration obligations - the legal rules of the civil law and related contracts - the laws governing the construction process - the procedures for the licensing of buildings - the theories of cost in contracting works (total cost theory - partial cost theory - normative theory) Economic feasibility - Administrative expenses in the field of contracting - Principles of engineering economics - Supply and demand theory - Construction economics - Risk analysis - Principles of evaluation of civil projects - Sources of financing - Market research and marketing

References:

- ***W.G. Sullivan, E.M. Wicks, and C.P. Koelling, Engineering economy, 14th edition, Pearson prentice hall, Upper saddle river, (2009).***
- ***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).***

Course name	Statistical applications in civil engineering				Course Code	BAS183
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
			50	100		

Probability - Counting principle - Multiplication - Permutation- Combination- Total probability Theorem - Discrete Random Variable - Binomial distribution - Multinomial distribution - Geometric distribution - Poisson distribution - Continuous random variable - Exponential distribution - Normal distribution - Multiple Random Variable - Joint probability for Discrete and continuous case - Estimation Theory - confidence interval of mean for variance is known and unknown - Test of hypotheses - One sided and two sided hypotheses - Correlation Theory - Linear correlation - Least squares regression.

Reference

- ***Sheldon Rose, A First course in probability, Eighth edition, 2010, Pearson Prentice Hall.***

Course name	Engineering Mathematices 3				Course Code	BAS184
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	3		2	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	0	0	40	110		

Ordinary Differential Equations (ODE)

Homogeneous higher order ODE – Nonhomogeneous higher order ODE with constant coefficients (undesemesterined coefficients method and variation of parameters method for finding the particular solution) – Cauchy-Euler ODE (homogeneous and nonhomogeneous) – System of ODE– Laplace transform – Inverse Laplace transform –Applications of Laplace transform – Series solution of ODE.

Functions of Several Variables

Differentiation of integration – Vector calculus –Multiple integrals double and triple) and their applications –Line integral – Green's theorem – Surface integral – Divergence (Gauss) and Stokes' theorems –Mathematical modeling using partial differential equations.

References:

- ***S. A. Wirkus, and R. J. Swifi, "A Course of Ordinary Differential Equations", Taylor & Francis Group, LLC, 2015.***
- ***D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.***

First Year-Second Semester:

Course Title	Theory of structures 2				Course Code	STE112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10	0	20	70		

Properties of plane areas - Straining actions - Normal stresses - Shear stresses due to shearing forces - Shear stresses due to torsional moments - Principal stresses.

References:

- ***V.N. Vazirani, M.M. Ratwani, & S.K. Duggal, "Analysis of structures", Khanna publishers, sixteenth edition, 2005.***

Course name	Plane Survey				Course Code	PWE112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	7
	4	1	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	175
	15	15	35	110		

Surveying fundamentals, Units, Type of surveying, Chain surveying, Obsticals, bearings, Reduced bearing & Whole circle bearing,relation between whole circle bearing & reduced bearing, Traverse (link traverse & loop traverse), Angular mislouser and linear misclouser, Tacheometry, Stadia hair method, Tangential method, Invar bar method, Coordinate transformation,
Distance Measurements (experiment: Mapping with tape)
Angular measurements (experiment: Compass)
Traverses and Traverse Computations (experiment: traverse field works).
Theory of levelling, Ordinary levelling, Flying levelling, Instruments, longitudinal levelling, Cross section levelling, Horizontal curves , Simple ,compound, reverse, transition curves. Setting out of horizontal curves using distance only, using distance and angles, using coordinates. Area , Volumes.
Leveling (Experiment: longitudinal section leveling, cross section leveling)
Horizontal curves , Vertical curves (Experiment: setting out of curves)
Areas and volumes (Experiment: grid leveling and volumes)

References:

Bannister, A., Raymond, S. and Baker, R.,"Surveying", 7th edition, Addison Wesley Longman Limited, England, 1998.

- ***Bossler,. & Moffit, "Surveying", 10th ed., 2004.***

Course Title	Properties & Testing of Materials				Course Code	STE121
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2		1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10	10	10	70		

Standard specifications of engineering materials, Testing machines and their calibration, Strain gages. Main properties of engineering materials (physical, chemical, mechanical …). Behavior of metals under static loads (Tension, Compression, Flexure, Shear), Surface hardness of metals. Behavior of metals under dynamic loads (Impact) and repeated loads (Fatigue).
Laboratory: Tensil and compressive strength test of metals

References:

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

Course name	Communication and Presentation Skills				Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			40	60		

Definition and importance of communication, Elements and forms of communication, Successful communication, Communication barriers, Personality traits, Listening skills, Speaking skills, Integrated presentation elements. Planning and delivering informative, persuasive, interesting and inspiring presentations. Writing skills and presentation preparation. Researching and collecting information for elective presentations. Designing effective visual aids. Using explicit and effective transitions throughout a presentation. Creating benefit statements for persuasive presentations. Using persuasive evidences such as pathos and videos in speeches. Handling question and answer sessions effectively.

References:

- Ian Tuhovsky, Wendell Wadsworth, Communication Skills: A Practical Guide to Improving Your Social Intelligence, Presentation, Persuasion and Public Speaking, CreateSpace Independent Publishing Platform, 2015.

Course name	Hydraulics 1				Course Code	IRH121
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	2	1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	15	15	30	90		

Introduction to fluid mechanics and hydraulics engineering - Fluid properties – Units and Dimensions - Fluid pressure - Hydraulic pressure measuring devices - Hydrostatic forces and applications - Equilibrium of floating objects - Water kinematics - Fluid flow - Fluid flow types - - Bernoulli equation applications - And the triangulation of the time required to fill and discharge the reservoirs – Dimensional analysis and similarities and their theories - hydraulics piping networks - the study of the flow of fluids through simple tubes - Introduction to fluid flow in the composite networks- water hammer phenomena.
Experiments: Hydrostatic pressure, buoyancy, Bernoulli's applications, pipe network, losses

References:

- ***Cengel, Y. and Cimbala, J. "Fluid Mechanics in SI Units (3rd edition)". ISBN-13: 978-9339204655, McGraw Hill Education,2017***
- ***Currie, Iain G., and I. G. Currie. "Fundamental mechanics of fluids", Crc Press, 2002.***
- ***Longo, S., Tanda, M. G., and Chiapponi, L. "Problems in Hydraulics and Fluid Mechanics (Springer Tracts in Civil Engineering) 1st edition". ISBN-13: 978-3030513863, Springer Tracts in Civil Engineering, Springer, 2021***.

Course Title	Concrete materials				Course Code	STE123
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2		1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10	10	10	70		

Cement (Manufacturing, Chemical composition, Hydration of cement, Physical and mechanical properties, Testing of cement, major types of cement). Aggregates (Types, Physical, chemical and mechanical properties, Testing of aggregates). Mixing water. Reinforcing steel. Introduction to nanotechnology.
Laboratory: Standard tests of cement.

References:

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

Second Year-First Semester:

Course Title	Theory of Structures 3				Course Code	STE211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		30	60		

Elastic deformations of structures - Analysis of statically indeterminate structures (Method of Consistent Deformations – Equation of Three moments) - Effect of Temperature & Forced Displacements.

References:

- ***V.N. Vazirani, M.M. Ratwani, & S.K. Duggal, "Analysis of structures", Khanna publishers, sixteenth edition, 2005.***

Course name	Topographic surveying and geodesy				Course Code	PWE211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	7
	4	1	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	200
	20	20	40	120		

Map projection, transformation of coordinates, geodesy, geometric geodesy, triangulation, adjustment of traverse net using bebbov method, strength of triangulation.
Observations, data corrections and reductions. (Theodolite Applications)
Reduction of observations to the ellipsoid and Reduction from the ellipsoid to the projection plane.
Total Station Measurement and Analysis of observations. (Total Station Applications)
Network adjustment and Analysis of adjustment. Principle of GIS.
Least square theory using codition equation method and parametric method
Route Surveying: Horizontal And Vertical Curves. (Total Station and Theodolite Applications).
Shape of Earth Surface, Historic Development, Geoid, Reference Ellipsoid and Spheroid, Coordinate Systems, Datum. GNSS, traverse Network adjustment and Analysis of adjustment.
Theory of errors , equal weight, un equal weight and error propagation. Principle of photogrammetry, Principle of remote sensing.

References:

Bannister, A., Raymond, S. and Baker, R., "Surveying", 7th edition, Addison Wesley Longman, 1998.

- ***Bannister, A., Raymond, S. and Baker, R.,"Surveying", 7th edition, Addison Wesley Longman Limited, England, 1998.***

Course name	Hydrology				Course Code	IRH221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	20		20	60		

Introduction to engineering hydrology - Units of measurement - Description, measurement, and analysis of hydrologic processes - Definition of hydrological cycle - Precipitation and types - Hydrological losses and methods of measurement - Definition of evaporation, transpiration and cold - Regulating equations of surface flow - Drawing and analysis of water curves - Guidance and remediation of floods - Groundwater hydrology - Groundwater in Egypt - Examples and case studies - Introduction to hydrological simulation - Design of aquifers - Calculation of storage in rivers - Interference of saline water in coastal areas, (Salt water intrusion) - Nile river hydrology – Case studies and applications in both surface and groundwater flows

References:

- ***Elsalmian, S. "Handbook of Engineering Hydrology: Environmental Hydrology and Water Management (1st Ed.)". ISBN: 9781466552494, CRC Press, 2014.***
- ***Warren Viessman, Jr. and Gary L. Lewis. "Introduction to Hydrology (5th International Edition)". ISBN-13: 978-0132763608, Pearson Education, 2011.***
- ***Subramanya, K. "Engineering Hydrology (3rd edition)". ISBN-13: 978-0070151468, McGraw-Hill Education, 2009***
- ***David R. Maidment, "Handbook of Hydrology", 1993.***

Course name	Building Construction				Course Code	ENG244
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	75
			25	50		

Building and Construction Materials (Stone, Brick, Concrete, Iron) - Architectural and Structural Symbols and Terms - Buildings Types (Structural - Walls) and Construction Methods of All Types and Structural Elements - Insulation Layers, Floors and Stairs Rain water - building materials, finishing materials and equipment used - applications with the implementation of simplified architectural drawings for buildings - Introduction to installations and sanitary extensions of the building - to study the method of implementation of various stages of construction processes theoretically and field sites.

References:

- ***Ching F. D . K, building construction illustrated, CBS publishers& distributors, India, 2008.***
- ***LYONS, Arthur, Materials for architects and Builders, Oxford: Elsevier, 2007.***
- ***McGRATH, B., GARDNER, J., Cinemetrics - Architectural Drawing Today, John Wiley & Sons - England - 2007.***
- ***NIKOLAS, Davies & JOKINIEMI, Erkki, Dictionary of Architecture and Building construction, 1st Edition. 2008.***

Course Title	Concrete Technology				Course Code	STE221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	4	1	1			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	175
	10	10	35	120		

Properties of fresh concrete: workability, cohesion, segregation and bleeding - Properties of hardened concrete: (compressive, tensile, flexural, shear, and bond strengths) - Volumetric changes of concrete (shrinkage, creep) - Durability of concrete (carbonation, corrosion process, permeability) - Concrete mix design methods - Non-destructive testing: (rebound hammer, ultrasonic, pulse velocity, core, steel detection.) - Special types of concrete: (high performance, polymer, fiber and lightweight concrete). Admixtures (chemical admixtures, mineral admixtures, air entrained admixtures).
Laboratory: Standard tests for fresh and hardened concrete.

References:

- ***Mehta, P.K., "Properties of concrete & Structures", Prentice Hall Inc., New Jersey, 1998.***
- ***Neville, A.M., "Properties of Concrete", Longman, 5th ed., 2010.***

Course name	Technical reports writing				Course Code	ENG111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Preparation of structural reports about buildings – Preparation of validation reports about structures – Technical description of structures inspection and assessments - Technical reports about repair of structure damages and problems – Writing technical reports about the results of structures testing

References:

- *Riordan, Daniel. Technical report writing today. Cengage Learning, 2013*

Second Year-Second Semester:

Course Title	Theory of structures 4				Course Code	STE212
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	4	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	10		50	90		

Buckling Analysis - Displacement Method of Analysis (Slope-Deflection Equations – Moment Distribution) - Analysis of statically indeterminate structures by stiffness method (Beam-Frame-Truss) - Stresses in prestressed concrete - Dynamic analysis: single degree of freedom system.

References:

- Wagih M. El- Dakhakhni "Theory of structures - Part 2," Assiut university, 2007.
- V.N. Vazirani, M.M. Ratwani, & S.K. Duggal, "Analysis of structures", Khanna publishers, sixteenth edition, 2005.

Course Title	Reinforced concrete 1				Course Code	STE231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	10		50	90		

Introduction to reinforced concrete - Design philosophy and methods of design - Design of reinforced concrete sections subjected to bending moment - Development length, splices, curtailment of bars and reinforcement details - Shear stresses in concrete beams - Design of solid slabs - Design of continuous beams - Design and analysis of columns and sections subjected to moment and axial loads - Design of reinforced concrete walls - Design of R/C sections using working stress method.

References:

- ***Macgregor, J.G., "Reinforced Concrete Mechanics & Design", Prentice-Hall International Inc., New Jersey, USA, 1997.***

Course name	Geology and soil mechanics				Course Code	PWE221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		20	70		

Introduction to soil mechanics: soil and soil properties; soil types and soil structure-soil formation: volumetric and weight characteristics and terminology-definitions and relationships-Mechanicl Analysis of soil -Soil classification systems - Soil consistency and atterberg limits – Soil compaction - Soil permeability- Soil stresses – Compressbility and Consolidation and settlement – Soil shear strength theory- ntroduction to geology and origins of Earth-rock composition-geological mapping in Egypt.

Experiments:

Grain Size Distribution- Atterberg limits – Permeability – Shear strength (Direct shear box and triaxial tests) - Consolidation.

References:

- ***Braja Das, "Principles of Geotechnical Engineering", 2010.***

Course name	Drinking water engineering				Course Code	PWE241
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		30	60		

Drinking water quality standards - the characteristics of potable water - water resources available for treatment plants-preliminary studies to calculate the required flow – estimate the number of population for the future – components of water treatment plants – design of water treatment units including intake, coagulation and flocculation, sedimentation, filtration and disinfection – design criteria for water networks – Special pieces used in networks – Elevated tanks design – design of valves and fire hydrants –testing and evaluation of water networks.

References:

- ***Qasim S.R., Motley E. M. and Zhu G., "Water Works Engineering: Planning, Design & Operation," A hand book, Eastern Economy Edition, 2004.***

Course name	Irrigation and drainage engineering				Course Code	IRH211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		30	60		

Introduction to irrigation and irrigation engineering - Irrigation types - Irrigation water requirements - Water resources in Egypt - Introduction to irrigation projects in Egypt - Soil, water and plant relationship - Water rationing - Factors influencing the design of canals and agricultural banks. Agricultural systems - Applications and examples of training - Water resource management and irrigation water distribution - Definition of modern irrigation systems - Principles of drainage and drainage types (open banks - sub-surface banks) - Planning and design of selected drainage system - Introduction to the environmental impact assessment (EIA) of irrigation and drainage projects – Overview of environmental sustainability of irrigation systems based on the efficiency parameters and the definitions of sustainability.

References:

- *Chaudhry, S. and Garg, Sh. "Smart Irrigation Techniques for Water Resource Management". IGI Global Publisher of Timely Knowledge, 2019*
- *Waller, Peter, and Muluneh Yitayew, "Irrigation and drainage engineering", ISBN 978-3-319-05699-9, Springer, 2016.*
- *Azhar, A. H., Ashraff, Ch. M., Ahmed, M. "Modern irrigation techniques and technologies: Efficient Utilization of Scarce Water Resources". ISBN-13: 978-3639364590, VDM Verlag Dr. Müller, 2011*

Course name	Transportation and traffic Engineering				Course Code	PWE231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			20	80		

This is an introductory course to key analytical techniques and design methods of Transportation Engineering and Planning. The course covers the following general topics: transportation and the socio-economic environment, components of transportation systems, different modes of transportation, design controls, fundamentals of vehicle motion, vehicle stability on horizontal curves, design of key highway geometric elements, fundamentals of traffic flow theory, capacity analysis, fundamentals of transportation planning methodologies, introduction to traffic safety analysis, and introduction to transportation impact studies and evaluation techniques of transportation projects.

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.***
- ***Papacostas, C.S. and Prevedouros, P.D., "Transportation Engineering and Planning", Third Edition, Pearson Canada, Toronto, 2000.***

Course title	Summer Training (1)				Course Code	ENG112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
			2			
Course grades	Oral	Practical	Sem. work	Final Exam	Total grads	50
		15	10	25		
Students promoted to the 2nd year are to carry out professional training inside the faculty, or in specialized training centers						

Third Year-First Semester:

Course Title	Specifications, Quantities & Quality control				Course Code	ENG 245
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Methods of Quantitates Calculation - Analysis of the various structural items included in the construction projects - Cost elements - Tables of quantities and price categories - Inventory methods of quantities of items - Utilization of inventory tables, abstracts and quantity lists - Calculation of quantities of items – Calculation of quantities of different types of piles - General and special documents and writing contracts - Technical specifications (writing - elements - specifications).

References:

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

Course Title	Construction project management				Course Code	STE 315
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	125
			45	80		

Planning and Scheduling of Construction Projects - Types of Networks (AON and AOA Networks) and their Applications - PERT Method - Strategy of engineering contracts - Methods of project management - Contract types and components - Contract documents - Tender types - Tender preparation for construction projects – Control of uncertain factors in the construction projects - Pricing policy - Preparing bill of quantities - Cash flow for construction projects – Time and cost control.

References:

- ***Hegazy, T., "Computer-Based Construction Project Management", 2002.***

Course Title	Reinforced Concrete 2				Course Code	STE331
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	4	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	175
	25		50	100		

Design of hollow block slabs (ribbed slabs) according to ECP 203 - Design of paneled beams systems - Torsional moments and their influence on concrete structures - Design and analysis of reinforced concrete sections subjected to torsion - Design and analysis of different systems of reinforced concrete stairs – Punching shear in flat slabs - Moment transfer from flat slabs to columns - Design of flat slabs according to ECP 203.

Roofs of halls using reinforced concrete simple and continuous beams - Design of reinforced concrete frames - Design of circular concrete frames - Design of different types of hinged supports - Different types of reinforced concrete arches - Design of concrete arches with tie - Design of reinforced concrete circular and arched slabs - Design of concrete halls using different types of girders - Design of saw-tooth concrete slabs - Structural systems that require natural lighting - Design of different types of saw-tooth systems.

References:

- ***Macgregor, J.G., "Reinforced Concrete Mechanics & Design", Prentice-Hall International Inc., New Jersey, USA, 1997.***
- ***El-behairy, S., "Reinforced Concrete Design Handbook", Fifth edition, Cairo, 1998.***
- ***Hassun, M.N., "Design of Reinforced Concrete Structures", PWS publishers, Boston, 1985.***

Course name	Hydraulics 2				Course Code	IRH321
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	125
	15		30	80		

General Introduction - Principles of open channels flow - Types of flow – Principles of energy in open channels (specific energy, horizontal transitions and vertical transitions) – Flow resistance in open channels- Resistance equations in open channels and discharge calculations in open channel (Chezy, Manning, Colebrook white equations)- Principles of momentum in open channels – Hydraulic jump and its types – Surge waves (unsteady rapidly varied flow) - Study of gradually varied flow in channels – Water profiles of gradually varied flow – Calculations methods of gradually varied flow profiles – Unsteady gradually varied flow in open channels (Saint Venant Equations) Velocity distributions in open channels – Design methods of erodible and non erodible open channels - Hydraulic modeling .

Experiments: Hydraulic jump - Calculation of open channel behavior. Preparation of a model for the study of the gradually changing flow in the laboratory - turbulent flow by experiment using colors with water being carried in a tube

References:

- ***Hubert, C., "The Hydraulics of Open Channel Flow: An Introduction. Physical Modelling of Hydraulics", 1999***
- ***Houghtalen, R.J., Akan, A.O.H., & Hwang, N.H.C. "Fundamentals of Hydraulic Engineering Systems (4th Edition)". Prentice Hall, 2011***
- ***Sturm, Terry W., "Open channel hydraulics", New York: McGraw-Hill, 2010.***

- ***Akan, A. O. "Open Channel Hydraulics". ISBN: 9780750668576, Butterworth-Heinemann Imprint, Elsevier Ltd, 2006***

Course name	**Highway and Airport Engineering**				**Course Code**	PWE321
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	5
	4	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	150
	20		40	90		

Introduction to road and airport engineering – Pavement Material Characterization - Design of asphalt mixtures - Tests of asphalt mixtures - Design of horizontal and vertical curves - Traffic loads – Structre design of flexible and rigid pavements –Stresses in pavmeents - Selection of airport location, planning, elevation, runways, apron area.

References:

- ***E. Ray and Prithvi S. Kandhal and Freddy L. Roberts and Y. Richard Kim and Dah-Yinn Lee and Thomas W. Kennedy Brown, "Hot Mix Asphalt Materials, Mixture Design, and Construction", NCAT, 3rd edition, 2009.***

Course name	**Enviromental issues**				**Course Code**	MUR233
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	75
			25	50		

Introduction and basics of EIA – international regulations governing environmental conservation – Egyptian environmental law and other legislation related to the environment-environmental ethics and regulation-environmental impact assessment procedures – Classification of projects into categories according to the risk and size of projects – Requirements for providing environmental impact assessment studies – Life cycle assessment for industrial systems components-material and energy balances – the impact of projects on wildlife and rare species — regulations for gas emissions-environmental systems-risk perception, assessment and management – Water pollution control.

References:

- ***Judith Petts, "Handbook of Environmental Impact Assessment", 1999***

Third Year-Second Semester:

Course name	Design of water structures 1				Course Code	IRH311
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Introduction to hydraulic structures - Criteria and methods of hydraulic design and analysis - Types of retaining walls (gravity made of bricks, stones, plain concrete) – Cantliver and counterfort with reinforced concrete - Structural design of retaining walls - Hydraulic losses in water structures - Hydraulic design of water structures - Structural design of crossing structures, culverts, siphons, aqueduct – hydraulic design of bridges and headin up calculations – hydraulic design of tail escapes – spillways and its functions – Introduction to hydraulic tunnels. Applications: planning and design as well as layout and details drawing for simple hydraulic structures project.

References:

- ***Houghtalen, R.J., Akan, A.O.H., & Hwang, N.H.C. "Fundamentals of Hydraulic Engineering Systems (4th Edition)". Prentice Hall, 2011***
- ***Novak, Moffat, Nalluki, and Nararyanan. "Hydraulic Structures (4th edition)". Taylor and Francis, 2007***
- ***Varshney Rs. "Theory And Design Of Irrigation Structures Vol 2." ISBN: 978-8185240480, Nem Chand & B, 2007***
- ***Austroads, "Waterway Design: A Guide to the Hydraulic Design of Bridges, Culverts and Floodways", 1994.***

Course Title	Steel constructions 1				Course Code	STE341
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	4	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	200
	20		60	120		

Types of steel structures - Types of loads acting on steel structures - Methods of design of steel structures according to the Egyptian code ECP - Calculation of forces in truss members - Design of steel members under tensile forces - Design of steel members under compressive forces - Design of columns subjected to axial forces - Design of welded connections – Design of bolted connections.

Calculation of eccentric loads – Design of steel columns - Design of column base –design of members against wind load - Design of steel frames - Design of steel beams under static loads – Design of steel beams under static and dynamic loads - Design of beams carrying cranes - Design of cold formed members.

References:

- ***Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design (LRFD) (205) Ministerial Decree No. 359-2007, Ministry of Housing, Utilities and Urban Development.***
- ***Egyptian Code of Practice for Steel Construction and Bridges (ASD) Code No. ECP 205-2001, Edit 2009. Ministry of Housing, Utilities and Urban Development.***
- ***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.***

- ***Machaly, S.B., "Behavior, Analysis, and Design of structural Steel Members", Volume(1), Cairo, 2002, Fourth edition, Cairo University Press.***

Course Title	**Soil mechanics and foundations 1**				**Course Code**	STE351
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	7
	4	2	1			
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	200
	10	10	60	120		

Soil types - Soil properties - Analysis of soil stresses –Foundation settlement - Foundations types - Soil bearing capacity for shallow foundations – Lateral earth pressure –Slope stability – Shallow foundations design under axial loads – Foundation design methods – Design of isolated concrete footings - Design of combined concrete foundations - Design of continuous concrete foundations - Design of neighbor foundations - Foundations under eccentric loads – Raft foundation

Soil tests: Mechanical properties of soil- Soil stresses.

References:

- ***Das, Braja M., "Advanced Soil Mechanics," 1983.***
- ***Das, B.M., "Principals of Foundation Engineering", 1988.***
- ***"Egyptian Code for Soil Mechanics and Design and Execution of Foundations", 2002.***

Course name	**Irrigation elective 1**				**Course Code**	-
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	100
	10		30	60		
Course name	**Advanced irrigation systems**				**Course Code**	IRH371

Irrigation systems - Types, efficiency and regularity of distribution - Planning sprinkler irrigation systems - Types and characteristics of sprayers - Hydraulic design of main and branch lines and pumping needs - Drip irrigation system: System elements - Selection of points and design principles – factors affecting the hydraulic design - Planning and design of networks - Filters and blocking phenomenon - Advanced irrigation - Advanced circuit design and low pressure pipe networks - Concrete channels - Pumping and outlet works - Field installations.

References:

Laycock, A., "Irrigation systems: design, planning and construction". Cabi, Reprint Ed., 2011.

Course name	**Hydraulic analysis of water distribution systems**	**Course Code**	IRH372

Water distribution systems - water needs - basic principles of flow in pipes - hydraulic analysis of compressed flow in networks - design of water transport and distribution systems - network construction - workshops for network analysis and design using software Axel and Abant - economic analysis of networks - study a huge system of water through simplification methods Different - rearrange existing networks with studied cases for application in different areas.

References:

Swamee, Prabhata K., and Ashok K. Sharma. "Design of water supply pipe networks", John Wiley & Sons, 2008.

Course name	Design of storm drainage networks	**Course Code**	IRH373

Introduction - Hydrological data for the design and analysis of storm drainage networks - Design of network entrances - Hydraulic analysis of networks - Planning of rainwater harvesting facilities - Design

of rain collection ponds – Numerical models of storm water collection networks design - Applications and design of rainwater harvesting networks. Study of the effects of erosion as a result of rainwater courses – Detailed study of one of the existing projects detailed study – study the storm water networks and the factors affecting the problems.

References:

Lancaster, B., "Rainwater harvesting for drylands and beyond", No. 628.11 L244r, Rainsource Press, 2013.

Course name	**Public Work Elective 1**				**Course Code**	-
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	100
	10		30	60		

Course name	Public transport systems	**Course Code**	PWE371

This course discusses the evolution and role of urban public transportation modes, systems and services. Various kinds of public transportation system like bus, bus rapid transit (BRT),tram, light rapid transit (LRT or fast tram), railway rapid transit will be discussed. Technological characteristics are described, along with their impacts on capacity, service quality, and cost. Current practice and new methods for data collection and analysis, performance monitoring, route and network design, frequency determination, and vehicle and crew scheduling are covered.

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.***
- ***Vuchic, V., "Urban Transit: Operations, Planning and Economics", New York, NY: Wiley, 2005.***
- ***"Transit Capacity and Quality of Service Manual", 3rd Edition, Transportation Research Board, 2013.***

Course name	Solid waste management	**Course Code**	PWE372

General introduction to solid waste management- Elements of solid waste management system- Characteristics, components and waste sources– Methods of reducing the generation of solid waste – local storage of domestic solid waste – Design of solid waste collection processes – temporary waste transfer stations – Recycling and reuse of wastes – waste separation at source – Anaerobic fermentation of organic waste – Safe disposal of waste– incineration plants design –landfills design – assessment of solid waste management system – industrial solid waste – hazardous waste.

References:

George Tchobanoglous, F., " Handbook of Solid Waste Management, Second Edition", Kreith, 2004.

Course name	Advanced sanitary engineering	**Course Code**	PWE373

Unconventional pollutants and hazardous pollutants in water - introduction to water purification and domestic and industrial wastewaster treatment using advanced technologies – Design criteria and selection of appropriate treatment technologies - adsorption process using Active carbon - Iron and manganese removal – Ion exchange process - water hardness - water desalination – Membrane technologies - Reuse of wastewater after treatment – Aspects and criteria of wastewater recycling – Environmentally friendly technologies for water and wastewater treatment – Anaerobic treatment

References:

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

Course Title	**Professional ethics**				**Course Code**	MUR115
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	2
	2					
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	50
			15	35		

Meaning of ethics in civil engineering - Engineering relations and concepts of engineering work - Parties involved in engineering projects and coordination of connecting relations - Ways of dealing with the participants in engineering projects - Attributes and values in engineering work - Regulations and ethics of engineering practice - Rules and ethics of engineering professions - Fields of engineering practice - Duties of Engineering syndicate members and academic departments.

References:

- "Manual of Professional Practice for Civil Engineers", Phillippine Insitute of Civil Engineers, INC., Third edition, 2011.

- Bagad, V. S., & Dhotre, I.A., " Professional Ethics in Engineers", Techincal Publications, 2013.

Fourth Year- Firt Semester:

Course Title	**Soil mechanics and foundations 2**				**Course Code**	STE451
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	7
	4	3				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	150
	10		40	100		

Introduction to soil hydraulics - Determination of soil hydraulic conductivity - Soil water flow - Methods of solving flow problems in porous media - One-dimensional flow - Two-dimensional flow - Groundwater flow and its effect on foundations - Types of piles types and methods of construction - Pile design - Vertical and horizontal bearing capacity of piles - Analysis of piles groups – Settlement of piles - Design of piles caps - Piles load tests.

Introduction to soil mechanics and foundations – Studying the lateral earth pressure of different soils and its influences on construction- Design of retaining walls and sheet piles – Different retaining systems for neighboring structures - Soil hydraulics - Water seepage theories - Seepage applications - Dewatering systems-Groundwater and its effects on concrete structures – different types of problematic soil and methods of solutions - Replacement soil and its applications.

References:

-"Egyptian code for soil mechanic, design and construction of foundations", code 202, 2001.

- Das, Braja M., "Principles of Foundation Engineering," 2007.

-Das, Braja M., "Principles of Foundation Engineering," 2007.

Course name	Design of water structures 2				Course Code	IRH411
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		30	60		

Introduction to essential knowledge about the types, functions and importance of control (heading up) structures –Seepage theories under heading up structures – Criteria and methods for design and analysis of foundations of water storage structures – Piping phenomena – Scour down stream heading up structures –types of weirs, standing wave weir, clear overfall weir and stepped weir. Hydraulic and structural design of weirs – Types of regulators and barrages. Head, intermediate and barrages- Hydraulic and structural design of regulators. Navigable lock types. Design of side culverts, gates, thrust walls and foundation- Scour precautions down stream heading up structures- Modern techniques in heading up structures design - Important heading up structures in Egypt – case study applied projects.

References:

- ***Houghtalen, R.J., Akan, A.O.H., & Hwang, N.H.C. "Fundamentals of Hydraulic Engineering Systems (4th Edition)". Prentice Hall, 2011***
- ***Novak, Moffat, Nalluki, and Nararyanan. "Hydraulic Structures (4th edition)". Taylor and Francis, 2007***
- ***Mays, L.W., "Hydraulic Design Handbook", McGraw-Hill, 1999.***

Course Title	Steel Constructions 2				Course Code	STE441
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	10		40	100		

Overview on bridges - Types and components of steel bridges - Calculation of forces on the different elements of bridges - Permissible design stresses – Design for fatigue - Design of stringers and cross girders –Design of main girders of composite section - Design of joints - Design of bridge bracings – Road way bridges - Design of side walk elements - Design of truss bridges - Design of bridges bearings.

References:

- ***Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design (LRFD) (205) Ministerial Decree No. 359-2007, Ministry of Housing, Utilities and Urban Development.***
- ***Egyptian Code of Practice for Steel Construction and Bridges (ASD) Code No. ECP 205-2001, Edit 2009. Ministry of Housing, Utilities and Urban Development.***
- ***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.***

Course Title	Structure Elective 1				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	10		30	60		

Course Title	Design of earthquake resistant structures	Course Code	STE471

Introduction to earthquake engineering - Earthquake Nature – Earthquake hazards - Seismic waves – Earthquake scales -Introduction to dynamics of structures – solution of equation of motion of multi-degree of freedom structures - design response spectrum for different soil types – behavior of structures and structural elements under earthquake type loading – Principles of earthquake resistant design of structures – Equivalent lateral force method – seismic design of beams, columns and beam-column joints according to the Egyptian code.

References:

- ***Aggarwal P., Shrikhande, M., "Earthquake Resistant Design of Structures", Prentice Hall India Learning Private Limited; 1 edition, 2006.***

Course Title	Structure analysis using Computer	Course Code	STE472

Types of dynamic loads - Types of nonlinearity in structures - Mathematical model and free body diagram - Jacobi's method for calculating the natural frequency and the corresponding Eigenvectors -
Shear Building - Calculating natural frequency of one and two degree of freedom dynamic problems - Types of Damping - Transmissibility of dynamic loads to the foundation and Steady State Response - Methods of calculating Critical Buckling Load of columns having different end conditions - Using computer FORTRAN program for solving Beams, Trusses and Frames.

References:

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

Course Title	Special Concretes	Course Code	STE473

Purpose of using special concretes – types of special concrete – Design methods of special concretes – Types of lightweight concretes – Self compacting concrete tests – Radiation resistant concrete – fiber reinforced concrete and its applications – Polymer concrete – High strength concrete – Ultra high performance concrete – High temperature resistant concrete – Effect of high temperature and fire exposure on concrete properties – Technical and economic feasibility of special concretes..

References:

P. Kumar Mehta, Paulo J. M. Monterio, Concrete: microstructure, properties and materials, McGraw Hill, 2013.

Edward G. Nawy,Concrete construction engineering handbook, Taylor & Francis Group, Second edition 2008.

Course Title	Design of composite steel structures	Course Code	STE477

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

References:

- ***Egyptian Code of Practice for Steel Construction (Load and Resistance Factor Design (LRFD) (205) Ministerial Decree No. 359-2007, Ministry of Housing, Utilities and Urban Development.***
- ***Egyptian Code of Practice for Steel Construction and Bridges (ASD) Code No. ECP 205-2001, Edit 2009. Ministry of Housing, Utilities and Urban Development.***
- ***Qing Quan Liang "Analysis and Design of Steel and Composite Structures", Taylor & Francis Group, 2016***
- ***R.P. Jhonson and R.J. Buckby "Composite structures of steel and concrete" Blachwell scientific publications, 1994***

Course name	**Railroad engineering**				**Course Code**	PWE431
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	100
	10		20	70		

Introduction and history of railway engineering. Moving dynamic of trains- Moving resistance, Hauling force and Braking distance. Alignment of railway lines- Centrifugal acceleration, Equilibrium cant and Transition curves. Design of railway track elements - Rail joints, Tilting the vertical axis of rails and Fastening systems .Thermal stresses in welded rails -Principles of long welded rail and Breathing length. Lateral strength of railway tracks. Railway turnouts- Common types of railway turnouts. Railway stations -Platform dimension. Signaling systems of railway lines- Types of signals and Mechanical signaling.

Refrences:

– Hay, W. W., "Railroad Engineering", Wiley; 2 edition, 1982.

- Chandra, S., & Agarwal, M.M., "Railway Engineering", 2 edition, 2013.

Course name	**Wastewater engineering**				**Course Code**	PWE441
Teaching hours	**Lectures**	**Tutorial**	**Practical**		**Contact hours**	3
	2	1				
Course grades	**Oral**	**Practical**	**Semester work**	**Final Exam.**	**Total grade**	100
	10		20	70		

Characteristics of wastewater - wastewater analysis – domestic and industrial wastewater sources preliminary studies to calculate the discharged flow – estimate the number of population for the future – wastewater treatment plant components – sewage networks design – pump stations and force main design of sewage - design criteria for the design of primary stage and biological stage for wastewater treatment – wastewater treatment using different technologies such as aerobic and anaerobic ponds, oxidation ditchs, wetlands ,SBR and MBBR - sludge treatment

References:

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

Course title	Summer Training (2)				Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
			2			
Course grades	Oral	Practical	Sem. work	Dissction	Total grads	50
		15	10	25		
Students promoted to the 3rd and 4th year are to carry out field training in specialized training sectors. Students trained outside the country should be approved by the Department Councils, The student will not be able to obtain his/her B.Sc. Graduation Certificate until Professional and Field Training are both accomplished succesfully.						

Fourth Year- Second Semester:

Course name	Building Economies & Feasibility Studies				Course Code	ENG233
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Time value of money - Simple and compound interest -Uniform series payment -Gradient series payments, Nominal and effective interest -Benefit cost ratio-Economic evaluation of alternatives - Application in construction field -Depreciation -Analysis of bids -Value Engineering

References:

Newman, D.G., and Lavelle, J.P., *Engineering Economic Analysis*, 7th edition, Engineering Press, Austin, Texas, 1998.

Ammar, M., *Principles of Engineering Economy*, Lecture Notes, Tanta University, 2008.

Griffis, F.H., Farr, J.V., and Morris, M.D., *Construction Planning for Engineers*, McGraw-Hill, Inc., New York, 2000.

Course Title	Structure Elective 2				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2					
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		
Course Title	Repair and Strengthening of Structures				Course Code	STE474

Causes of deterioration of concrete structures - Assessment of concrete structures - Repair and strengthening materials (types, selection and testing) - Bond between repair or strengthening materials and substrate concrete – Different techniques of repair and strengthening - Protection and maintenance of concrete structures - Repair and strengthening of different concrete elements (footing - column - beam - slab … etc.) – Strength assessment of repaired and strengthened structures.

References:

- ***Telford, T., "Repair and Strengthening of Structures", 1991.***

Course Title	Advanced construction materials	Course Code	STE475

Types of Fibers and Polymers – Advanced Composite Materials (ACM) – Advantages, Disadvantages, and Applications of ACM in construction - Carbon Fiber and applications in construction –. Strengthening of concrete elements using ACM according to the Egyptian code of practice (strengthening in flexure and shear). Nano carbon fiber and its application in advanced concretes – Nanotechnology and its applications in structural engineering field. Sustainable building materials - Alkali-activated materials - Waste materials as aggregates and binder for concrete.

References:

- ***Bank. L.C., "Composite for Construction", 2006.***
- ***Mamlouk, M.S., "Material for Civil and Construction Engineers", 2010.***

Course Title	Irrigation elective 2				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
			30	70		

Course Title	Environmental hydraulics	Course Code	IRH474

Introduction to the environmental hydraulics - Introduction to the flow and transfer of surface and groundwater water - Surface and surface water pollution and methods of simulation - Numerical modeling methods and solving the governing equations of transition - Applied studies on the behavior of rivers and coastal areas and their distribution - Application of electronic control in the observation and study of northern areas on Egyptian coasts - Applications of Remote sensing in environmental hydraulics - Environmental impact assessment of projects affecting the coast - Case studies, models and results of existing projects and the development and comparison of results.

References:

Jayawardena, A. W., Lee, J.H.W., and Wang, Z.Y., "Environmental hydraulics", 1998.

Course Title	Inland navigation	Course Code	IRH475

Introduction to inland navigation - Types of inland navigational channels and catogries - Studies necessary for the design of inland navigational channels - Design of navigable channels - Natural phenomena affecting the design of navigable channels - Hydraulic phenomena associated with the passage of ships in the inland navigable channels - Types of revetments and its design – Flexible and rigid revetments – types of navigable locks and factors affecting its dimension- Design of navigable locks - Maintenance of navigable channels - Numerical modeling of flow in the channels of inland navigation - Navigation aids - applications - environmental studies required About the design of inland ports.

References:

McCartney, B., et al. "Inland navigation channel training works" American Society of Civil Engineers, 2012.

Course name	Dam engineering	Course Code	IRH476

Introduction to dam engineering - Reservoir planning and river refinement – Floof routing - Dam types - Gravity dams – Earth dams – Composed dams – Shapes of Dams - Hydraulic design of gravity, mass and composite dams - Design of water reservoirs – Dam grouting works design and types - Dams and their applications - Numerical Modeling of Dam failure and Damages Collapse - A Comparative Study between the Dams in Egypt and Dams of the Upstream Countries and Their Impact on the Future of Water demond on Egypt.

References:

Golzé, Alfred R., "Handbook of dam engineering", New York: Van Nostrand Reinhold, 1977.

Course name	Coastal engineering	Course Code	IRH477

Introduction- Coastal Area Planning - Geophysical phenomena affecting coastal area - Wave types - Wave forecasting - Tidal phenomenon - Types of coastal currents and their equations - Definition of sediments – Sediment transport and types - Calculation of sediments transport - Coastal protection systems - Use of satellite images and remote sensing in the monitoring of erosion and accretion on the beaches - Case study of Egyptian beaches - Integrated coastal zone management - Environmental factors in coastal areas studies and their impact on development plans - Impact of climate change on Egyptian coasts - Modern systems in coastal protection.

References:

Reeve, D., Chadwick, A., and Fleming, C., "Coastal engineering: processes, theory and design practice", CRC Press, 2012.

Course name	Harbors Engineering				Course Code	IRH431
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	100
	5		20	75		

Introduction to harbor engineering – Natural phenomena. Coastal water level fluctuations: tides and water levels, sea level rise – Coastal currents - Wind - Wave mechanics: wave theories and characteristics, linear wave theory, wave forecasting, wave tranformations (shoaling, refraction, diffraction,..etc), Design wave characteristics (breaking and non-breaking waves, extreme waves) – Wave Forces - Harbor planning and port facilities – Port terminals modules - Port elements – Breakwater design (rubble mound, vertical and compound breakwaters) – Forces on quay walls – Quay wall structural systems – Quay wall design – Navigable channels –Navigation aids (lighthouse – Bouys) - Port furntures (Fenders and bollards).

References:

- ***Tsinker, Gregory P., ed. "Port engineering: planning, construction, maintenance, and security", John Wiley & Sons, 2004.***
- ***Us Army Corps of Engineers. "Coastal Engineering Manual". EM1110-2-1100. US Army Coastal Research Center, 2008.***
- ***J. William Kamphuis. "Advanced Series on Ocean Engineering: Volume 48 - Introduction to Coastal Engineering and Management (3rd Edition)". ISBN: 978-981-120-799-0, World scientific, 2020***

Course Title	Reinforced Concrete 3				Course Code	STE432
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2				
Course grades	Oral	Practical	Semester work	Final Exam.	Total grade	150
	15		45	90		

Serviceability limit states - Deflection and crack control - Types of water structures - loads on water structures - design of sections for crack control - Design of circular concrete tanks - design of rectangular concrete tanks - Design of surface of revolution structures – Design of prestressed concrete Design and analysis of continuous prestressed concrete beams - Calculation of losses and stresses in prestressed beams – introduction to the design of multi-story buildings under lateral loads.

References:

El-Behairy, Shaker, "Handbook of Concrete Structures", 1996.

- ***Hilal, M., "Design of Reinforced Concrete Halls", Cairo University, 1998.***

Course Title	Graduation project				Course Code	STE476 IRH478 PWE471
Teaching hours	Lectures		Tutorial	Practical	Contact hours	6
	1			5		
Course grades	Oral	Practical	Semester work	Dissection Report	Total grade	200
		50	50	100		
The student completes the practical analysis for the project after the exams of the second semester **References:** ***- According to the project subject.***						

Architectural Engineering Program

Architectural Engineering Program

Program description

The discipline of architecture draws on knowledge and skills from the human and physical sciences, the humanities, and the fine and applied arts. It addresses the accommodation of all human activity in all places under all conditions, understanding our place within differing physical, historical, cultural, social, political and virtual environments. Architecture proposes, forms, and transforms our built environment, and does so through an engagement with the spaces, buildings, cities and landscapes in which we live. Architectural education is therefore rich, varied and by definition interdisciplinary.

Program concentration

There are no specified concentration in this program.

Program LO (specialized)

In addition to the competencies for all engineering programs (Level A) and the competencies for the **Basic Architectural** engineering discipline (Level B), the **Architectural** engineering graduate must be able to (Level C) :

C1. Design robust architectural projects with creativity and technical mastery.
C2. Demonstrate Fundamentals of building acquisition, operational costs, and of preparing construction documents and specifications of materials, components, and systems appropriate to the building.
C3. Demonstrate knowledge of cultural diversity, differences and the impact of a building on community character and identity.
C4. Demonstrate professional competence in developing innovative and appropriate solutions of architectural and urban problems.
C5. Apply advanced lighting , acoustics, and smart systems techniques in design.

Required courses

In order to get a Bachelor of science Degree in this program, and to sattisfay the program LO, the following set of courses need to be completed.

List of Architectural Engineering Program Requirements Courses

Code	Course Title
	Mansoura University Requriments
	Faculty of Engineering Requriments
	Architectural engineering Requriments
ARE111	Architectural Design 1
ARE211	Architectural Design 2
ARE212	Architectural Design 3
ARE232	Urban Design
ARE311	Architectural Design 4
ARE312	Interior design
ARE313	Architectural Design 5
ARE411	Architectural Design 6
ARE421	Working drawing 3
ARE431	Urban planning 2
ARE441	Graduation Research Project
ARE442	Graduation Project
	Elective course 1
	Elective course 2
	Elective course 3

Elective Courses	
Code	**Elective Course (1)**
ARE151	Maintenance and restoration of buildings
ARE152	Building fixtures
	Elective Course (2)
ARE251	Advanced building systems
ARE252	Architectural criticism and competitions
	Elective Course (3)
ARE351	Renewal and urban upgrading
ARE352	Detailed planning

Distribution of Program Courses on the semesters:

In addition to the courses of preparatory year the students of the **Architectural Engineering** program should study the following courses

First Year-First Semester:

Code	Course Name	Teaching Hours					Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours	Student Work Load (SWL)		Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
BAS 141	Applied Statistics	3	2	0	5	10	3	50	0	100	150			5				
MUR114	Communication & Presentation skills	2	2	0	4	6	2	40	0	70	100	4						
ARE 121	Building Construction (1)	2	4	0	6	12	5	90	10	50	150				3	3		
ARE 142	History and Theories of Architecture (1)	2	0	0	2	4	2	30	0	70	100	1			1			
ARE 144	Architecture Principles& Drawing techniques	2	2	0	4	8	4	60	20	70	150			2		2		
ENG242	Theories of Structures	2	1	0	3	6	2	30	0	70	100			3				
Total		13	11	0	24	46	19	300	30	420	750	5	0	10	4	5	0	0

First Year-Second Semester:

Code	Course Name	Teaching Hours					Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours	Student Work Load (SWL)		Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 111	Architectural Design (1)	2	3	0	5	12	6	90	10	50	150			2		3		
ARE 122	Building Construction (2)	2	4	0	6	12	5	90	10	50	150					3	3	
STE 146	Properties and techniques of building materials (1)	3	0	0	3	6	3	35	0	90	125			3				
ARE 112	Visual Design	1	4	0	5	10	4	90	10	50	150			3	2			
ENG243	Surveying	2	1	0	3	6	2	30	10	60	100				3			
MUR 233	Environmental issues	2	1	0	3	4	2	25	0	50	75	3						
Total		12	13	0	25	50	24	360	40	350	750	3	0	8	5	6	3	0

Second Year-First Semester:

Code	Course Name	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 211	Architectural Design (2)	2	4	0	6	12	6	90	10	50	150					1	5	
ARE 221	Building Construction (3)	2	4	0	6	12	5	90	10	50	150			4		2		
ARE 241	Computer Applications in Architecture (1)	1	2	0	3	6	3	30	10	60	100					3		
ARE 242	History and Theories of Architecture (2)	2	0	0	2	4	3	30	0	70	100	1			1			
STE 246	Foundations& Concrete Structures	3	2	0	5	10	4	40	10	75	125			2		3		
ENG111	Technicl reports writting	2	1	0	3	4	2	30	0	70	100	3						
ENG 112	Training (1)	0	0	0	2	3	-	0	50	0	50							2
Total		12	13	0	25	48	23	320	90	360	750	4	0	6	1	9	5	2

Second Year-Second Semester:

Code	Course Name	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 212	Architectural Design (3)	2	4	0	6	12	6	90	10	50	150					2	4	
ARE222	Building Construction (4)	2	4	0	6	12	5	90	10	50	150					3	3	
ARE245	Computer Applications in Architecture (2)	1	2	0	3	6	3	40	10	75	125					2	1	
ARE232	Urban Design	2	2	0	4	8	4	75	10	40	125	2					2	
ARE 244	Environmental Control	2	2	0	4	8	3	30	10	60	100			2			2	
ARE 231	Theories of town Planning	2	0	0	2	4	3	30	0	70	100	2						
Total		11	14	0	25	50	21	360	50	340	750	4	0	2	0	7	12	0

Third Year-First Semester:

Code	Course Name	Teaching Hours						Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours	Student Work Load (SWL)	Wr. Exam Dur.	Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 311	Architectural Design (4)	1	4	0	5	10	6	90	10	75	175					2	3	
ARE 321	Working drawing (1)	1	4	0	5	10	6	90	10	50	150					4	1	
ARE 312	Interior design	1	4	0	5	10	5	90	10	50	150					2	3	
ARE 331	Urban Planning (1)	1	3	0	4	8	4	75	10	40	125					2	2	
STE 341	Steel structure	2	2	0	4	8	3	40	0	60	100					2	2	
MUR115	Professional Ethics	2	0	0	2	3	2	15	0	35	50	2						
Total		8	17	0	25	49	27	410	40	300	750	2	0	0	0	12	11	0

Third Year-Second Semester:

Code	Course Name	Teaching Hours						Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours	Student Work Load (SWL)	Wr. Exam Dur.	Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 313	Architectural Design (5)	1	5	0	6	12	6	90	10	75	175					2	4	
ARE 322	Working drawing (2)	1	5	0	6	12	6	90	10	75	175		2				4	
ARE 332	Housing	2	2	0	4	8	3	40	10	100	150					2	2	
ARE343	Technical supply	1	2	0	3	6	3	50	0	75	125				1		2	
-	Elective course (1)	2	2	0	4	8	3	35		90	125	2	2					
Total		7	16	0	23	46	23	320	30	400	750	2	4	0	1	4	12	0

Fourth Year-First Semester:

Code	Course Name	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 411	Architectural Design (6)	1	5	0	6	12	6	90	10	٧٥	175					2	4	
ARE 421	Working drawing (3)	1	5	0	6	12	6	90	10	٧٥	175		2				4	
ARE 431	Urban Planning (2)	2	2	0	4	10	5	55	10	60	125					2	2	
ARE 441	Graduation research Project	1	2	0	3	6		50	75		125							3
	Elective course (2)	2	2	0	4	6	3	40	0	60	100						4	
ENG113	Training (2)	0	0	0	2		-	0	50	0	50							2
Total		7	16	0	23	46	21	325	115	225	750	0	2	0	0	4	14	5

Fourth Year-Second Semester:

Code	Course Name	Teaching Hours				Student Work Load (SWL)	Wr. Exam Dur.	Marking				Subject Area						
		Lectures	Tutorial	Practical	Contact Hours			Semester work	oral	Written Exam	Total	Hum. & Soc. Sc.	Business Administration.	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
ARE 442	Graduation Project	2		4	6	17	0	125	125 Disscution		250							6
ARE 432	Regional Planning	2	4	0	6	12	4	90	10	50	150	3					3	
ENG245	Specifications, Quantities & Quality Control	2	1	0	3	6	3	30	0	70	100		3					
	Elective course (3)	2	2	0	4	6	3	30	10	60	100						4	
MUR221	Research and analysis skills	2	0	0	2	3	3	15	0	35	50	2						
ARE 444	Environmental Impact of Engineering Projects	2	1	0	3	4	3	30	0	70	100	0					3	
Total		12	8	4	24	48	14	315	120	315	750	5	3	0	0	0	10	6

Distribution of Program Contact Hours Over the Subject Areas

Semester		Teaching Hours				Student Work Load (SWL)	Subject Area						
		Lectures	Tutorial	Practical	Contact Hours		Hum. & Soc. Sc.	Business Administration	Math. & B. Sc.	Engineering Culture	B. Eng. Sc.	App. Eng. & Des.	Proj. & Practice
Preparatory year/ 1st semester		14	8	2	24	50	5	0	15	0	4	0	0
Preparatory year/ 2ndsemester		12	8	5	25	50	0	0	12	3	10	0	
First year/1st semester		13	11	0	24	46	5	0	10	4	5	0	0
First year/ 2nd semester		12	13	0	25	50	3	0	8	5	6	3	0
Second year/1st semester		12	13	0	25	48	4	0	6	1	9	5	2
Second year/ 2nd semester		11	14	0	25	50	4	0	2	0	7	12	0
Third year/1st semester		8	17	0	25	49	2	0	0	0	12	11	0
Third year/ 2nd semester		7	16	0	23	46	2	4	0	1	4	12	0
Fourth year/1st semester		7	16	0	23	46	0	2	0	0	4	14	5
Fourth year/ 2nd semester		12	8	4	24	48	5	3	0	0	0	10	6
Total of Five Years		**108**	**124**	**11**	**243**	**483**	**30**	**9**	**53**	**14**	**61**	**67**	**13**
% of Five Years							**12**	**3.6**	**21.3**	**5.6**	**25.1**	**27**	**5.2**
% NARS	**Minimum**						**8.00**	**2.00**	**18.00**	**4.00**	**25.00**	**25.00**	**4.00**
	Maximum						**12.00**	**4.00**	**22.00**	**6.00**	**30.00**	**30.00**	**6.00**

The above table shows the agreement with NARS requirements

Summary of Courses Specification

First Year-First Semester:

Course title	Applied statictics				Course Code	BAS 141
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	0	0	50	100		

Probability - Counting principle - Multiplication - Permutation- Combination- Total probability Theorem - Discrete Random Variable - Binomial distribution - Multinomial distribution - Geometric distribution - Poisson distribution - Continuous random variable - Exponential distribution - Normal distribution - Multiple Random Variable - Joint probability for Discrete and continuous case - Estimation Theory - confidence interval of mean for variance is known and unknown - Test of hypotheses - One sided and two sided hypotheses - Correlation Theory - Linear correlation - Least squares regression.

References:

- Sheldon Rose. "A First course in probability", 8th edition, Pearson Prentice Hall, 2010.

Course title	Communication & Presentation skills				Course Code	MUR114
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	40	60		

concept of communication, the concept of the message, the rules for designing effective slides and presentations, how to deal with the ordinary audience and the oral presentation, the preparation of the subject of the presentation and ways to save ideas, Using displays, providing a dynamic presentation that combines information and materials - discussion and response to objections. study and solve the problems of simplified design and development the skills of design projects.

References:

- Matthew McKay, Martha Davis, et. "Messages: The Communications Skills Book", 2018.

Course title	Building Construction (1)				Course Code	ARE 121
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

Building and Construction Materials (Stone, Brick, Concrete, Iron) - Architectural and Structural Symbols and Terms - Buildings Types (Structural - Walls) and Construction Methods of All Types and Structural Elements - Insulation Layers, Floors and Stairs Rain water - building materials, finishing materials and equipment used - applications with the implementation of simplified architectural drawings for buildings - Introduction to installations and sanitary extensions of the building - to study the method of implementation of various stages of construction processes theoretically and field sites.

References:

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

Course title	History and Theories of Architecture (1)				Course Code	ARE 142
Teaching hours	Lectures		Tutorial	Practical	Contact hours	2
	2		0	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

history of art (ortitlents, sculpture, painting, etc.) - Prehistoric architecture - Ancient Egyptian architecture - Ancient Egyptian cities - Castles and forts - Houses - Temples (religious and funerary) - Cemeteries - Roman architecture - artistic movements in the 20th century (cubism, expressionism, futurism and surrealism). Art trends through historical times and parallel architectural trends - contemporary artistic trends and their effects on architecture and new ideas on the interrelationship between arts, architecture and technical education. , The artistic values in the works of art - technical standards and design principles in architecture

concept of architecture and its theories - Architectural formation (line, level and mass) - Principles of composition (unity - symmetry - homogeneity - rhythm - hierarchy - diversity .....) - Types of buildings - Factors affecting architectural design - Design and design parameters, capabilities and design determinants based on efficiency, comfort and safety - spatial relations - the scale and dimensions of the human body and its relation to the design criteria of architectural spaces - elements of horizontal movement and vertical movement elements in buildings - service units for individuals and materials processing and infrastructure.

References:

- Francis D. K. Ching Mark M. Jarzombek, et al. "A Global History of Architecture", 2017.

- Ching, Francis D.K. "Architecture: form, space and order", van nostrand reinhold company, 4ed, New Yoek, 2014.

- Nikos A. Salingaros. "A Theory of Architecture", 2016.

Course title	Architecture Principles& Drawing techniques				Course Code	ARE 144
Teaching hours	Lectures		Tutorial	Practical	Contact hours	4
	2		2	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	20	0	60	70		

Introducing architecture as a framework for human sciences - the concepts related to architectural design according to human and functional needs - human relationship with the environment and the modular - training the student on the sense of proportions - his hands and his eyes - (techniques of using pencils, proportions, values, degrees, scale, front, middle and background levels, showing buildings and their details, studying nature and showing trees, art of crooks), and development of manual skills – and applying to solve a Simple design problems

References:

- Francis D. K. Ching. "Architectural Graphics", Amazon Digital Services LLC, April 2015.

- Ernest R. Norling. "Perspective Made Easy (Dover Art Instruction)**", 2012.**

Course title	Theories of Structures				Course Code	ENG242
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

Stability and compatibility - internal and external stability of fixed flat structures, static and horizontal shapes, frames and gems - vertical stresses, shear stresses, torsion and assembled stresses - flexible profiles - introduction to analysis of non-static structures - method of compatible configurations and distribution method - Columning - Introduction to space and uneven structures.

References:

- **M. Nadim Hassoun and Akthem Al-Manaseer. "Structural Concrete:** Theory and Design**", 2015.**
- **Bjorn N. Sandaker, Arne P. Eggen, et al. "The Structural Basis of Architecture", 2019.**

First Year-Second Semester:

Course title	Architectural Design (1)				Course Code	ARE 111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	2	3	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

understand the configurations and formations of architecture and design, focusing on design considerations and functional requirements- study of functional relations- guidance, privacy and spatial configurations- These projects are based on the human needs and their interaction with the natural and built environment - applications in architectural models, study of the methods of projecting and architectural presentation of projects.

References:

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

Course title	Building Construction (2)				Course Code	ARE 122
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

Building materials - Structural and theoretical study of structural materials and systems - Foundation types - Heat insulation of ceilings and exterior walls - Sound insulation - Expansion and landing joints - Introduction to finishing works and equipment used in building finishes. Construction and construction of buildings - Structural buildings - Tires - Sliding tiles - Precast concrete - Applicable tiles - Scaffolding - Metal structures - Gables - Details of the construction of stairs.

References:

- **Nikolas, Davies & Jokiniemi, Erkki. "Dictionary of Architecture and Building construction", 1st Edition. 2008.**

Course title	Properties and techniques of building materials (1)				Course Code	STE 146
Teaching hours	Lectures		Tutorial	Practical	Contact hours	3
	3		0	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	0	0	35	90		

Engineering materials - standardization and measurement - standards - codes - thermal and sound behavior of materials - suitable for surrounding environment - technical inspection - concrete technology - concrete manufacturing - engineering materials mechanics - Testing machines - Stress measurement - Material resistance and conduct under static loads - Tensile and pressure - Traditional and non conventional building materials and study of physical and mechanical properties of building materials - Laboratory tests for all of the above.

References:

- Bjørn N. Sandaker, Arne P. Eggen, et al. "The Structural Basis of Architecture", 2019.

Course title	Visual Design				Course Code	ARE 112
Teaching hours	Lectures		Tutorial	Practical	Contact hours	5
	1		4	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

drawing principles and technical techniques- Pencil techniques, ink pen - Perspective proportions, size and composition - Drawing architectural and landscape elements - Architectural presentation - Free drawing skills - use of colors in the drawing of built and natural elements - colors and presentation media - drafting and experimentation, and manual and mental skills - application of interior design of buildings -Shadow study, straight lines, plane shapes, objects, projection shading methods

References:

- Francis D. K. Ching. "Architectural Graphics", 2015.
- Ernest R. Norling. "Perspective Made Easy (Dover Art Instruction)**", 2012.**

Course title	Surveying				Course Code	ENG243
Teaching hours	Lectures		Tutorial	Practical	Contact hours	3
	2		1	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	10	0	30	60		

Introduction - The concept and classification of cadastral sciences - Units of measurement - Exploration - Drawing of field crocodiles - Area of tape, measuring distances, measuring errors and correction, methods of lifting, measuring and signing angles. Determination of ROBER teams - Balances and types - Contour lines - Soil works - Principles of imaging and their applications in architecture.

References:

- William Smith. "Foundations of Materials Science and Engineering" , 2018.

Course title	Environmental issues				Course Code	MUR233
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	75
	0	0	25	50		

Environmental Studies and Future Prospects - Linking humanitarian, climatic and user needs - Technical systems and integration of internal and external environmental systems - Awareness of the dynamics of spaces internally and externally - Architectural formation during basic concepts of vacuum - Tools and methods Sustainable environmental design, and global warming and it's affects on design process.

References:

- **Charles Harper. "Environment and Society:** Human Perspectives on Environmental Issues**", 2015.**

Second Year- First Semester:

Course title	Architectural Design (2)				Course Code	ARE 211
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

Experience of the design process with its different dimensions - Study of the techniques of performance in design - Study of the environmental elements in the contracting in the stage of design quantity and quality.- Study of the design techniques and the analysis of the elements of the medium and measurement projects.

References:

- 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.

Course title	Building Construction (3)				Course Code	ARE 221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

Construction and finishing works in the buildings - Sand works and axes - Excavation and boring works - Ordinary and reinforced concrete works - Brick building works - Canes and palaces - Carpentry works and details of drawing doors, windows, rims and details - Works of whitewash and paints for facades and interior surfaces - Works of insulating layers for moisture and insulation applications.

References:

- Nikolas, Davies & Jokiniemi, Erkki. "Dictionary of Architecture and Building construction", 1st Edition. 2008.

Course title	Computer Applications in Architecture (1)				Course Code	ARE 241
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	10	0	30	60		

Importance of using the computer in architecture - Applications of computers in architecture in different stages of design and implementation of the building - The operating system for opening programs and operating lists and shortcuts - The initial exercises for horizontal projections and sectors - The use of computers in programming and architectural design and help in the work of drawings and quantities of buildings - Drawing programs Architectural Ready - GIS - Architectural Applications..

References:

- George Omura, Brian C. Benton. "Mastering AutoCAD 2018 and AutoCAD LT", 2018.

Course title	History and Theories of Architecture (2)				Course Code	ARE 242
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

study of the arts and architecture in the Middle Ages and Islamic worlds. - Some contemporary trends in art and architecture - Islamic architecture, its principles and its elements and distinctive elements - Historical buildings affecting Islamic architecture - Influencing buildings in the modern era - Raising the efficiency of dealing with aspects contrary to the process of designing multi-element projects .

Theories of architecture: Analytical study of the factors affecting architectural design (economical, functional, social, human, psychological, and environmental) — building technology and construction techniques — architectural theories and criteria of designing for building elements — vertical circulation in buildings residential buildings — office buildings — commercial buildings.

References:

- Vincenzo de' Rossi as Architect: "A Newly Discovered Drawing and project for the Pantheon in Rome " Femke Speelberg and Furtio Rinaldi, 2015.
- Janson, H.W. "History of Art", 8th edition., Thames & Hudson, London, 2010.

Course title	Foundations& Concrete Structures				Course Code	STE 246
Teaching hours	Lectures	Tutorial	Practical		Contact hours	5
	3	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	10	0	40	75		

Study of soil properties and mechanics - Testing and design of foundations - Stress transmission through soil - Design of shallow bases - Piling foundations - Retaining walls - Soil research and selection of suitable foundation type. Principles of design of concrete structures - analysis and design of sections that are subject to bending load distribution - Distribution of loads - Reinforcement of beams and design - Solid and flat slabs - columns - Stairs –hollow blocks and ribs and study the joints for precast constructions

References:

- David R. H. Jones and Michael F. Ashby. "Engineering Materials 1: An Introduction to Properties", Applications and Design by, 2011.

Course title	Technical reports writting				Course Code	ENG111
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

Introduction to technical writing - elements of writing strategy - planning technical reports – writing a technical report: using illustrations, organizing and numbering, writing reference lists and appendices. Formal reports: categories of formal reports, structure of formal reports - Applications in report writing: laboratory report, field report, periodic reports, proposal, theses and dissertations - Ethical considerations and plagiarism - making presentation - writing a successful CV.

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.**

Course title	Training (1)				Course Code	ENG112
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	0	0	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	50
	25	25		0		

Field training after completion of the second year - in the engineering institutions or offices - Training period four weeks - discuss with the academic supervisor on training skills

Second Year-Second Semester:

Course title	Architectural Design (3)				Course Code	ARE 212
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

Methods of identification of dealing with design problems - Studying gaps in terms of formation and function - Studies of environmental impact assessment of ventilation openings and natural lighting of buildings - Structural materials and how to adapt design with its components and pillars with the surrounding environment and customs and human characteristics - Conduct research and field visits and apply them to architectural design projects.

References:

- **Annie R Pearce. "Sustainable Buildings and Infrastruction", 2012.**
- **Mary Guszowski. "Towards Zero-energy Architecture New Solar Design", laurence king, 2010.**

Course title	Building Construction (4)				Course Code	ARE 222
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

General Location - Executive Details - Different Finishing Raw Materials - Expansion and Landing Joints - Steel Works and Details - Methods and Techniques of Expansion Joints in Building Materials - Prefabricated Buildings, Precast Concrete - Methods and techniques of mixing and concrete - Laboratory devices of quality assurance - Thermal and moisture proofing - Finishing materials.

References:

- Crosbie, Michael J. "Time Saver Standards for architectural design data", McGraw Hill book company, New York, 2009.

Course title	Computer Applications in Architecture (2)				Course Code	ARE 245
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	10	0	40	75		

Identification of methods and techniques of computer applications in the fields of urban and architectural design - Computer use in programming and architectural design - How to help in the work of drawings and reports of quantities and characterization - Digital and spatial analysis and 3D drawings - Extracting the best perspective shots - Using the programs of collection and presentation and project submission.

References:

- ASCENT, Center for Technical. "AutoCAD 2018 3D Drawing & Modeling - Student Guide", Autodesk.2017.

Course title	Urban Design				Course Code	ARE 232
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	10	0	75	40		

definition of urban design - general objectives, elements of urban design methods and elements of green and water elements and lighting, and the dimensions of the basic - the study of the foundations of urban design - the environmental impact on the formation of urban - the design and analysis of urban spaces networks and follow-up characteristics of visual perception in the physical environment and visual composition of the city.

References:

- Taylor & Francis Ltd. "The Urban Design Reader 2nd New edition, Routledge", London, United Kingdom, 2012.
- Francis D. K. Ching. "Architectural Graphics", 2015.

Course title	Environmental Control				Course Code	ARE 244
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	10	0	30	60		

Environmental control: The natural environment and climatic factors — human thermal comfort in building interiors — buildings and streets orientation — natural ventilation in buildings — solar control in windows — design of buildings and windows to adapt with the surrounding environment — landscaping and use of trees for shading, air purification, and control of ventilating patterns — protection from desertification – simulating energy consumption and ventilation and lighting and daylighting by using thermal analysis programs.

References:

- Norbert Lechner. 'Heating, Cooling and Lighting", Canada, 2015.

Course title	Theories of town Planning				Course Code	ARE 231
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

History of the earliest human settlements in different civilizations - study of the evolution and historical - city planning in ancient Egypt, Mesopotamia, Greek and Roman civilizations - a comparison, Medieval periods in the Western and Islamic Worlds and a comparison, Renaissance, Industrial Revolution age and its impact on city planning- modern theories and trends of city planning — researches and trainings.

References:

- CARMONA, Matthew and TIESDELL, Steve. "Urban Design Reader: The Dimensions of Urban Design", The Architectural Press, 2007.

Third Year : First Semester

Course Title	Architectural Design (4)				Course Code	ARE311
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	5
	1	4	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	175
	10	0	90	75		

Study of the external environmental influences with architectural projects in terms of context, blocks, and spaces - The quality of the relationship between the outer space and the shapes of buildings with the urban nature and the surrounding fabric - Study the importance of the construction idea in the formation of large architectural spaces. - Raising the efficiency of dealing with aspects that are contrary to the process of designing multi-component projects and overlapping internal relations - a study presented to the strategic and environmental studies of green architectural projects

References:

- Brian w. Edwards and Emanuele. "Green Buildings Pay", Routledge, USA and Canada, 2013.

Course Title	Working drawing (1)				Course Code	ARE321
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	5
	1	4	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	150
	10	0	90	50		

Preparation of detailed architectural drawings for large projects - Detailed study through the implementation of the sites - Preparation of research in the various and modern construction methods to cover the Spans and large areas of specialized and specialized buildings - Preparation of architectural drawings for the complete projects of these projects - Field visits to sites of engineering projects under construction to study the operational details on the nature.

References:

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

Course Title	Interior design				Course Code	ARE312
Teaching Hours	Lecture	Tutorial	Lecture		Contact hours	5
	1	4	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	150
	10	0	90	50		

foundations of interior design and the formation of interior spaces for public and private buildings- the study of different technical schools of the main design trends in interior design -Study the architectural components of the interior spaces: lighting - acoustics - industrial design and furnishing - materials and materials - texture - Architectural aesthetics- Studying the types of different finishes for general spaces and the work of studies of quantities, specifications and engineering measurements.

References:

- **"Architectural Drawing Course:** Tools and Techniques for 2D and 3D Representation**", 2nd edition, Mo Zell , 2018.**

Course Title	Urban Planning 1				Course Code	ARE 331
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	4
	1	3	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	125
	10	0	75	40		

Studying the different levels of national, regional and local planning - Development studies and structural plans of the country - Environmental, social, economic and demographic studies - Legislation and laws governing planning in Egypt. General planning of the city and its components and components - and study the development of planning goals and programs - study the laws of population density and activities and economic rules of cities - and social and population possibilities.

References:

- **John *M.* Levy. *"Contemporary Urban Planning",10th Edition, USA, 2013.***

Course Title	Steel structure				Course Code	STE 341
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	100
	0	0	40	60		

Principles of Structural Systems For the metal structures, and the study of design loads and their distribution and their impact on the structural elements of metal form and size.
Design of metal members exposed to axial forces or bending or cutting. -Design of welded and bonded joints – Design Steel Structure System For Wided-Span Space.

References:

- Dennis Lam, Ang, Thien Cheong, et al. ***"Structural Steelwork:*** *Design to Limit State Theory"****, 4th Edition, 2018.***

Course Title	Professional Ethics				Course Code	MUR115
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	50
	0	0	15	35		

Studying the laws and legislations governing the ethics of scientific research and architectural design. Ethics of practicing the profession - Relationship of the Engineer to the professional practice systems of the Engineers Syndicate. And its relationship with the owner and the supervision and contractors..

References:

- John Randolph and Gilbert M. "Masters, Energy for Sustainability: Technology, Planning, Policy", Island press, Washington, DC, 2008.

Third year-The second Semester:

Course Title	Architectural designing (5)				Course Code	ARE 313
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	6
	1	5	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	175
	10	0	90	75		

Experience in innovative solutions and problems of environmental design and studying structural - solutions for the formation of large internal spaces with large surfaces and their relationship to the urban environment.-Studying the visual relations of buildings, means of lighting and natural and industrial ventilation with the use of computer applications in the design - application of architectural models.

References:

- Annie R Pearce. "Sustainable Buildings and Infrastruction",2012.

Course Title	Working drawing (2)				Course Code	ARE 322
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	6
	1	5	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	175
	10	0	90	75		

Drainage and recharge drawings - Electrical drawings for all roles and high pressure lines - Mechanical drawings for elevators, escalators and rooms that can be adapted for cooling and heating - Fixed and mobile openings and partitions - Fixed frames - Tables and details of all finishing materials - Field visits to engineering projects sites under construction to study details Executive on nature.

References:

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

- Crosbie, Michael J. "Time saver standards for architectural design data", McGraw hill book company, New York, 2004.

Course Title	Housing				Course Code	ARE 332
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	150
	10	0	40	100		

Urban planning and housing problems in Egypt within the framework of its economic, social and urban dimensions and its different approaches and concepts. Analytical study of different types of housing. Economical, medium, and luxurious. Design, analysis and evaluation of housing models. Planning and design of residential areas and neighborhoods and social, economic and environmental factors affecting design. Housing for the development of housing models..

References:

- R P Misra. "Regional Planning "Concepts, Techniques, Policies and case studies**"", Peter Hall and Mark Tewdwr-Jones, Urban and Regional Planning, 5th Edition, 2010.**

Course Title	Technical supply				Course Code	ARE 343
Teaching Hours	Lecture	Tutorial	Practical		Contact hours	3
	1	2	0			
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	125
	0	0	50	75		

Electrical installation and industrial lighting - Industrial lighting sources and design principles - Acoustic design of buildings and spaces - Air conditioning and electromechanical Supplies - Water supply and sanitation works and the principles of design , calculation rates and studies to calculate the required flow - the disposal of waste for buildings - fire resistance and automatic alarm and its principles of design and calculation rates - new trends

References:

- Qasim S.R., Motley E. M. and Zhu G. "Engineering: Planning, Design & Operation", A hand book**, Eastern Economy Edition, 2011.**

Course Title	Elective course (1)				Course Code	-
Teaching Hours	Lecture		Tutorial	Practical	Contact hours	4
	2		2	0		
Course grades	Oral	Practical	Semester Work	Written exam	Total grads	125
	0	0	35	90		

ARE151 -Maintenance and restoration of buildings:

Standards and specifications - Definition of maintenance and Egyptian code - Basics and types of maintenance of the buildings - the development of the plan for maintenance stages - methods and methods of maintenance of buildings - the calculation of new costs and trends.

References:

- **Pijush Kanti Guha. "Maintenance and Repairs of Buildings Paperback,** New Central Book Agency**", 2nd Revised edition, Jan. 2011.**

ARE152 -Building fixtures:

Industrial lighting in terms of design - installation and finishing - acoustic design of buildings - adaptation and heating - fire installation and fire protection and alarm - sewage and waste disposal.

References:

- **Jan L. M. Hensen & Roberto Lamberts. "Building Performance Simulation for Design and Operation", Routledge, February, 2011.**

Fourth Year-First Semester:

Course title	Architectural Design (6)				Course Code	ARE 411
Teaching hours	Lectures		Tutorial	Practical	Contact hours	6
	1		5	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	175
	10	0	90	75		

application of knowledge and skills in the professional, architectural, construction and technological sciences in the architectural and urban design processes for projects of an applied nature - Discussing various models of solutions for design projects - Studying, analyzing and critique different alternatives to the design idea - Determining the project program and the basic elements and its functional relations. - studies of the environmental strategy of urban and architectural projects.

References:

- **Jan L.M. Hensen & Roberto Lamberts. "Building Performance Simulation for Design and Operation Hardcover", Routledge, 1st edition, Jan 2011.**

Course title	Working drawing (3)				Course Code	ARE 421
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	1	5	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	175
	10	0	90	75		

Preparation of a complete set of architectural designs and drawings for a specialized project that contains a wide sea component - Studies and preparation of detailed architectural drawings for sanitary works, electrical works, cladding materials, suspended ceilings, acoustic treatments, moisture insulation, water, thermal insulation, lighting, interior furnishing and various technical equipment. , With a focus on modern technologies with their operational details - building regulations and regulations - conditions, specifications and quantities using the computer.

References:

- Ching, F. D K. "Building Construction Illustrated", CBS publishers & distributors, India, 2008.

Course title	Urban Planning (2)				Course Code	ARE 431
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	10	0	55	60		

Study of the characteristics of the city - Study of the characteristics of the site and surrounding areas - Urban database - Social, economic and cultural database - Detailed study of the city's transport network - Numerical analysis of functional relations within the project site in one of the old or new cities Visual perception, visual sequence, mental image of the city and its elements.

References:

- Carmona, M. heath, T& tiesdell, S. "Public Places Urban Space: the dimensions of the urban"**, Oxford, architectural press, 2nd Edition, 2010.**

Course title	Graduation Research Project				Course Code	ARE 441
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	1	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	125
	50	0	75	0		

Data collection and information - Site and Project selection and reasons - Site analysis and accessibility and environmental and physical studies of the project - Linking the project and the surrounding environment - Designing the master plan of the project - Studying the societal needs of the project and its relationship with the development in Egypt - The social and economic feasibility of the project - Program design and functional of the project and determine its components.

Providing a detailed report on the studies and rationale for the design of the project according to the architectural work assets (identification of the program, identification and analysis of the project).

References:

- Carmona, M. heath, T& tiesdell, S. "Public Places Urban Space: the dimensions of the urban"**, Oxford, architectural press, 2nd Edition, 2010.**

Course title	Elective course (2)				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	40	60		

ARE251 - Advanced building systems

Introduction to the study of the foundations of industrial construction systems under the technical development and modern architectural trends - loads and constructions - construction materials – examples.and.applied.research.

References:

- **Leonidas Stavridi. "Structural Systems:** Behaviour and Design" - **Volume 1: Plane structural systems, 2010.**

ARE252 - Architectural criticism and competitions

Defining the concepts of architectural criticism and its history - Tools and methods of architectural criticism - Criteria and principles of criticism, evaluation and evaluation - Defining the concepts and importance of architectural competitions and objectives - Ideas and trends in design - Preparation of drawings and technical reports - Applied studies of architectural criticism

References:

- **Joseph Gwilt. "Elements of Architectural Criticism** for the Use of Students"**, Amateurs, and Reviewers, 2010.**

Course title	Training (2)				Course Code	ENG113
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	0	0	2			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	50
	25	25	0	0		

second level of training Field training after completion of the second year - in the engineering institutions or offices - Training period four weeks - discuss with the academic supervisor on training skills

Fourth Year-Second Semester:

Course title	Graduation Project				Course Code	ARE 442
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	0	4			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	250
	0	0	125	125		

Introducing new architected thinking for current and future problems – new concepts and philosophy of solutions – dealing with determinants (architectural – urban – environmental – technological – humanitarian – construction – cultural …..) and linking with different sciences to produce a distinct architectural products.

References

- **Scott Boylston. "Designing Sustainable Packaging Paperback", Laurence King Publishing, April, 2009**

Course title	Regional Planning				Course Code	ARE 432
Teaching hours	Lectures	Tutorial	Practical		Contact hours	6
	2	4	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	150
	10	0	90	50		

relationship between regional planning and traditional land use planning - development and contemporary applications of regional planning. Regional planning and history in developed economies. The need for regional planning has also been enhanced by increasing interregional connectivity, both locally and across regional boundaries - examples from Egypt and other countries and considering in some detail the interaction between economic development processes and regional planning. - Sustainable Regional Planning - Regional Renewal - Transport and Communication Systems - Regional Planning and Global Communication.

References:

- **Fulong Wu. "Planning for Growth:** Urban and Regional Planning in China"**, 2015.**

Course title	Specifications, Quantities & Quality Control				Course Code	ENG245
Teaching hours	Lectures	Tutorial	Practical		Contact hours	3
	2	1	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

Economic feasibility study - Elements of feasibility study - Principles of building economics - Global and local trends for cost reduction - Design economics - Contracting economics - Implementation economics - Analysis of building performance efficiency relative to total cost - Project evaluation criteria (Before implementation and after works) - Preparation of tender documents and conditions study Specifications and Execution Documents – Quantity and Costing calculation .

References:

- **"GACC Guide to the Appointment of Consultants & Contractors", 4th edition, 2009.**
- **Datta, B.N. "Estimating and Costing in Civil Engineering:** Theory & Practice Including Specifications and Valuation", **Sangam Books Ltd, 27 revised editions, 2002.**

Course title	Elective Course (3)				Course Code	-
Teaching hours	Lectures	Tutorial	Practical		Contact hours	4
	2	2	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	10	0	30	60		

ARE351 - Renewal and urban upgrading

Maximizing the potential of the existing environment and its human and urban resources - Experiences of local and global improvement and upgrading - Problems of existing urbanization and the causes of deterioration and its phenomena - Means and techniques used in renovation and upgrading - preservation and maintenance policies.

References:

- **Maddison Wolfe. "Urban Planning and Renewal", 2017.**

ARE352- Detailed planning

Role of planning in achieving the formation of the relationship between structural blocks and spaces - the formation of spaces and their follow - up, dimensions, dimensions, shapes and relationship - the visual composition of various re - paths of movement - coordination of the site - the detailed components of the special.

References:

- **CARMONA, Matthew and TIESDELL, Steve. "Urban Design Reader:** The Dimensions of Urban Design"**, The Architectural Press, 2007.**

Course title	Research and analysis skills				Course Code	MUR221
Teaching hours	Lectures	Tutorial	Practical		Contact hours	2
	2	0	0			
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	50
	0	0	15	35		

Critical thinking - Assess and develop thinking skills – Identifying arguments - Argument and non-argument - Clarity, internal consistency and structure - Reading between the lines: Recognising underlying assumptions and implicit arguments - Identifying flaws in the argument - Finding and evaluating sources of evidence - Critical reading and note-making: Critical selection, interpretation and noting of source material – Critical thinking when writing – Evaluating critical writing.

References:

- **S. Cottrell. "Critical Thinking Skills", 3rd Edition, published by Macmillan Study Skills, 2017.**

Course title	Environmental Impact of Engineering Projects				Course Code	ARE 444
Teaching hours	Lectures		Tutorial	Practical	Contact hours	3
	2		1	0		
Course grades	Oral	Practical	Semester work	Final Exam.	Total grads	100
	0	0	30	70		

Environmental Pollution Sources - Environmental Standards - Objectives of Environmental Impact Assessment - Environmental, Potential and Common Environmental Impact of Engineering Projects - Classifications of Projects according to their Environmental Impact - Steps for Environmental Impact Assessment.

References:

- **Peter Wathern. "Environmental Impact Assessment:** Theory and Practice"**, Routledge, Feb 2013.**