INTRODUCTION

Firstly: Aims of the Faculty of Engineering.

Engineering is the profession in which the knowledge of all basic sciences (Mathematics, Physics, Chemistry…etc) and that earned from engineering studies, experience and practice are applied to develop, and to create methods, machinery and equipment with the optimum use of materials and natural resources for the benefit of the human community.

Therefore, the Faculty of Engineering aims at achieving the following objectives:

- To prepare a graduate capable of applying the Engineering Sciences and their methods to the practical life.
- To prepare a graduate capable of making decisions and dealing with problems.
- To prepare a graduate familiar with the means of the new technologies and information technology and how to deal with them.
- To prepare a graduate capable of competing in the workplace under the new and changing circumstances of the international community.
- To help in the preparation of scientific experts in all disciplines present at the Faculty of Engineering.
- To help in the development of society and environment through the participation in offering scientific solutions to existing problems via research work.

Secondly: The timeline of the Faculty of Engineering and its scientific departments.

1941 The Faculty of Engineering – Cairo University established its branch in Alexandria.

1942 The emanation of law ordinance No. 32 for the year 1942 for founding Alexandria University.

1942 The inception of the education in of the preparatory year and the first year (Architecture, Civil Engineering, Electrical and Mechanical Engineering)

1946 Establishing the department of Sanitary Engineering and Municipalities.

1953 Establishing the department of Chemical Engineering

1960 Establishing the departments of Mechanical Power Engineering, and Weaving & Textile Engineering.

1961 Establishing the department of Marine Engineering.

1963 Establishing the department of Production Engineering.

1964 Establishing the department of Nuclear Engineering.

1974 Establishing the department of Computer Science and Automatic Control.

Thirdly: The timeline of the bylaws of the Faculty of Engineering:

1942 The emanation of law ordinance No. 32 for the year 1942 for founding Alexandria University.

1954 The emanation of the law No. 626 for the year 1954 of the principal internal bylaw of the Faculty of Engineering.

1956 The emanation of the presidential decree No. 216 for the year 1956 for the executive bylaw of the law of organizing Universities No. 345 for the year1956 including the internal bylaws of the Faculty of Engineering.

1959 The emanation of the presidential decree No. 1911 for the year 1959 for the executive bylaw of the law of organizing Universities in the United Arab Republic No. 184 for the year 1958 including internal bylaws of the Faculty of Engineering.

1974 The emanation of the ministerial decree No. 700 for the year 1974 with the internal bylaw of the Faculty of Engineering.

1994 The emanation of the ministerial decree No. 25 for the year 1994 concerning amendment of the internal bylaw of the Faculty of Engineering

1997 The emanation of the ministerial decree No. 8 for the year 1997 with the internal bylaw of the Faculty of Engineering

2003 The emanation of the ministerial decree No. 1633 for the year 2003 with the internal bylaw of the Faculty of Engineering

CHAPTER ONE

The Departments of the Faculty of Engineering and the Bachelor of Science Degree

CHAPTER ONE

The Departments of the Faculty of Engineering and the Bachelor of Science Degree

Article (1): The Faculty of Engineering is composed of the following departments:

1- Engineering Mathematics and Physics
2- Architectural Engineering
3- Structural Engineering
4- Irrigation Engineering and Hydraulics
5- Transportation Engineering
6- Sanitary Engineering
7- Mechanical Engineering
8- Textile Engineering
9- Production Engineering
10- Marine Engineering and Naval Architecture
11- Electrical Engineering
12- Computer and Systems Engineering
13- Nuclear and Radiation Engineering
14- Chemical Engineering.

Article (2): The following subjects are within the domain of each department:

1- Engineering Mathematics and Physics Department

Mathematics - Statistics - Mechanics - Physics - Engineering Drawing and Geometrical Projection.

2- Architectural Engineering Department

Architectural Design Fundamentals - Building Construction - Visual Studies & Theory of Colors - Computer in Architecture - History of Architecture - Theories of Architecture - Shade - Shadow and Perspective - Environment Control in Buildings - Architectural Design - Execution Design- Theory of structures - Properties and Testing of Materials - Technical Systems in Buildings - History of Islamic Architecture - History of Islamic Architecture - History of City & Site Planning - Interior Design - Structural Engineering - Urban Planning and Housing - Quantities & Specifications - Public Buildings Design – Research methodology & Programs - Theories of Architecture and Criticism - Housing Design - Housing Theories and Economics - Urban Design Projects - Theories of Urban Design - Graduation Project - Law and Architectural Legislation - Architecture Professional Practice - Landscape Architecture - Contemporary Arts - Heritage Preservation - Architecture and Environment - Site Analysis Studies - Construction Project Management - Construction and Building Technology - Projects Feasibility Studies - Housing in Developing Countries - Design of Rural Communities - Urban Geography - Urban Space - Urban Infrastructure - Geographical Information Systems - Urban Economics

3- Structural Engineering Department

Theory of Structures - Testing and Properties of Materials - Soil Mechanics, Foundation Engineering - Reinforced Concrete - Construction Engineering - Modern Methods for Structural Analysis - Management of Engineering

Constructions - Advanced Engineering Materials - Steel Structures - Deign of Industrial and Tall Buildings - Concrete Structures and Bridges – Contracts – Quantities and Specifications - Repair, Inspection, and Quality Control - Steel Structures and Bridges.

4- Irrigation Engineering and Hydraulics Department

Hydrology – Hydraulics – Design of advanced irrigation systems – Irrigation and Drainage Engineering – Applied hydraulics – Design of pipeline and piping network – Design of |Irrigation Structures – Hydraulic Structures – Computer application in hydraulic structures.

5- Transportation Engineering Department

Surveying and Topography - Civil drawing - Engineering Geology - Surveying and Topography - Transportation Planning and Traffic Engineering - Applications of new technologies and instruments in surveying - Engineering - Alignment and setting out of civil engineering projects - Railway Engineering - Harbor Engineering and Marine structures - Highway Engineering - Transportation Systems Planning - Coastal engineering – Computer applications in civil engineering.

6- Sanitary Engineering Department

Water Supply Engineering - Sanitary Engineering - Wastewater Engineering - Environmental protection Engineering - Environmental Sciences

7- Mechanical Engineering Department

Mechanics of Materials - Fundamentals and Measurements of Fluid Flow and Heat - Mechanical Drawing - Mechanics of Machinery - Computer Aided Mechanical Drawing - Thermodynamics - Computer Applications in Mechanical Engineering - Mechanical Design - Fluid Mechanics - Fundamentals of Combustion Engineering - Mechanical Vibrations - Internal Combustion Engines - Heat Transfer - Gas Dynamics - Automatic Control - Thermal Power Plants - Hydraulic Machines - Refrigeration and air Conditioning - Optimum Design - Design of Thermal Equipment - Industrial Fluid Mechanics - Gas Turbines - Introduction to Mechatronics - Operation and Management of Thermal Power Stations - Fluid Machinery - Advanced Topics in Combustion Engineering - Tribology - Applications in Thermal Engineering - Hydraulic Circuits - Automotive Engineering – Environment & Energy.

8- Textile Engineering Department

Drawing and machine construction - Raw material and fiber physics - Design and theory of textile Machinery - Spinning technology - Weaving preparation - Textile technology - Yarn physics and testing - Textile quality control - Technology of yarn production - Physics and Fabric Structure – Computer Application in Textile Industry - Information systems - Mechanics of Textile Machinery - Technology of wool yarn production - Weaving technology - Technology of man-made yarn production - Ready made garments - Non woven fabric - Manufacturing and End–use of technical Industrial fabrics - Technology of Texturizing - Theories of spinning - Weaving and knitting - Garment Engineering - Technology of Non conventional yarn production - Technology of non – conventional cloth production - Automatic control and robotic systems in Textile mills - Finishing technology - New spinning systems - New weaving systems.

9- Production Engineering Department

Materials Technology - M/C Tool Elements Drawing - Foundry and Welding - Operations Research - Machining processes - Forming Technology - Theory of Metal Cutting - Solid Mechanics - Dimensional Metrology - Machine Tool Elements Design - Theory of Machines - Plasticity and Metal Forming - Theory & Design of M/C Tools - Geometrical Metrology - Facilities Layout & Design - Production Planning & Control - Advanced M/C Tools - Automatic Control - Advanced Metrology Systems – Mechatronic Systems - Advanced Material Technology - Quality Control - Machine Tool Dynamics - Abrasive Machining - Non Destructive Testing - Non Conventional Machining - Non Conventional Forming - Engineering Management & Organization - Quality Improvement & Management - Engineering Material Selection - Knowledge Engineering - Computer Aided Metrology Systems - Advanced Machining Technology - Failure Analysis - CNC Machine Tools - Principles & Applications of Noise Control Systems - Industrial Systems Modeling & Simulation - Die Design - Maintenance Technology (Condition Monitoring).

10- Marine Engineering and Naval Architecture Department

Ship Machinery Drawing - Naval Architecture - Ship Structural Analysis - Ship and Machinery Drawing - Fluid Mechanics - Ship Construction - Computer Programming - Fluid Mechanics and Hydraulic Machines - Material Technology - Ship Structural Design - Ship Hydrodynamics - Ship Propulsion Systems - Probabilistic Methods in Marine Systems - Shipbuilding Technology - Ship Design - Marine Power Plants - Dynamics of Marine Vehicles - Ship Outfittings - Offshore Engineering - Computer Aided Ship Design - Risk Analysis - Shipyard Engineering - Heat Transfer & Refrigeration and Air Conditioning - Marine Structural Dynamics - Auxiliary Machinery.

11- Electrical Engineering Department

Electric Circuits, Modern Physics, Introduction to Energy Systems, Electric and Electronic Measurements, Electronic Devices and Circuits, Introduction to Logic Circuits and Programming, Electric Circuit Analysis, Microprocessor Fundamentals, Electromagnetic Fields, Electronic Engineering, Electric Power Engineering, Electric Machines, Control and Computer Applications, Measurement Systems, Introduction to Integrated Circuits, Power Electronics, Protection of Power Systems, Automatic Control Engineering, Electric Engineering Materials, Communications for Electrical Power Systems, Signal Processing for Electrical Power Systems, Power System Analysis, Industrial Applications and Installation Engineering for Power Systems, Special Electric Machines, Mechatronics and Robotics, Industrial Automation, High Voltage Engineering, Electrical Drives, Operation and Planning of Electrical Power Systems, Solid State Drives, Control of Electrical Power and Machines, Solid State Electronics, Electronic Circuit Analysis, Logic Circuit Design, Electric Machines and Power Systems, Semiconductor Devices, Microprocessors, Electromagnetic Waves and Acoustics, Signals and Systems, Analog Integrated Circuits, Microwave and Optical Transmission Media, Analog Communications, Control Systems and Their Components, Microwave Devices, Optical Devices, Electronic and Microwave Measurements, Optical Communications Systems, Digital Integrated Circuits, Antenna Engineering, Digital Signal Processing, Communication Systems, Modeling and Design of VLSI Integrated Circuits,

Advanced Communication Systems, Biomedical Engineering, Communications Networks, Digital Control Systems and Robotics, Digital Communications.

12- Computer and Systems Engineering Department

Computers and programming, programming, probability theory and it's applications in computers, data structures, computer fundamentals, computer mathematics, statistical methods for computers, digital systems, numerical analysis and its applications in computers, systems and components programming, linear control systems, micro systems, digital nonlinear control, analysis of algorithms, algorithms for digital signal processing and digital signal transmission, operating systems, operations research and computers, embedded systems, computer architecture, programming languages and translators, database management systems, communications and computer networks, software engineering, artificial intelligence, computer graphics, switching theory and computation models, pattern recognition, optimization technologies, special topics in computer engineering, special topics in information systems and software, modern control systems, distributed systems and network programming, topics in computer networks, special topics in systems engineering, special topics in computer science, performance evaluation of computer systems

13- Nuclear and Radiation Engineering Department

Modern Physics - Introduction to Engineering Materials Science - Introduction to Nuclear & Radiation Engineering - Properties & Testing of Nuclear Materials - Nuclear Physics - Thermodynamics & Kinetic Theory of Gases - Radiation Safety - Nuclear Reactors Materials - Radiochemistry - Heat Transfer - Materials Characterization Techniques - Radiobiology - Simulation of Nuclear Power Stations - Quantum Mechanics - Electromagnetics & Plasma Theory - Nuclear Reactors Physics - Radiation Detection - Thermal Power Stations - Computational Methods in Materials - Fundamentals of Simulation of Radiation Transport - Nuclear Reactor Safety - Nuclear Reactors Analysis - Radiation Shielding Design - Reactors Automatic Control - Nuclear Fuel Cycles - Non-destructive Testing - Introduction to Medical Radiography - Nuclear Power Stations - Reactors Kinetics - Applications of Radioisotopes - Materials Radiography - Radiation Health Physics - Measurements of Nuclear Power Stations.

14- Chemical Engineering Department

Engineering chemistry – Programmed calculations for chemical engineers - Organic chemistry - Inorganic chemistry - Physical chemistry - Surfaces chemistry and phase equilibria - Inorganic and analytical chemistry - Materials science - Chemical processes - Engineering metallurgy - Chemical engineering fundamentals - Thermodynamics in chemical engineering - Heat transfer - Fluid flow engineering - Separation processes - Corrosion engineering - Modeling and simulation in chemical engineering - Water treatment - Biochemical engineering - Fuel engineering and combustion – Alternative energy resources - Chemical reaction engineering - Electrochemical processes - Fertilizers technology - Silicate industries - Extractive metallurgy - Technology of natural fibers and tissues - Oils and fats technology - Dyestuffs and textile finishing - Mechanical unit operations - Chemical process industries - Petroleum refining engineering - Natural gas engineering - Wastewater treatment - Treatment of solid and gas

wastes – Chemical process control – Design of chemical processes – Water desalination - Safety engineering and explosives - Non-Newtonian fluids - Polymer engineering - Composites and reinforced materials - Petrochemicals..

Article (3): The Vice-Dean for Education and Student Affairs supervises Humanities, Foreign and Technical Language courses. He may assign the supervision of some of these courses to one or more of the departments of the Faculty of Engineering.

Article (4): (a) The tables annexed to Article (26) show the courses, their respective weekly hours and their distribution among the lectures, tutorials, labs and oral. The tables also show that duration of the final exams for each course as well as the marks assigned for the class work, lab, oral and final exams.

(b) Article (27) shows the contents of the each course

Article (5): Alexandria University grants the degree of the Bachelor of Science based on the request of the council of the Faculty of Engineering in one of the following specializations:

1- Architectural Engineering, in one the following branches:
   a) Public buildings b) Housing c) Urban design

2- Civil Engineering

3- Mechanical Engineering

4- Textile Engineering

5- Production Engineering

6- Marine Engineering and Naval Architecture

7- Electrical Engineering, in one of the following two branches:
   a) Power and Electrical Machines b) Communications and Electronics

8- Computer and Systems Engineering

9- Nuclear and Radiation Engineering

10- Chemical Engineering

The Bachelor of Science degree is granted yearly, in June and November

CHAPTER TWO
General Rules

CHAPTER TWO
General Rules

Article (6): The Faculty of Engineering follows a two-semester system per academic year. The duration of study to obtain a Bachelor of Science (B.Sc.) degree is five academic years: a preparatory year, followed by four academic years. Each semester runs for 15 weeks.

Article (7): Students passing the preparatory year, are distributed among the different scientific departments of the Faculty of Engineering according to the system approved by the Council of the Faculty of Engineering. The registration of the students in these departments remains till their graduation.

Article (8): Students of the fourth year prepare a project during the academic year. The Department Councils specify the topics and designate an additional period - following the final written examinations - that ranges from one to three weeks.

Article (9): Summer training is considered a complementary part of the study. The B.Sc. degree is not granted unless the student spends a total of three months throughout the academic years. Each Department Council specifies a summer training system to be implemented during the summer holiday, under the supervision of department faculty members.

Article (10): Each Department Council organizes a scientific trip for the fourth year students to visit industrial facilities, engineering and serving firms to be familiar with them and their respective technological systems. These trips are supervised by the department faculty members.

Article (11): Each student is requested to attend at least 75% of the lectures, tutorials and labs of each course. The student is deprived of attending the final exam of any course he has not fulfilled the attendance requirement. In this case, the student is considered a failure in the course. If the student submits an excused absence – approved by the Faculty Council – it is then considered absence with an acceptable excuse.

Article (12): A student is promoted to the following class year at the end of the academic year if he/she successfully passes the final exams of all courses or fails in no more than two courses. The student has to pass the exam(s) of the failing course(s) during the semester they are taught in. The maximum grade a student can obtain in this case, is the upper limit of the grade "PASS". If the student was absent with an acceptable excuse in a given course, he/she can keep the grade obtained according to the marks received in this course.

Article (13): Fourth year students failing in no more than two courses from the fourth year or from any previous years, repeat the exams of these courses at the beginning of the following first semester (November). The last semester work marks are considered. If the failure is repeated in both courses or in either one, the students will have to take the corresponding exam(s) at the end of the semester(s) in which the course(s) is (are) taught. In this case the students are treated as if they passed with retardation courses, as far as the semester work grade is concerned.

Article (14): A student failing in the senior project is considered a repeating student.

Article (15):
- The Faculty council specifies the minimum number of registered students for each elective course according to the potentials available in the Faculty and in the different departments.
- It is not allowed to change the elective courses for a failing student or a student absent without an acceptable excuse.
- The maximum number of listed courses for an elective unit is five.

Article (16): The success of the student in the courses is considered according to the following grading system:

Excellent	From 85%	to	100%
Very Good	From 75%	to	Less than 85%
Good	From 65%	to	Less than 75%
Pass	From 50%	to	Less Than 65%

While the failure of the student in the courses is considered according to the following:

Weak	From 30%	to	Less then 50%
Very Weak	-		Less then 30%

Article (17): A student is considered a failure if he/she obtains less then 30% in the final written exam. In that case, "Bylaw Failure" is quoted for this course. In this case, the semester work marks, oral and lab marks are not added to those of the final exam.

Article (18): If a course includes marks for a practical, oral, mid-term and written exams, the final grade of the student will be according to the sum of all these marks. If the student does not attend the final exam, neither of these marks are allocated, and the student is considered absent in this course.

Article (19): A course consisting of two or more subjects and one exam mark, is considered as one course regarding success and failure. The Faculty Council distributes the hours (lectures, tutorials, labs, oral and final exam) of the different subjects of this course. The Council specifies as well the proportion of questions for each subject within the same exam. This occurs only if there is no explicit distribution in the present Faculty Bylaw. A separate answer sheet is provided for the final exam of each subject.

Article (20): The continuing courses (courses divided into two parts presented in two successive semesters, with a final exam for each division at the end of the respective semester) are treated as follows:

1- A student is considered successful in a continuing course if he/she passes successfully both parts of the course.

2- A student is considered a "Bylaw Failure" in a continuing course if less that 30% of the total marks of the final exams of both parts is achieved.

3- If a student fails in one of the two parts, but their total marks together qualify the student for passing the course, the student is considered successful and will not be required to repeat the failing part. When failing in one part of the continuing course, and passing in the other, the student keeps the marks he/she obtained in the part he/she passed, and repeats the exam in the other part the next semester in which this part is taught. If the student achieves 65% or more in the repeated part, the mark of this part is downgraded to the maximum mark

of the grade "PASS", followed by summing the marks of this part and those of the part he passed earlier, in order to obtain the final grade of the continuing course.

4- If a student fails in both parts of the continuing course, he/she repeats both parts the following academic year, during the corresponding semesters. If the student achieves 65% of the total marks of the course, the marks are then downgraded to the maximum mark of the grade "PASS".

Article (21): A student failing in a course may repeat all the class work of this course. He/she acquires all the marks earned after the repetition, regardless of the class work grades earned earlier. The student has to pass all the lab and oral exams of the course, if there are any. In case of an external student, the class work mark is calculated as a ratio of the final exam, and if the course includes a lab exam or an oral exam, the student has to take them.

Article (22): Without misusing Articles (86) and (87) of the Executive Bylaw for the Law of Organizing Universities, the Faculty Council specifies annually the conditions and regulations for students transferring from other faculties of Engineering. The following should be observed:

1- Students transferring to the first year, are distributed among the different departments according to the places available in each department, and remain registered in these departments until they graduate.

2- Transferring students keep, the grades earned in each course, the total marks and the overall grade obtained in each academic year form the faculty they transfer from.

3- The department councils specify a list of complementary courses not covered in the faculties the students are transferring from. They specify as well, a list of exempted courses covered in the faculties the students are transferring from. Transferring students are treated as follows:

   a- A transferring student is not promoted to the higher class, unless he/she succeeds in all the courses - including the complementary courses. He/she may fail in no more than two courses, to be promoted to the higher class. Transferring students sit for the complementary courses with the group of students taking these courses and during the semester they are taught in. The students are given the legal opportunities to be examined in these complementary courses according to the class where they are taught.

   b- A transferring student may ask for a suspension in the class he/she is registered in, until passing the complementary courses.

   c- Upon passing the complementary courses, their grades are not added to the grades of the regular courses of the class the student was registered in the faculty he/she transferred from. In case of failure in these courses, they are not considered as failure courses in this class.

   d- The marks earned in the complementary courses are considered in the cumulative total of the student.

   e- The marks of the exempted courses are not considered among those of the class of these courses.

   f- The maximum for the total accumulative marks a student earns during the five years is 7500. If this is not realized, the marks are calculated by proportion.

CHAPTER THREE

Transitional Rules

CHAPTER THREE
"Transitional Rules"

Article (23): The rules of the present bylaw are applied on the fresh preparatory year students, repeating students and re-registered students starting from the academic year following the issuance of the ministerial decree concerning this bylaw. It is then applied successively on the rest of class years.

Article (24): Upon applying the rules of the present bylaw on any class year, they are pertained on repeating students, re-registered students and external students. The faculty council accommodates the conditions of the students according to the present bylaw and the previous ones.

CHAPTER FOUR

Tables for the Distribution of Courses

CHAPTER FOUR
"Tables for the Distribution of Courses"

Article (25):
Code system used:

AA	N1	N2	N3

AA- The department teaching the course
N1- A digit indicating the class year in which the course is taught.
[The preparatory year (0) – First year (1) – Second year (2) – Third year (3) – Fourth year (4)]
N2- A digit indicating the specialized group of the course. The letter (E) indicates the specialized group for the elective courses.
N3- A digit indicating the sequence of the courses among its specialized group in the class year within which it is taught.

The Departments responsible for teaching

Department	Code
Engineering Mathematics and Physics	MP
Architectural Engineering	AR
Civil Engineering	CE
Mechanical Engineering	ME
Textile Engineering	TE
Production Engineering	PE
Marine Engineering and Naval Architecture	MR
Electrical Engineering	EE
Computer and Systems Engineering	CS
Nuclear and Radiation Engineering	NE
Chemical Engineering	CH
Joint Courses	JE
Humanities	HS

1- There is no department for humanities. These courses are taught by the concerned departments. If no one from the Faculty of Engineering can teach the course an external Faculty member is then conceded for teaching the course.
2- If a course is being taught in more than one class year, the letter 'X' is used instead of the class year.
3- The project is given the number 401 for the first semester and the number 402 for the second semester, preceded by department code.

Article (26): The following tables show the distribution of the courses among the class years, the weekly hour distribution specified for the lectures, tutorials and labs, the number of hours specified for the final exam, the maximum mark for each course distributed between the class work, lab exams, oral exams and final exams.

Engineering Mathematics and Physics Department

Engineering Mathematics and Physics Department

Preparatory Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 011	Mathematics – 1*	4	2		6	45			105	150	3
MP 021	Mechanics – 1 **	2	2		4	30			–	–	–
MP 031	Physics – 1*	4	1	1	6	30	20	10	90	150	3
MP 041	Engineering Drawing and geometrical Projection – 1**	2	4		6	60			–	–	–
CS 021	Computers and Programming	2	1	1	4	20	20		60	100	2
PE 011	Production Technology	2	1	1	4	20	20		60	100	2
Total		16	11	3	30	205	60	10	315	500	

Preparatory Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 012	Mathematics – 2*	4	2		6	45			105	150	3
MP 022	Mechanics – 2 **	2	2		4	30			140	200	3
MP 032	Physics – 2*	4	1	1	6	30	20	10	90	150	3
MP 042	Engineering Drawing and geometrical Projection – 2**	2	3	1	6	40	20		180	300	4
CH 011	Engineering Chemistry	2	1	1	4	20	20		60	100	2
HS 011	English	2			2	15			35	50	2
HS 021	History of Engineering Sciences	2			2				50	50	2
Total		18	9	3	30	180	60	10	660	1000	

* Continuous courses

** Ongoing courses: the class marks of two terms are added and the final exam is held at the end of the second term.

Architectural Engineering Department

Architectural Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 111	Architectural Design Fundamentals -1 *	6	2		8	120			-	-	-
AR 113	Building Construction -1*	4	2		6	75			-	-	-
AR 121	Visual Studies & Theory of Colors	2	2		4	60			40	100	3
AR 122	Computer in Architecture-1**	4		2	6	100		50	-	150	-
HS 122	History of Architecture-1	4			4	30			70	100	3
AR 124	Theories of Architecture -1	2			2	15			35	50	2
TOTAL		22	6	2	30	400		50	145	400	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 112	Architectural Design Fundamentals	6	2		8	120		80	80	400	4
AR 114	Building Construction-2*	4	2		6	75			150	300	4
AR 131	Shade - Shadow and Perspective	2	2		4	60			40	100	4
AR 123	Computer in Architecture-2**	4		2	6	100		50	-	150	-
AR 125	Environment Control in Buildings	2			2	15			35	50	2
HS 123	History of Architecture-2	4			4	30			70	100	3
TOTAL		22	6	2	30	400		130	375	1100	

* Continuous courses – First and second term work summed together (written and oral exams) in the second term
** Ongoing courses

The student must complete summer training during the summer holiday for 4 weeks according to department rules.

Architectural Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 211	Architectural Design-1*	6	2		8	120		-	-	-	-
AR 213	Execution Design-1*	4	2		6	100		-	-	-	-
AR 221	Theories of Architecture-2	4			4	30			70	100	3
CE 267	Theory of structures-6**	2	2		4	30			70	100	3
CE 269	Properties and Testing of Materials	2	2		4	30			70	100	3
JE 2J1	Technical Systems in Buildings-1 a)Acoustics b)Lighting	 2 2			 2 2	 15 15			 35 35	100	4
TOTAL		22	8		30	340			280	400	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 212	Architectural Design-2*	6	2		8	120		80	80	400	6
AR 214	Execution Design -2*	4	2		6	100		40	60	300	4
JE 2J2	Technical Systems in Buildings-2 a)Sanitary Installations b)Mechanical Installations	 2 2			 2 2	 15 15			 35 35	100	4
HS 224	History of Islamic Architecture	4			4	30			70	100	3
HS 225	History of City & Site Planning	2	2		4	30			70	100	3
CE 268	Theory of structures-7*	2	2		4	30			70	100	3
TOTAL		22	8		30	340		120	420	1100	

* Continuous courses – First and second term work summed together (written and oral exams) in the second term
** Ongoing courses

The student must complete summer training during the summer holiday for 4 weeks according to department rules.

Architectural Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 311	Architectural Design and Interior Design-1*	6 2	 2		10	120 30					
AR 313	Execution Design-3*	4	2		6	90					
HS 326	Regional and City Planning	2	2		4	30			70	100	3
AR 321	Theories of Architecture-3	4			4	30			70	100	3
AR 3E1	Elective Course (1) ***	2	2		4	30			70	100	3
CE 361	Structural Engineering-2 ** Steel Structures	1	1		2	15			35	50	3
TOTAL		21	9		30	345			245	350	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 312	Architectural Design & Interior Design-2*	6 2	 2		 10	120 30		80 40	80	500	6
AR 314	Execution Design-4*	4	2		6	90		60	60	300	4
AR 322	Urban Planning and Housing	2	2		4	30			70	100	3
AR 331	Quantities and Specifications	2	1		3	25			50	75	2
AR 3E2	Elective Course (2)***	2	2		4	30			70	100	3
CE 362	Structural Engineering-3** a) Reinforced Concrete b) Soil Mechanics	1 1	1		3	15 10			25 25	75	4
TOTAL		20	10		30	350		180	380	1150	

* Continuous courses – First and second term work summed together (written and oral exams) in the second term

** Ongoing courses

*** The Student selects at the beginning of the year a specialized branch from the three offered sections (A- Public buildings, B- Housing, C- Urban Design)

The student selects an course for Elective 1 and one for Elective 2 among the electives of his specialized section

Two hours of the elective courses are allocated for research and applications

Each student spends a summer training for 4 weeks during the summer holiday according to department rules

Architectural Engineering Department

Public Buildings Section

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 411	Architectural Design	8	4		12	180		60	60	300	4
AR 414	Execution Design-5	6	2		8	120		40	40	200	3
AR 431	Research methodology and Programs	2			2	15			35	50	2
AR 421	Theories of Architecture and Criticism	4			4	30			70	100	3
AR 4E3	Elective Course (3)*	2	2		4	30			70	100	3
TOTAL		22	8		30	375		100	275	750	

Housing Section

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 412	Housing Projects	8	4		12	180		60	60	300	4
AR 415	Execution Design-6	6	2		8	120		40	40	200	3
AR 431	Research methodology Programs	2			2	15			35	50	2
AR 422	Housing Theories and Economics	4			4	30			70	100	3
AR 4E3	Elective Course (3)*	2	2		4	30			70	100	3
TOTAL		22	8		30	375		100	275	750	

Urban Design Section

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 413	Urban Design Projects	8	4		12	180		60	60	300	4
AR 416	Execution Design -7	6	2		8	120		40	40	200	3
AR 431	Research methodology and Programs	2			2	15			35	50	2
AR 423	Theories of Urban Design	4			4	30			70	100	3
AR 4E3	Elective Course (3) *	2	2		4	30			70	100	3
TOTAL		22	8		30	375		100	275	750	

* The student selects one elective course for Elective 3 from the electives of his section of specialty.

Architectural Engineering Department

Fourth Year Second Semester

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
AR 402	Graduation Project (B,H,U)	14	4		18	270		180		450	-
HS 431	Law and Architectural Legislation	2			2	15			35	50	2
HS 451	Architecture Professional Practice	2			2	15			35	50	2
AR 4E4	Elective Course (4)*	2	2		4	30			70	100	3
AR 4E5	Elective Course (5)**	2	2		4	30			70	100	3
TOTAL		22	8		30	360		180	210	750	

* The student selects a course for Elective 4 among the electives of his section of specialty

** The student selects a course for Elective 5 among the electives of sections of specialty

Architectural Engineering Department

Elective Courses

AR xEx	Public Buildings Elective courses
AR x41	Landscape Architecture
AR x42	Contemporary Arts
AR x43	Heritage Preservation
AR x44	Architecture and Environment
AR x45	Site Analysis Studies

AR xEx	Housing Elective courses
AR x51	Construction Project Management
AR x52	Construction and Building Technology
AR x53	Projects Feasibility Studies
AR x54	Housing in Developing Countries
AR x55	Design of Rural Communities

AR xEx	Urban Design Elective courses
AR x61	Urban Geography
AR x62	Urban Space
AR x63	Urban Infrastructure
AR x64	Geographical Information Systems
AR x65	Urban Economics

Common Courses

JE 2J1	Technical Systems in Buildings 1
EE 267	Building Acoustics
AR 222	Lighting

JE 2J2	Technical Systems in Buildings 2
AR 223	Sanitary Installations
ME 214	Mechanical Installations

Civil Engineering Department

Civil Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 124	Mechanics - 4	2	2		4	30			70	100	3
CE 161	Theory of Structures - 1	3	2		5	35			90	125	3
CE 141	Surveying and Topography - 1	4	1	2	7	35	20	15	105	175	3
CE 142	Civil Drawing – 1 **	2	2		4	40			60	100	3
CE 162	Properties of Materials-1	4	1	1	6	30	30		90	150	3
CE 146	Computer Applications in Civil Engineering	2	2		4	30			70	100	2
TOTAL		17	10	3	30	200	50	15	485	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics - 3	4	2		6	45			105	150	3
CE 143	Engineering Geology	2	1		3	25			50	75	2
CE 163	Theory of Structures - 2	4	2		6	45			105	150	3
CE 144	Surveying and Topography-2	2	1	2	5	25	15	10	75	125	3
CE 145	Civil Drawing – 2 **	2	2		4	40			60	100	3
HS 132	Engineering Law and Economics a- Law b- Engineering Economics	 2 2	 2		 2 4	 15 30			 35 70	150	3
TOTAL		18	10	2	30	225	15	10	500	750	

** Continuous Course

Civil Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematics - 4	4	1		5	35			90	125	3
CE 264	Theory of Structures-3	3	2		5	35			90	125	3
CE 281	Soil Mechanics - 1	4	2		6	45			105	150	3
CE 246	Surveying and Photogrammetry - 3	4	2	2	8	40	20	20	120	200	3
CE 231	Hydrology	3			3	25			50	75	2
HS x41	Environmental Sciences	3			3	25			50	75	2
TOTAL		21	7	2	30	205	20	20	505	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CE 265	Theory of Structures- 4	4	2		6	45			105	150	3
CE 232	Hydraulics -1	4	3		7	55			120	175	3
CE 266	Properties of Materials-2	4	1	1	6	30	30		90	150	3
CE 251	Transportation Planning and Traffic Engineering	2	2		4	30			70	100	3
AR 215	Arch. Design Principles	3			3	25			50	75	3
CE 271	Reinforced Concrete-1	2	2		4	30			70	100	3
TOTAL		19	10	1	30	215	30		505	750	

Civil Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CE 3E1	Elective Course (1)	2	2		4	30			70	100	3
CE 3E2	Elective Course (2)	2	2		4	30			70	100	3
CE 321	Irrigation and Drainage Engineering	2	2		4	30			70	100	3
CE 333	Hydraulics -2	4	2		6	45			105	150	3
CE 372	Metallic Structures -1	4	2		6	45			105	150	3
CE 373	Reinforced Concrete-2	4	2		6	45			105	150	3
TOTAL		18	12		30	225			525	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CE 3E3	Elective Course (3)	2	2		4	30			70	100	3
CE 3E4	Elective Course (4)	2	2		4	30			70	100	3
CE 322	Design of Irrigation Structures -1	4	2		6	45			105	150	3
CE 311	Sanitary Engineering	4	2		6	45			105	150	3
CE 382	Foundation Engineering	4	4		8	80			120	200	3
HS x12	Technical Report Writing	2			2	15			35	50	2
TOTAL		18	12		30	245			505	750	

Civil Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CE 474	Concrete Structures & Bridges-1	2	2		4	30			70	100	3
CE 423	Design Of Irrigation Structures-2	4	2		6	45			105	150	3
CE 452	Railways Engineering	4	2		6	45			105	150	3
CE 453	Harbor Engineering and Marine Structures	4	2		6	45			105	150	3
CE 454	Highways Engineering	4	2		6	45			105	150	3
CE 483	Contracts , Quantities and Specifications- 1	2			2	15			35	50	2
TOTAL		20	10		30	225			525	750	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CE 4E5	Elective Course (5)	2	2		4	30			70	100	3
CE 475	Concrete Structures & Bridges-2	4	2		6	45			105	150	3
CE 476	Metallic Structures and Bridges-1	4	2		6	45			105	150	3
HS X61	Project Management	2	2		4	30			70	100	3
HS 442	Environment Protection	2			2	15			35	50	2
CE 402	Project	8			8	100		100		200	
TOTAL		22	8		30	265		100	385	750	

Elective Courses

CE 3E1 Elective (1) : One of the following courses

CE 324	Design of Improved Irrigation Systems
CE 347	Geodetic Surveying
CE 384	Construction Engineering
CE 367	Structural Analysis by Modern Methods
CE 387	Inspection, Quality Control, and Repair

CE 3E2 Elective (2) : One of the following courses

CE 334	Applied Hydrology
CE 348	Applications of New Technologies and Instruments in Surveying
CE 385	Engineering Projects Management
CE 368	Advanced Engineering Materials
CE 356	Coastal Engineering

CE 3E3 Elective (3) : One of the following courses

CE 312	Water Supply Engineering
CE 335	Applied Hydraulics
CE 377	Design of Concrete Bridges
CE 386	Soil Mechanics -2

CE 3E4 Elective (4) : One of the following courses

CE 325	Design of Pipeline Networks
CE 349	Alignment and Setting out of Civil Engineering Projects
CE 378	Metallic Structures -2
CE 369	Design of Industrial Structures and High Buildings
CE 337	Hydraulic Structures

CE 4E5 Elective (5) : One of the following courses

CE 413	Wastewater Engineering
CE 455	Transportation System Planning
CE 488	Contracts, Quantities and Specifications - 2
CE436	Computer Applications in Hydraulic Structures
CE 479	Metallic Structures and Bridges - 2

Mechanical Engineering Department

Mechanical Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics-3	4	2		6	45			105	150	3
MP 123	Mechanics -3	4	2		6	45			105	150	3
ME 141	Mechanics of Materials	2	1	1	4	20	20		60	100	3
ME 111	Fundamentals and Measurements of Heat and Fluid Flow	4	2	2	8	40	25	15	120	200	3
ME 142	Mechanical Drawing	2	4		6	60			90	150	3
TOTAL		16	11	3	30	210	45	15	480	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematics-4	4	2		6	45			105	150	3
ME 143	Mechanics of Machinery-1	4	1	1	6	30	20	10	90	150	3
CE 166	Structural Engineering -1	2	1	1	4	30			70	100	3
PE 128	Technology and Processing of Metals	4	2		6	45			105	150	3
ME 144	Computer-Aided Mechanical Drawing**		2	2	4	50	50			100	3
HS x52	Industrial Safety	4			4	30			70	100	2
TOTAL		18	8	4	30	230	70	10	440	750	

** Final Examination is held at Computer Laboratory

Mechanical Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 215	Mathematics-5	4	2		6	45			105	150	3
ME 241	Mechanics of Machinery-2	4	2		6	45			105	150	3
ME 211	Thermodynamics-1	4	2		6	45			105	150	3
EE 272	Electrical Machines-1	4	1	1	6	45			105	150	3
PE 228	Production Engineering-2	2	2		4	30			70	100	3
HS x12	Technical Report Writing	2			2	15			35	50	2
TOTAL		20	9	1	30	225			525	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
ME 242	Computer Applications in Mechanical Engineering	2	2		4	40			60	100	3
ME 243	Mechanical Design-1	4	2		6	60			90	150	3
ME 231	Fluid Mechanics-1	4	1	1	6	30	20	10	90	150	3
ME 221	Fundamentals of Combustion Engineering	4	1	1	6	30	20	10	90	150	3
EE 253	Electrical Power and Electronics	4	2		6	45			105	150	3
HS x27	Psychology	2			2	15			35	50	2
TOTAL		20	8	2	30	220	40	20	470	750	

Mechanical Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
ME 311	Thermodynamics-2	4	2		6	45			105	150	3
ME 331	Fluid Mechanics-2	4	2		6	45			105	150	3
ME 341	Mechanical Design-2	4	2		6	60			90	150	3
ME 342	Mechanical Vibrations	4	2		6	45			105	150	3
ME 321	Internal Combustion Engines	4	1	1	6	30	20	10	90	150	3
TOTAL		20	9	1	30	225	20	10	495	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
ME 312	Heat Transfer	4	2		6	45			105	150	3
ME 322	Gas Dynamics	4	2		6	45			105	150	3
ME 343	Mechanical Design-3	3	3		6	60			90	150	3
ME 344	Automatic Control	4	1	1	6	30	20	10	90	150	3
HS 362	Engineering Economy and Project Management	4	2		6	45			105	150	3
TOTAL		19	10	1	30	225	20	10	495	750	

Mechanical Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
ME 411	Thermal Power Plants	4	1	1	6	30	20	10	90	150	3
ME 431	Hydraulic Machines	4	1	1	6	30	20	10	90	150	3
ME 412	Refrigeration and air Conditioning	4	2		6	45			105	150	3
ME 4E1	Elective Course (1)	4	2		6	45			105	150	3
HS x33	Industrial Legislations	2			2	15			35	50	2
ME 401	Project *	2	2		4	40					
TOTAL		20	8	2	30	205	40	20	425	650	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
ME 4E2	Elective Course (2)	4	2		6	45			105	150	3
ME 4E3	Elective Course (3)	4	2		6	45			105	150	3
ME 433	Mechanical Engineering Laboratory **			6	6	80	50	20		150	
HS 463	Marketing	2			2	15			35	50	2
ME 417	Environment and Energy	4	2		6	45			105	150	3
ME 402	Project *	2	2		4	40		120		200	
TOTAL		16	8	6	30	270	50	140	350	850	

* The student should select one of the four project specializations in the department within the allowable number of students. In the same time the student should select at least one of elective Courses 1 and 2 to be in same specialization of his project.

* Ongoing course; the total class mark is the sum of the class marks given in the first semester and the second one. The final exam is an oral discussion, held at the end of the academic year.

** The final examination consists of oral part and a practical part.

Elective Courses

ME 4E1 Elective Course (1): One of the following courses

ME 413	Design of Thermal Equipment
ME 421	Gas Turbines
ME 432	Industrial Fluid Mechanics
ME 441	Optimum Design

ME 4E2 Elective Course (2): One of the following courses

ME 414	Operation and Management of Thermal Power Stations
ME 422	Advanced Topics in Combustion Engineering
ME 434	Fluid Machinery
ME 442	Introduction to Mechatronics

ME 4E3 Elective Course (3): One of the following courses

ME 415	Applications in Thermal Engineering
ME 423	Automotive Engineering
ME 435	Hydraulic Circuits
ME 443	Tribology

Textile Engineering Department

Textile Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics – 3	4	2		6	45			105	150	3
MP 123	Mechanics – 3	4	2		6	45			105	150	3
CE 166	Structural Engineering-1	4	2		6	45			105	150	3
TE 111	Drawing and machine Construction-1	1	3		4	40			60	100	3
CE 167	Properties and Testing of materials	4		1	5	35			90	125	3
HS x41	Environmental Science	3			3	25			50	75	2
TOTAL		20	9	1	30	235			515	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematics – 4	4	2		6	45			105	150	3
MP 129	Mechanics – 9	4	2		6	45			105	150	3
TE 112	Drawing and Machine Construction -2	2	4		6	60			90	150	3
TE 121	Raw Materials and fiber physics	4		2	6	30	20	10	90	150	3
CS 123	Computers	2		2	4	20	20		60	100	3
HS x12	Technical Report Writing	2			2	15			35	50	2
TOTAL		18	8	4	30	215	40	10	485	750	

Textile Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 215	Mathematics - 5	4	1		5	35			90	125	3
ME x32	Fluid Mechanics – 3	4	1		5	35			90	125	3
EE x11	Electrical Circuits	4	2		6	45			105	150	3
TE 213	Design and theory of Textile Machinery	2	2		4	30			70	100	3
TE 231	Spinning Technology	4		2	6	30	20	10	90	150	3
HS x52	Industrial Safety	4			4	30			70	100	2
TOTAL		22	6	2	30	205	20	10	515	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 218	Mathematics–8 (Statistics)	2	2		4	30			70	100	3
ME 212	Thermodynamics Refrigeration, Air Conditioning	4	2		6	45			105	150	3
TE 241	Weaving Preparation	4		2	6	30	30		90	150	3
TE 242	Weaving Technology	4		2	6	30	20	10	90	150	3
TE 222	Yarn Physics and Testing	4		2	6	30	30		90	150	3
Hs x33	Laws and Legislation for Engineering Profession.	2			2	15			35	50	2
TOTAL		20	4	6	30	180	80	10	480	750	

Textile Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 375	Electronics and Electric Machinery	4	2		6	45			105	150	3
TE 323	Textile Quality Control	4		2	6	30	30		90	150	3
TE 332	Technology of Yarn Production	4		2	6	30	20	10	90	150	3
TE 324	Physics & Fabric Structure	4		2	6	30	30		90	150	3
TE 3E1	Elective Course (1)	2		2	4	30			70	100	3
HS x64	Engineering Economy	2			2	15			35	50	2
TOTAL		20	2	8	30	180	80	10	480	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
TE 314	Mechanics of Textile Machinery	4	2		6	30	30		90	150	3
TE 333	Technology of Wool Yarn Production	4		2	6	30	30		90	150	3
TE 343	Weaving Technology	4		2	6	30	20	10	90	150	3
TE 334	Technology of Synthetic Yarn Production	4		2	6	30	30		90	150	3
TE 3E2	Elective Course (2)	4			4	30			70	100	3
Hs x66	Accounting and Costs	2			2	15			35	50	2
TOTAL		22	2	6	30	165	110	10	465	750	

Textile Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
TE 435	Technology of Texturizing	3		2	5	25	25		75	125	3
TE 436	Theories of Spinning	4		2	6	30	20	10	90	150	3
TE 444	Weaving and Knitting	4		2	6	30	30		90	150	3
TE 4E3	Elective Course(3)	2		2	4	20	20		60	100	3
HS 460	Plant Organization and Management	4	1		5	35			90	125	3
HS 439	Contracts and specifications	2			2	15			35	50	2
TE 401	Project*	2			2	50					
TOTAL		21	1	8	30	205	95	10	440	700	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
TE 454	Automatic Control and Robot in Textile Industry	3	2		5	35			90	125	3
TE 449	Finishing Technology	3		2	5	25	25		75	125	3
TE 438	New Spinning Systems	4		2	6	30	30		90	150	3
TE 440	New Weaving Systems	4		2	6	30	20	10	90	150	3
HS 461	Feasibility Studies	2			2	15			35	50	2
TE 402	Project*	6			6	50		100		200	
TOTAL		22	2	6	30	185	75	110	380	800	

* Ongoing Course. Class marks of the first semester are transferred to the second for final evaluation. Presentation and Defense is at the end of second semester.

Elective Courses

TE 3E1 Elective (1) : One of the following courses

TE 351	Computer Applications in Textile Industry
TE 352	Information Systems

TE 3E2 Elective (2) : One of the following courses

TE 347	Garment Industry
TE 325	Non Woven Fabrics
TE 348	Manufacturing and Use of Industrial Fabrics

TE 4E3 Elective (3) : One of the following courses

TE 445	Garment Engineering
TE 437	Technology of Non-Conventional Yarns production
TE 446	Technology of Non- Conventional cloth production

Production Engineering Department

Production Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics –3	4	2		6	45			105	150	3
MP 133	Physics –3	4	1	1	6	30	15	15	90	150	3
CE 164	Testing of Materials and Theory of Structures	4	2		6	30	30		90	150	3
PE 121	Materials Technology -1	4	1	1	6	30	15	15	90	150	3
PE 151	M/C Tool Elements Drawing -1	1	3		4	40			60	100	3
HS x12	Technical Reports Writing	2			2				50	50	2
TOTAL		19	9	2	30	175	60	30	485	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 125	Mechanics -5	2	2		4	30			70	100	3
PE 122	Foundry and Welding	4	1	1	6	30	30		90	150	3
PE 111	Operations Research	4	2		6	45			105	150	3
PE 131	Machining processes	2	1	1	4	20	10	10	60	100	3
PE 152	M/C Tool Elements Drawing -2	1	3		4	40			60	100	3
HS 161	Management Information Systems	4		2	6	30	30		90	150	2
TOTAL		17	9	4	30	195	70	10	475	750	

Production Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 223	Forming Technology	2	1	1	4	20	10	10	60	100	3
PE 232	Theory of Metal Cutting	4	1	1	6	30	15	15	90	150	3
PE 224	Solid Mechanics	4	1	1	6	30	30		90	150	3
PE 241	Dimensional Metrology	4	1	1	6	30	15	15	90	150	3
ME x32	Fluid Mechanics -3	2	2		4	30			70	100	3
PE 261	Machine Tool Elements Design –1	2	2		4	40			60	100	3
TOTAL		18	8	4	30	180	70	40	460	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 225	Materials Technology–2	4	1	1	6	30	15	15	90	150	3
PE 253	Theory of Machines	2	2		4	30			70	100	3
HS x64	Engineering Economy	2	2		4	30			70	100	3
EE x76	Electrical Engineering	3	2		5	35			90	125	3
MP x14	Mathematics -4	4	2		6	45			105	150	3
PE 262	Machine Tool Elements Design -2	3	2		5	35			90	125	3
TOTAL		18	11	1	30	205	15	15	515	750	

Production Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 326	Plasticity and Metal Forming	4		1	5	25		10	90	125	3
HS 363	Human Factors	2	2		4	30			70	100	3
MP 310	Mathematics –10 (Engineering Statistics)	4	1		5	35			90	125	3
EE 314	Electric and Electronic Engineering	4	2		6	45			105	150	3
PE 363	Theory and Design of M/C Tools -1	4	2		6	45			105	150	3
PE 3E1	Elective (1)	2	2		4	30			70	100	3
TOTAL		20	9	1	30	210		10	530	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 342	Geometrical Metrology	4	1	1	6	30	15	15	90	150	3
PE 313	Facilities Layout and Design	3	1	1	5	40		10	75	125	3
PE 334	Production and Operation Management	3	1	1	5	40		10	75	125	3
ME 323	Thermal Engineering	2	2		4	30			70	100	3
PE 364	Theory and Design of M/C Tools -2	4	2		6	45			105	150	3
PE 3E2	Elective (2)	2	2		4	30			70	100	3
TOTAL		18	9	3	30	215	15	35	485	750	

Production Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 465	Advanced M/C Tools	2		2	4	20	20		60	100	3
PE 466	Automatic Control	2	2		4	30			70	100	3
PE 444	Advanced Metrology Systems	2		2	4	20	20		60	100	3
PE 431	Advanced Machining Technology	2	1	1	4	20	20		60	100	3
PE 4E3	Elective (3)	2	2		4	30			70	100	3
PE 4E4	Elective (4)	2	2		4	30			70	100	3
PE 401	Project*	4	2		6	100					
TOTAL		16	9	5	30	250	60		390	600	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
PE 427	Technology of advanced Materials	2	1	1	4	20	20		60	100	3
PE 445	Quality Control	2	1	1	4	30			70	100	3
HS x61	Project Management	2	2		4	30			70	100	3
PE 457	Machine Tool Dynamics	2	1	1	4	20	20		60	100	3
PE 4E5	Elective (5)	2	2		4	30			70	100	3
PE 4E6	Elective (6)	2	2		4	30			70	100	3
PE 402	Project*	4	2		6	100		100		300	
TOTAL		16	11	3	30	260	40	100	400	900	

* Ongoing Course. Class marks of the first semester are transferred to the second for final evaluation. Presentation and Defense is at the end of second semester.

Elective Courses

PE 3E1 Elective (1) : One of the following courses

PE 335	Abrasive Machining
PE 327	Non Destructive Testing

PE 3E2 Elective (2) : One of the following courses

PE 336	Non Conventional Machining
PE 328	Non Conventional Forming

PE 4E3 Elective (3) : One of the following courses

PE 411	Engineering Management & Organization
PE 446	Quality Improvement & Management
PE 428	Engineering Material Selection

PE 4E4 Elective (4) : One of the following courses

PE 412	Knowledge Engineering
PE 447	Computer Aided Metrology Systems
PE 443	Mechatronic Systems

PE 4E5 Elective (5) : One of the following courses

PE 429	Failure Analysis
PE 432	CNC Machine Tools
PE 468	Principles & Applications of Noise Control Systems

PE 4E6 Elective (6) : One of the following courses

PE 413	Industrial Systems Modeling & Simulation
PE 420	Die Design
PE 469	Maintenance Technology (Machine Condition Monitoring)

Marine Engineering
and Naval Architecture Department

Marine Engineering and Naval Architecture Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics-3	4	2		6	45			105	150	3
MP 123	Mechanics-3	4	2		6	45			105	150	3
MR 111	Ship Machinery Drawing	1	3		4	40			60	100	3
MR 112	Naval Architecture-1	4	2		6	45			105	150	3
PE 123	Production Engineering-1	3	1		4	30			70	100	3
HS x52	Industrial Safety	4			4	30			70	100	3
TOTAL		20	10		30	235			515	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematics-4	4	2		6	45			105	150	3
MR 141	Ship Structural Analysis-1	4	2		6	45			105	150	3
CE 167	Properties and Testing of Materials	4	2		6	45			105	150	3
HS x12	Technical Report Writing	2			2	15			35	50	2
MR 113	Ship and Machinery Drawing	2	4		6	60			90	150	3
ME 145	Mechanics of Machines-3	2	2		4	30			70	100	3
TOTAL		18	12		30	240			510	750	

Marine Engineering and Naval Architecture Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 215	Mathematics-5	3	1		4	30			70	100	3
MR 231	Fluid Mechanics	4	2		6	45			105	150	3
MR 211	Naval Architecture-2	4	2		6	45			105	150	3
MR 261	Ship Construction	4	2		6	45			105	150	3
MR 224	Computer Programming	2	1	3	6	30	30		90	150	3
HS 234	Maritime Law and Marine Insurance	2			2	15			35	50	2
TOTAL		19	8	3	30	210	30		510	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MR 232	Fluid Mechanics and Hydraulic Machines	4	1		5	35			90	125	3
MR 241	Ship Structural Analysis-2	4	2		6	45			105	150	3
MR 242	Material Technology	3	1		4	30			70	100	3
ME 213	Thermodynamics and Heat Engines	4	2		6	45			105	150	3
ME 244	Mechanics of Machines-4	4	1		5	35			90	125	3
HS x64	Engineering Economics	2	2		4	30			70	100	3
TOTAL		21	9		30	220			530	750	

Marine Engineering and Naval Architecture Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MR 341	Ship Structural Design-1	4	2		6	45			105	150	3
MR 331	Ship Hydrodynamics-1	4	2		6	45			105	150	3
EE x76	Electrical Engineering	4	2		6	45			105	150	3
MR 3E1	Elective Course (1)	4			4	30			70	100	3
MR 351	Ship Propulsion Systems	4	1		5	35			90	125	3
HS 353	Total Quality Management	2	1		3	25			50	75	2
TOTAL		22	8		30	225			525	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MR 332	Ship Hydrodynamics-2	4	2		6	45			105	150	3
MP 311	Mathematics-11	4	2		6	45			105	150	3
MR 321	Ship Design-1	4	2		6	45			105	150	3
MR 3E2	Elective Course-2	4			4	30			70	100	3
MR 352	Marine Power Plants	4	2		6	45			105	150	3
HS 365	Ship Economics	2			2	15			35	50	2
TOTAL		22	8		30	225			525	750	

Marine Engineering and Naval Architecture Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MR 471	Offshore Engineering-1	4			4	30			70	100	3
MR 421	Ship Design-2	4	2		6	45			105	150	3
MR 441	Ship Structural Design-2	4	2		6	45			105	150	3
MR 4E3	Elective Course-3	4	2		6	45			105	150	3
MR 401	Research Project in the Marine Field	4	2		6	-		150	-	150	-
HS 435	Maritime Statutes	2			2	15			35	50	2
TOTAL		22	8		30	180		150	420	750	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MR 461	Shipyard Engineering	4			4	30			70	100	3
MR 4E4	Elective Course (4)	4	2		6	45			105	150	3
MR 4E5	Elective Course (5)	4	3		7	55			120	175	3
MR 402	Design Project	6	2		8	-		200	-	200	-
HS 454	Specifications and Feasibility Study	2	1		3	25			50	75	2
HS 443	Marine Pollution	2			2	15			35	50	2
TOTAL		22	8		30	170		200	380	750	

Elective Courses

MR 3E1 Elective (1) : One of the following courses

MR 311	Probabilistic Methods in Marine Systems
MR 361	Shipbuilding Technology

MR 3E2 Elective (2) : One of the following courses

MR 333	Dynamics of Marine Vessels
MR 322	Ship Outfittings

MR 4E3 Elective (3) : One of the following courses

MR 422	Computer Aided Ship Design
MR 411	Risk Analysis

MR 4E4 Elective (4) : One of the following courses

ME 416	Heat Transfer, Refrigeration and Air Conditioning
MR 442	Marine Structural Dynamics

MR 4E5 Elective (5) : One of the following courses

MR 472	Offshore Engineering-2
MR 452	Auxiliary Machinery

Electrical Engineering Department

Electrical Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE x11	Electrical Circuits	4	1	1	6	30	20	10	90	150	3
EE 131	Modern Physics	3	1	1	5	25	25		75	125	3
EE 151	Introduction to Energy Systems	3	1	1	5	25	25		75	125	3
MP 113	Mathematics -3	4	2		6	45			105	150	3
JE 1J3	Applied Mechanics and Theory of Structures a) Mechanics-6 b) Theory of Structures-5	2 2	1 1		6	25 25			50 50	150	3
HS x33	Laws for Engineering Profession	2			2	15			35	50	2
TOTAL		20	7	3	30	190	70	10	480	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 121	Electric and Electronic Measurements	4	1	1	6	30	30		90	150	3
EE 132	Electronic Devices and Circuits	4	2	1	7	35	20	15	105	175	3
EE 141	Introductions to Logic Circuits and Programming	4	1	1	6	30	30		90	150	3
MP x14	Mathematics-4	4	2		6	45			105	150	3
HS x66	Accounting and Costs	2			2	15			35	50	2
HS x41	Environmental Sciences	3			3	25			50	75	2
TOTAL		21	6	3	30	180	80	15	475	750	

Electrical Engineering Department

(Communications and Electronics Section)

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 212	Electric Circuit Analysis	4	2	2	8	40	25	15	120	200	3
EE 233	Solid State Electronics	4	1	1	6	30	30		90	150	3
EE 261	Electromagnetic Fields	4	1	1	6	30	30		90	150	3
MP 215	Mathematics-5	3	1		4	30			70	100	3
PE 226	Technology of Electrical Materials	2			2	15			35	50	3
HS x64	Engineering Economy	2	2		4	30			70	100	2
TOTAL		19	7	4	30	175	85	15	475	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 234	Electronic Circuit Analysis	4	1	1	6	30	20	10	90	150	3
EE 242	Logic Circuit Design	4	1	1	6	30	30		90	150	3
EE 271	Electric Machines and Power Systems	4	1	1	6	30	30		90	150	3
ME 245	Mechanical Engineering	4	1	1	6	30	30		90	150	3
MP 219	Mathematics-9 (Random Signal Analysis)	3	1		4	30			70	100	3
HS x27	Psychology	2			2	15			35	50	2
TOTAL		21	5	4	30	165	110	10	465	750	

Electrical Engineering Department

(Communications and Electronics Section)

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 336	Semiconductor Devices	4	1	1	6	30	30		90	150	3
EE 345	Microprocessors-1	4	1	1	6	30	30		90	150	3
EE 362	Electromagnetic Waves and Acoustics	4	1	1	6	30	30		90	150	3
EE 381	Signals and Systems	4	1	1	6	30	20	10	90	150	3
MP x16	Mathematics-6	3	1		4	30			70	100	3
HS x12	Technical Reports Writing	2			2	15			35	50	2
TOTAL		21	5	4	30	165	110	10	465	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 337	Analog Integrated Circuits	3	1	1	5	25	25		75	125	3
EE 363	Microwave and Optical Transmission Media	4	1	1	6	30	20	10	90	150	3
EE 382	Analog Communications	3	1	1	5	25	25		75	125	3
EE 391	Control Systems and Their Components	4	1	1	6	30	30		90	150	3
EE 3E1	Elective Course (1) C	3	1	1	5	25	25		75	125	3
PE 343	Metrology and Sensors	2		1	3	15	15		45	75	2
TOTAL		19	5	6	30	150	140	10	450	750	

Electrical Engineering Department

(Communications and Electronics Section)

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 423	Electronic and Microwave Measurements	2	2	2	6	30	20	10	90	150	3
EE 481	Digital Communications	4	2	2	8	40	40		120	200	3
EE 4E2	Elective Course (2) C	3	1	1	5	25	25		75	125	3
EE 4E3	Elective Course (3) C	3	1	1	5	25	25		75	125	3
HS 467	International Trade	2			2	15			35	50	2
EE 401	Project*	2		2	4	25	25				
TOTAL		16	6	8	30	160	135	10	395	650	

Forth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 447	Microprocessors-2	2	1	1	4	20	20		60	100	3
EE 484	Communication Systems	4	1	1	6	30	20	10	90	150	3
EE 4E4	Elective Course (4) C	3	1	1	5	25	25		75	125	3
EE 4E5	Elective Course (5) C	3	1	1	5	25	25		75	125	3
HS x61	Project Management	2	2		4	30			70	100	3
HS 436	Communications Laws and Codes	2			2	15			35	50	2
EE 402	Project *	2		2	4	25	25	100		200	
TOTAL		18	6	6	30	170	115	110	405	850	

* Ongoing course: the marks of the first and second semesters are added and the final oral exam is to be held at the end of the second semester.

Elective Courses

EE 3E1 - Elective Course (1) C: One of the following courses

CS 333	Operating Systems
EE 364	Microwave Devices
EE 365	Optical Devices

EE 4E2 - Elective Course (2) C: One of the following courses

EE 482	Optical Communication Systems
EE 431	Digital Integrated Circuits

EE 4E3 - Elective Course (3) C: One of the following courses

EE 466	Antenna Engineering
EE 483	Digital Signal Processing

EE 4E4 - Elective Course (4) C: One of the following courses

EE 432	Modeling and Design of VLSI Integrated Circuits [PR: EE 431]
CS x35	Computer Architecture
EE 485	Advanced Communication Systems

EE 4E5 - Elective Course (5) C: One of the following courses

EE 433	Biomedical Engineering
EE 486	Communication Networks
EE 494	Digital Control Systems and Robotics [PR: EE 483]

Joint Course

JE 1J3 - Applied Mechanics and Theory of Structures

MP 126	Mechanics-6
CE 165	Theory of Structures-5

Electrical Engineering Department

(Power and Machines Section)

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 212	Electric Circuit Analysis	4	2	2	8	40	25	15	120	200	3
EE 243	Microprocessor Fundamentals	4	1	1	6	30	30		90	150	3
EE 261	Electromagnetic Fields	4	1	1	6	30	30		90	150	3
PE 226	Technology of Electrical Materials	3	1		4	30			70	100	3
MP 215	Mathematics-5	2			2	15			35	50	3
HS x64	Engineering Economy	2	2		4	30			70	100	2
TOTAL		19	7	4	30	175	85	15	475	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 235	Electronic Engineering	2	1	1	4	20	20		60	100	3
MP x16	Mathematics-6	4	1	1	6	30	30		90	150	3
EE 252	Electric Power Engineering-1	4	1	1	6	30	20	10	90	150	3
EE 272	Electric Machines Engineering -1	4	1	1	6	30	30		90	150	3
ME 245	Mechanical Engineering	4	1	1	6	30	30		90	150	3
HS x27	Psychology	2			2	15			35	50	2
TOTAL		20	5	5	30	155	130	10	455	750	

Electrical Engineering Department

(Power and Machines Section)

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 353	Electric Power Engineering-2	4	1	1	6	30	30		90	150	3
EE x73	Electric Machines Engineering -2	4	1	1	6	30	20	10	90	150	3
EE 392	Control and Computer Applications	4	1	1	6	30	30		90	150	3
EE 3E1	Elective Course (1) P	4	1	1	6	30	30		90	150	3
MP 312	Mathematics -12	3	1		4	30			70	100	3
HS x12	Technical Reports Writing	2			2	15			35	50	2
TOTAL		21	5	4	30	165	110	10	465	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 339	Power Electronics -1	2	1	1	4	20	20		60	100	3
EE 354	Protection of Power Systems -1	4	1	1	6	30	30		90	150	3
EE 374	Electric Machines Engineering -3	4	1	1	6	30	30		90	150	3
EE 393	Automatic Control Engineering -1	3	1	1	5	25	15	10	75	125	3
EE 3E2	Elective Course (2) P	4	1	1	6	30	30		90	150	3
HS 368	Economics of Electrical Energy	2	1		3	25			50	75	2
TOTAL		19	5	6	30	150	140	10	450	750	

Electrical Engineering Department

(Power and Machines Section)

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 434	Power Electronics -2	4	1	1	6	30	20	10	90	150	3
EE 455	Protection of Power Systems -2	2	1		3	25			50	75	3
EE 456	Power System Analysis	4	1	1	6	30	30		90	150	3
EE 495	Automatic Control Engineering -2	3	1	1	5	25	25		75	125	3
EE 4E3	Elective Course (3) P	2	1		3	25			50	75	3
HS 437	Laws and Rules of Electrical Safety	3			3	25			50	75	2
EE 401	Project *	2		2	4	25	25		-	-	-
TOTAL		20	5	5	30	185	100	10	405	650	

Forth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
EE 449	Industrial Automation	2	1	1	4	20	20		60	100	3
EE 458	High Voltage Engineering	4	1	1	6	30	20	10	90	150	3
EE 476	Electrical Drives	4	1	1	6	30	30		90	150	3
EE 4E4	Elective Course (4) P	2	1		3	25			50	75	3
HS 469	Specifications and Projects Management	2	1		3	25			50	75	2
ME 411	Thermal Power Plants	3	1		4	30			70	100	3
EE 402	Project *	2		2	4	25	25	100	-	200	-
TOTAL		19	6	5	30	185	95	110	410	850	

* Ongoing course: the marks of the first and second semesters are added and the final oral exam is to be held at the end of the second semester.

Elective Courses

EE 3E1 - Elective Course (1) P: One of the following courses

EE 322	Measurement Systems
EE 338	Introduction to Integrated Circuits

EE 3E2 - Elective Course (2) P: One of the following courses

EE 313	Electric Engineering Materials
EE 383	Communications for Electrical Power Systems
EE 384	Signal Processing for Electrical Power Systems

EE 4E3 - Elective Course (3) P: One of the following courses

EE 435	Power Electronics -3
EE 457	Industrial Applications and Installation Engineering for Power Systems
EE 475	Special Electric Machines
EE 496	Mechatronics and Robotics

EE 4E4 - Elective Course (4) P: One of the following courses

EE 459	Operation and Planning of Electrical Power Systems
EE 477	Solid State Drives
EE 497	Control of Electrical Power and Machines

Computer and Systems Engineering Department

Computer and Systems Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematics -3	4	2		6	45			105	150	3
CS 121	Programming -1	4	1		5	35			90	125	3
EE 112	Electric Engineering Fundamental	4	1	1	6	30	30		90	150	3
MP 127	Mechanics -7	3	1		4	30			70	100	3
EE 131	Modern Physics	4	1	1	6	30	30		90	150	3
HS 171	Computer and Productivity Support	2		1	3	25			50	75	2
TOTAL		21	6	3	30	195	60		495	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematics -4	4	2		6	45			105	150	3
CS 111	Probability theory and Computer Applications	3	1		4	30			70	100	3
CS 122	Data Structures -1	4	1		5	35			90	125	3
CS 131	Computer Fundamentals	4	1	1	6	30	30		90	150	3
EE x11	Electric Circuits	4	1	1	6	30	30		90	150	3
HS 172	Computers and Society	2		1	3	25			50	75	2
TOTAL		21	6	3	30	195	60		495	750	

Computer and Systems Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 211	Mathematics for Computer	4	2		6	45			105	150	3
CS 221	Programming -2	4	1		5	35			90	125	3
EE 236	Electronics	4	1	1	6	30	30		90	150	3
CS 212	Statistical Methods for Computers	4	1		5	35			90	125	3
CS 231	Digital Systems -1	4	1	1	6	30	30		90	150	3
HS x12	Technical Reports Writing	2			2	15			35	50	2
TOTAL		22	6	2	30	190	60		500	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 213	Numerical Analysis and Computer Applications	4	1		5	35			90	125	3
CS 222	System and Components Programming	4		1	5	25	25		75	125	3
CS 232	Digital Systems -2	4	1	1	6	30	30		90	150	3
CS 241	Linear Control Systems	4	2		6	45			105	150	3
CS 223	Data Structure -2	4	1	1	6	30	30		90	150	3
HS x33	Laws for Engineering Profession	2			2	15			35	50	2
TOTAL		22	5	3	30	180	85		485	750	

Computer and Systems Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 331	Microprocessor Systems	4	1	1	6	30	30		90	150	3
CS 341	Discrete and Nonlinear Control Systems	4	1	1	6	30	30		90	150	3
CS 311	Analysis of Algorithms	4	1		5	35			90	125	3
CS 332	Digital Signal Processing and Transmission Algorithms	4	1		5	35			90	125	3
CS 333	Operating Systems	4	1		5	35			90	125	3
HS 373	Man-Machine Interface -1	2		1	3	25			50	75	2
TOTAL		22	5	3	30	190	60		500	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 312	Operations Research and Computers	4	1		5	35			90	125	3
CS 334	Embedded Systems	4	1	1	6	30	30		90	150	3
CS x35	Computer Architecture	4	1		5	35			90	125	3
CS 321	Programming Languages and Translators	4	1		5	35			90	125	3
CS 322	Database Systems	4	1	1	6	30	30		90	150	3
HS 374	Man-Machine Interface-2	2		1	3	25			50	75	2
TOTAL		22	5	3	30	190	60		500	750	

Computer and Systems Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 431	Computer Networks and Communications	4	1	1	6	30	30		90	150	3
CS 4E1	Elective Course (1)	4		1	5	25	25		75	125	3
CS 4E2	Elective Course (2)	4		1	5	25	25		75	125	3
CS 441	Modern Control Systems	3	1	1	5	25	25		75	125	3
CS 401	Project *	4		1	5	75					-
HS x64	Engineering Economy	2	2		4	30			70	100	2
TOTAL		21	4	5	30	210	105		385	625	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CS 432	Distributed Systems and Net-Centric Computing	4	1	1	6	30	30		90	150	3
CS 4E3	Elective Course (3)	4		1	5	25	25		75	125	3
CS 4E4	Elective Course (4)	4		1	5	25	25		75	125	3
CS 433	Performance Evaluation of Computer Systems	4	1	1	6	30	30		90	150	3
CS 402	Project *	4		1	5	75		100		250	
HS 444	Social Risks and Security of Computer Systems	2	1		3	25			50	75	2
TOTAL		22	3	5	30	210	110	125	380	875	

* Ongoing Course. Class marks of the first semester are transferred to the second semester for final evaluation. Presentation and Defense are at the end of second semester.

Elective Courses

CS 4E1 Elective Course (1) : One of the following courses

CS 434	Software Engineering
CS 423	Artificial Intelligence
CS 422	Computer Graphics
CS 411	Switching Theory and Models of Computability

CS 4E2 Elective Course (2) : One of the following courses

CS 424	Pattern Recognition
CS 412	Optimization Techniques
CS 435	Special Topics in Computer Engineering
CS 421	Special Topics in Information Systems and Software

CS 4E3 Elective Course (3) : One of the following courses

CS 422	Computer Graphics
CS 434	Software Engineering
CS 423	Artificial Intelligence
CS 436	Topics in Computer Networks

CS 4E4 Elective Course (4) : One of the following courses

CS 413	Special Topics in Computer Science
CS 435	Special Topics in Computer Engineering
CS 421	Special Topics in Information Systems and Software
CS 442	Special Topics in Systems Engineering

Nuclear and Radiation Engineering Department

Nuclear and Radiation Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP113	Mathematics-3	4	2		6	45			105	150	3
MP128	Mechanics-8	3	1		4	30			70	100	3
NE111	Modern Physics	4	1	1	6	30	20	10	90	150	3
NE121	Introduction to Engineering Materials Science	4	1		5	20		15	90	125	3
ME147	Machine Drawing	1	5		6	60			90	150	3
HS129	History of Nuclear Engineering	3			3	25			50	75	2
TOTAL		19	10	1	30	210	20	25	495	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MPx14	Mathematics-4	4	2		6	45			105	150	3
EEx11	Electric Circuits	4	1	1	6	30	30		90	150	3
NE112	Computers and Numerical Methods	3	1	1	5	25	15	10	75	125	3
NE131	Introduction to Nuclear and Radiation Engineering	4			4	30			70	100	3
NE122	Properties and Testing of Nuclear Materials	4	1	1	6	30	20	10	90	150	3
HSx41	Environmental Sciences	3			3	25			50	75	2
TOTAL		22	5	3	30	185	65	20	480	750	

Nuclear and Radiation Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP215	Mathematics-5	4	1		5	35			90	125	3
NE211	Nuclear Physics	4	1	1	6	30	20	10	90	150	3
NE251	Thermodynamics and Kinetic Theory of Gases	4	2		6	45			105	150	3
ME246	Stress Analysis and Machine Design	3	2		5	35			90	125	3
EEx73	Electrical Machines Engineering -2	4	1	1	6	30	30		90	150	3
HS230	Laws and Statutes	2			2	15			35	50	2
TOTAL		21	7	2	30	190	50	10	500	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MPx16	Mathematics-6	4	2		6	45			105	150	3
NE241	Radiation Safety	4	1		5	35			90	125	3
NE221	Nuclear Reactors Materials	4			4	30			70	100	3
ME232	Fluid Mechanics and Flow Engineering	4	2		6	45			105	150	3
NE242	Radiochemistry	4		1	5	25	15	10	75	125	3
HSx61	Projects Management	2	2		4	30			70	100	2
TOTAL		22	7	1	30	210	15	10	515	750	

Nuclear and Radiation Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP317	Mathematics-7	4	2		6	45			105	150	3
NE351	Heat Transfer	4	1	1	6	30	20	10	90	150	3
EE331	Electronic Circuits and Pulses	4	1	1	6	30	30		90	150	3
NE3E1	Elective Course (1)	4			4	30			70	100	3
NE311	Quantum Mechanics	4			4	30			70	100	3
HS345	Nuclear Energy and the Environment	4			4	30			70	100	2
TOTAL		24	4	2	30	195	50	10	495	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
NE312	Plasma and Electro-magnetic Theory	4	1	1	6	30	20	10	90	150	3
NE331	Nuclear Reactors Physics	4	1	1	6	30	20	10	90	150	3
NE341	Radiation Detection	4	1	1	6	30	20	10	90	150	3
NE352	Thermal Power Stations	4	2		6	45			105	150	3
NE3E2	Elective Course (2)	4			4	30			70	100	3
HSx12	Technical Reports Writing	2			2	15			35	50	2
TOTAL		22	5	3	30	180	60	30	480	750	

Nuclear and Radiation Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
NE431	Nuclear Reactor Analysis-1	4	2		6	45			105	150	3
NE432	Radiation Shielding Design	2	1		3	25			50	75	3
NE433	Reactors Automatic Control	3		1	4	15	15	10	60	100	3
NE434	Nuclear Fuel Cycles	4	1		5	35			90	125	3
NE4E3	Elective Course (3)	4			4	30			70	100	3
HSx27	Psychology	2			2	15			35	50	2
NE401	Project *	4	2		6	75					
TOTAL		23	6	1	30	240	15	10	410	600	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
NE435	Nuclear Reactor Analysis-2	4	2		6	45			105	150	3
NE436	Reactors Kinetics	2	1		3	25			50	75	3
EE450	Electric Power Systems	4	1		5	35			90	125	3
NE441	Applications of Radioisotopes	3		1	4	15	15	10	60	100	3
NE4E4	Elective Course (4)	4			4	30			70	100	3
HS464	Economics of Energy	2			2	15			35	50	2
NE402	Project *	4	2		6	75		150		300	
TOTAL		23	6	1	30	240	15	160	410	900	

* Ongoing Course. Class marks of the first semester is transferred to the second for final evaluation. Presentation and Defense is at the end of second semester.

Elective Courses

NE3E1 Elective Course (1): One of the following subjects

NE321	Characterization of Materials
NE342	Radiobiology
NE332	Simulation of Nuclear Stations

NE3E2 Elective Course (2): One of the following subjects

NE322	Computational Methods in Materials
NE343	Introduction to Simulation of Radiation Transport
NE333	Safety of Nuclear Reactors

NE4E3 Elective Course (3): One of the following subjects

NE421	Nondestructive Testing
NE442	Introduction to Medical Radiography
NE437	Nuclear Power Stations

NE4E4 Elective Course (4): One of the following subjects

NE422	Materials Radiography
NE443	Radiation Health Physics
NE438	Measurements of Nuclear Stations

Chemical Engineering Department

Chemical Engineering Department

First Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP 113	Mathematic -3	4	2		6	45			105	150	3
CH 111	Programmed Calculations for Chemical Engineers	2	2		4	30			70	100	3
CH 112	Organic Chemistry -1	4	1	1	6	30	30		90	150	3
CH 113	Inorganic Chemistry	3	1	2	6	30	30		90	150	3
CH 114	Physical Chemistry	4	1	1	6	30	30		90	150	3
HS 128	History of Chemical Engineering Science	2			2	15			35	50	2
TOTAL		19	7	4	30	180	90		480	750	

First Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 115	Surface Chemistry and Phase Equilibrium	3	1	1	5	25	25		75	125	3
CH 116	Organic Chemistry -2	3	1	1	5	25	25		75	125	3
CH 117	Inorganic and Analytical Chemistry	4	1	2	7	35	35		105	175	3
CH 118	Materials Science	4	1	1	6	30	30		90	150	3
JE 1J4	Mechanical Operations in Chemical Processes A-Chemical Processes B-Mechanical Operations	 2 2	1		5	 20 20			 45 40	125	3
HS x 12	Technical Reports Writing	2			2	15			35	50	2
TOTAL		20	5	5	30	170	115		465	750	

Chemical Engineering Department

Second Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
MP x14	Mathematic -4	4	1		5	35			90	125	3
CH 211	Organic Chemistry -3	3	1	1	5	25	25		75	125	3
CH 221	Engineering Metallurgy	4		1	5	25	25		75	125	3
CH 222	Chemical Engineering Fundamentals-1	4	2		6	45			105	150	3
CH 223	Chemical Engineering Thermodynamics-1	4	2		6	45			105	150	3
HS x41	Environmental Sciences	3			3	25			50	75	2
TOTAL		22	6	2	30	200	50		500	750	

Second Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 224	Heat Transfer	4	2		6	45			105	150	3
CH 225	Fluid Mechanics Engineering	4	2		6	45			105	150	3
CH 226	Chemical Engineering Fundamentals-2	4	2		6	45			105	150	3
CH 227	Chemical Engineering Thermodynamics-2	4	2		6	45			105	150	3
EE x 76	Electrical Engineering	2	1		3	25			50	75	2
HS 238	Laws and Ethics for Engineering Professions A- Laws B- Professional Ethics	 1 2			3	 10 15			 20 30	 75	 2
TOTAL		21	9		30	230			520	750	

Chemical Engineering Department

Third Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 321	Separation Processes -1	4	2		6	45			105	150	3
CH 322	Corrosion Engineering	4	1	1	6	30	30		90	150	3
CH 331	Modeling and Simulation in Chemical Engineering	4	2		6	45			105	150	3
CH 3E1	Elective Course (1)	3	1		4	30			70	100	3
CH 3E2	Elective Course (2)	3	1		4	20	20		60	100	3
HS X64	Engineering Economy	2	2		4	30			70	100	2
TOTAL		20	9	1	30	200	50		500	750	

Third Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 323	Separation Processes-2	4	2		6	45			105	150	3
CH 324	Chemical Reactions Engineering	4	2		6	45			105	150	3
CH 332	Electrochemical Processes	4	1	1	6	30	30		90	150	3
CH 3E3	Elective Course (3)	3	1	1	5	25	25		75	125	3
CH 3E4	Elective Course (4)	3	1	1	5	25	25		75	125	3
HS 375	Philosophy of Field Research	2			2	15			35	50	2
TOTAL		20	7	3	30	185	80		485	750	

Chemical Engineering Department

Fourth Year **First Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 421	Mechanical Unit Operations	4	1	1	6	30	15	15	90	150	3
CH 431	Chemical Processes Industries	4	2		6	45			105	150	3
CH 4E5	Elective Course (5)	3	1	1	5	25	25		75	125	3
CH 4E6	Elective Course (6)	3	1		4	30			70	100	3
CH 401	Project*	3	1	2	6	50	50				
HS 455	Industrial Operations Management	3			3	25			50	75	2
TOTAL		20	6	4	30	205	90	15	390	600	

Fourth Year **Second Semester**

Code	Course Title	Weekly Hours				Marks					Exam Duration
		Lec	Tut	Lab	Total	Class	Lab	Oral	Final	Total	
CH 422	Chemical Process Control	4	2		6	45			105	150	3
CH 432	Chemical Process Design	4	1	1	6	30	15	15	90	150	3
CH 4E7	Elective Course (7)	3	1	1	5	25	25		75	125	3
CH 4E8	Elective Course (8)	3	1		4	30			70	100	3
CH 402	Project*	3	1	2	6	50	50	100		300	
HS 456	Professional Skills and Marketing	3			3	25			50	75	2
TOTAL		20	6	4	30	205	90	115	390	900	

* Ongoing Course. Class marks of the first semester are transferred to the second for final evaluation. Presentation and Defense are at the end of second semester.

Elective Courses

CH 3E1 Elective Course (1): One of the following courses

CH 333	Water Treatment
CH 334	Biochemical Engineering

CH 3E2 Elective Course (2): One of the following courses

CH 325	Fuel and Combustion Engineering
CH 335	Alternative Energy Sources

CH 3E3 Elective Course (3): One of the following courses

CH 341	Fertilizers Technology
CH 336	Silicate industries
CH 337	Extractive Metallurgy

CH 3E4 Elective Course (4): One of the following courses

CH 342	Technology of Natural fibers and Tissues
CH 343	Technology of oils and Fats
CH 338	Dying and Tissues

CH 4E5 Elective Course (5): One of the following courses

CH 423	Petroleum Refining Engineering
CH 424	Natural Gas Engineering

CH 4E6 Elective Course (6): One of the following courses

CH 433	Treatment of Wastewater
CH 434	Treatment of Gaseous and Solid Wastes

CH 4E7 Elective Course (7): One of the following courses

CH 435	Desalination
CH 425	Safety Engineering and Explosives
CH 436	Non-Newtonian Fluids

CH 4E8 Elective Course (8): One of the following courses

CH 426	Polymer Engineering
CH 437	Composite Materials
CH 438	Petrochemicals

Joint Course:

JE 1J4 Mechanical Operations for Chemical Processes

CH 121	Chemical Processes
ME 146	Mechanical Operations

Chapter Five
Departmental Course Description

Article (27) Following are Departmental Course Descriptions

Engineering Mathematics and Physics Department

MP 011 Mathematics-1

Calculus of integration and differentiation: Functions, limits and continuity, algebraic and periodic functions, calculating differentials, inverse functions, parametric forms, libetnz theory, Maclaurin's and Taylor's expansions, the mean value of curvature theory, inverse differentials .
Linear algebra : matrices, algebraic operations on matrices, hermetian and orthogonal matrices, ordinary operations, ordinary matrices, equivalence of matrices, graded matrix, systems of linear equations, rank of a matrix, eigen values and cayley-hamilton theory, linear spaces, binomial theory, partial fractions.

MP 012 Mathematics-2

Calculus of integration and differentiation: Methods of integration, applications of definite integration (areas, volumes, circular surfaces, length of curvature, central points) first order ordinary differential equations, **introduction to probability theory** : sample space, probability axioms, some basic theories, counting methods, conditional probability, random variables, mathematical expectation, some discrete and continuous distributions, **Analytical geometry** : shifting and rotating of axes, conic sections and their specifications : parabola , ellipse, hyperbola .

MP 113 Mathematics – 3

Methods of Integration, some special techniques, successive reduction method, improper integrals, mean value theorem special function: the error, gamma and beta functions of several variables, limits and continuity, partial derivatives, chain rule directional derivatives, Taylor expansions of functions of several variables, extreme, differentiation under integral sign.
Sequences, series, convergence and convergence tests, uniform convergence. Fourier series expansions of general periodic functions, expansions of even and odd functions, convergence and remarks.

MP x14 Mathematics-4

Multiple Integral, Regions in plane and space, Double and triple integrals, Change of variables technique and the Jacobeans, Line integrals and green theorem, ordinary differential equations of the second order and higher. Elle's homogeneous equations and simultaneous differential equation.
Calculus of finite differences, Vector algebra, Scalar and cross product. Identifies, Application. Line and planes in space, Spherical and cylindrical coordinate systems, Quadratic surfaces. Line, Surface and volume integral, green's and stock's and divergence theorems.

MP 215 Mathematics-5

Ordinary and Prtial differential equation: Solution of ordinary differential equations with variable Coefficients, system of linear differential equations, heat wave and Iapilace equation in two and three dimensions. Separation of variable technique, some boundary value problems and applications. Numerical solutions of differential equation.
Complex analysis: Function of complex variables, differentiation and integration, analytic functions, cache theorem and cache formula. Contour integration, power, series expansion, conformal mapping vector analysis: Scalar and vector fields, vector, operator, application to geometry, line, surface and volume integral, divergence theorem of gauss stock's and Green theorem. Curvilinear and orthogonal coordinates.

MP x16 Mathematics-6

Numerical analysis (Gauss elimination method, numerical solution of nonlinear algebraic equations, numerical integration, interpolation, numerical solution of differential equations, error analysis),

linear algebra (vector spaces, independence, bases, subspaces, dimensions, linear transformations and matrices, eigen values and eigen vectors, inner product), special functions (beta and gamma functions, Legendre functions, Bessel functions, Chebyshev functions), Z-transform.

MP 317 Mathematics-7
Numerical analysis (Gauss elimination method, numerical solution of nonlinear algebraic equations, numerical integration, interpolation, numerical solution of differential equations, error analysis), introduction to probability theory (sample space, conditional probability and Bayes' theorem, discrete and continuous random variables, distribution functions, expectation and variance, some special distributions, moments and moment generating function, central limit theorem and law of large numbers, Chebyshev's inequality).

MP 218 Mathematics-8 (Statistics)
Descriptive statistics: description of sample data,statistical measures (location and dispersion), review on probability axioms and counting techniques. Conditional probabilities and bays formula, stochastic independence and applications, random variables and probability distributions. Mathematical expectation, mean, variance and moments. Some standard distribution: binomial, Poisson, negative binomial, hyper geometric, normal, gamma, exponential and chi-square distribution. The T and F distribution. Joint distributions, properties, marginal distributions, covariance and correlation coefficient.

MP 219 Mathematics-9 (Random signal analysis)
Stochastic analysis of signals, probability and random processes (univariate random variables, bivariate and multivariate random variables, bivariate and multivariate joint distribution functions, marginal distribution functions, independence, covariance and correlation coefficient, conditional distribution functions and conditional expectation, Markov chains, continuous time random processes, auto correlation and auto covariance, power spectrum functions and spectral analysis).

MP 310 Mathematics-10 (Engineering statistics)
Statistical methods (descriptive statistics, sampling, sampling distributions, point and interval estimation, test of hypotheses, regression analysis, analysis of variance, design of experiments).

MP 311 Mathematics-11 (Optimization and numerical methods)
Numerical analysis (Gauss elimination method, numerical solution of nonlinear algebraic equations, Curve fitting, numerical integration, interpolation, numerical solution of differential equations, error analysis), Optimization (linear and nonlinear programming), computer applications.

MP 312 Mathematics-12
Stochastic processes (random variables, discrete and continuous time stochastic processes, Markov chains), linear programming, calculus of variations.

MP 021 Mechanics-1
Statics : vector algebra, analytical and geometrical solutions for : reduction of different systems of forces (intersecting or non intersecting) in two dimensions, operations of force analysis in two dimensions, equivalence of force systems, body equilibrium, rigid bodies, equilibrium of ideal

systems : groups of bodies , groups of rigid bodies and its applications friction : volplane, loop, applications on the real mechanical systems .

MP 022 Mechanics-2

Dynamics : introduction in vector analysis, a simple review on second order ordinary differential equations, kinematics of bodies, motion analysis in one dimension, body kinematics and motion analysis in two dimensions in Cartesian and intrinsic forms, some engineering applications in kinematics, : relation between force and acceleration, static integration of motion (relation between energy and work), time integration of motion (relation between impulse and momentum) engineering applications : motion of body in one dimension in a conservative or non conservative fields, external plasticity in a conservative field. Motion of bodies under ideal wraps, orthogonal and inclined impact, motion of vibrating bodies, other engineering applications suitable for the level of students in mathematical analysis .

MP123 Mechanics-3

Central Force Motion: Polar Coordinates – Properties of central Force Motion – Equation of Motion – Applications to Space Mechanics – **Nonconservative Systems**: Energy dissipation – Real System - Kinetics of System of Particles: Equations of Motion - Motion of the Mass Center of System of Particles – **Systems Gaining or Losing Mass**: Motion of Rockets – Motion of Chains and Cables- Plane Kinematics of Rigid Bodies: Translational, Rotation and General plane motion- Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - Kinetics of Plane **Motion of Rigid Bodies** : Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications- **Initial Motion** –Impulse and Momentum of Plane motion of Rigid Bodies : Principle of Impulse and Momentum for a rigid Body and for a System of Rigid Bodies – Collision of Rigid Bodies –**Gyroscopic Motion**: Gyroscopes-Gyroscopic Couple – Application- Rotation of a Three-Dimensional Body about a Fixed Axis : Dynamic Reaction – Balancing- **Mechanical Vibrations**: Free Vibrations – Damped Free Vibrations – Forced Vibrations.

MP124 Mechanics-4

Plane Kinematics of Rigid Bodies: Translational, Rotational and General plane motion - Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - Kinetics of Plane **Motion of Rigid Bodies**: Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications - Initial Motion – **Mechanical Vibrations**: Principle of Virtual Work: Virtual Displacement – Virtual Velocity – Virtual Work and Virtual Power - Applications – **Analysis of Cables and Chains** : Ideal Cable – Cables with Concentrated Loads - Cables with Distributed Loads – Parabolic Cable - Catenary .

MP125 Mechanics-5

Plane Kinematics of Rigid Bodies: Translational, Rotational and General plane motion- Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - **Kinetics of Plane Motion of Rigid Bodies**: Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications- Initial Motion –**Impulse and Momentum of Plane motion of Rigid Bodies**: Principle of Impulse and Momentum for a rigid Body and for a System of Rigid Bodies – Collision of Rigid Bodies - **Gyroscopic Motion**: Gyroscopes-Gyroscopic Couple – Application- **Rotation of a Three-Dimensional Body about a Fixed Axis** : Dynamic Reaction – Balancing- Mechanical Vibrations: Free Vibrations – Damped Free Vibrations – Forced Vibrations.

MP126Mechanics-6

Central Force Motion: Polar Coordinates – Properties of central Force Motion – Equation of Motion – Applications to Space Mechanics – **Motion of Charged Particles**: In a Uniform Steady Electrical Field - In a Uniform Steady Magnetic Field **Plane Kinematics of Rigid Bodies**: Translational, Rotational and General plane motion- Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - **Kinetics of Plane Motion of Rigid Bodies**: Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications- Initial Motion –**Impulse and Momentum of Plane motion of Rigid Bodies** : Principle of Impulse and Momentum for a rigid Body and for a System of Rigid Bodies – Collision of Rigid Bodies - **Mechanical Vibrations**: Free Vibrations – Damped Free Vibrations – Forced Vibrations.

MP127 Mechanics-7

Central Force Motion: Polar Coordinates – Properties of central Force Motion – Equation of Motion – Applications to Space Mechanics — **Motion of Charged Particles**: In a Uniform Steady Electrical Field - In a Uniform Steady Magnetic Field **Kinetics of System of Particles**: Equations of Motion - Motion of the Mass Center of System of Particles – Systems Gaining or Losing Mass: Motion of Rockets – Motion of Chains and Cables- **Plane Kinematics of Rigid Bodies**: Translational, Rotational and General plane motion - Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - **Kinetics of Plane Motion of Rigid Bodies** : Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications- Initial Motion –Impulse and **Momentum of Plane motion of Rigid Bodies** : Principle of Impulse and Momentum for a rigid Body and for a System of Rigid Bodies – Collision of Rigid Bodies - **Mechanical Vibrations** : Free Vibrations – Damped Free Vibrations – Forced Vibrations.

MP128 Mechanics-8

Central Force Motion: Polar Coordinates – Properties of central Force Motion – Equation of Motion – Applications to Space Mechanics –**Kinetics of System of Particles**: Equations of Motion- Motion of the Mass Center of System of Particles – Systems Gaining or Losing Mass: Motion of Rockets – Motion of Chains and Cables- **Plane Kinematics of Rigid Bodies**: Translational, Rotational and General plane motion- Instantaneous center of rotation in plane motion – Rolling without sliding – Gears – Mechanisms - **Kinetics of Plane Motion of Rigid Bodies** : Angular Momentum – Kinetic Energy – Equations of Motion – Moment of Inertia – Applications- Initial Motion –**Impulse an**d **Momentum of Plane motion of Rigid Bodies** : Principle of Impulse and Momentum for a rigid Body and for a System of Rigid Bodies – Collision of Rigid Bodies – **Mechanical Vibrations**: Free Vibrations – Damped Free Vibrations – Forced Vibrations – Analytical Mechanics: Generalized Coordinates - Energy and Work – Canonical Transformations – Lagrange's Equations – The Hamiltonian – Hamiltonian form of the Equation of motion – Applications – Wave Mechanics.

MP129 Mechanics-9

Kinematics of Mechanisms: Velocity and Acceleration Diagrams. **Dynamic Force Analysis of Mechanisms**: D' Alembert Principle. Application: Gears Systems – Geneva Wheel – Hook's Joint **Analytical Mechanics**: Generalized Coordinates – Classification of Dynamical Systems - Energy and Work– Lagrange's Equations – Applications.

MP 031 Physics-1

Properties of matter : systems of standard units and conversion constants between them, dimensional analysis and its applications , moment of inertia, angular displacement, velocity and acceleration of angular motion, torque, angular kinetic energy, work and power for angular motion, angular momentum, relation between angular and linear motion ,theory of perpendicular and parallel axes , moments of inertia for symmetrical bodies about rotational axes, stress, strain, modulus of elasticity, hook's law ,Poisson ratio, relation between young's modulus, bulk modulus and shear modulus , energy stored in strain bodies, fluid statics : continuity equation, Bernoulli's equation and its applications, viscosity ,stock's equation, viscosity of gases, Newton's gravitational law, determination of gravitational constant, gravitational field, gravitational potential and its potential energy, coefficient of surface tension, tangential angel, capillarity phenomenon, work and energy for thin membrane, **Thermo dynamics** : internal energy, specific internal energy, temperature, heat energy, heat capacity, specific heat, phase change, latent heat, heat transfer, conduction convection and radiation, one dimensional Fourier equation in steady state, (thermal equilibrium), heat conduction coefficient, heat resistance, applications of Fourier equations on simple walls, methods of heat transfer by convection, Newton's cooling law, total heat transfer coefficient, black body radiation, emissivity, Steven and boltzmann law for radiation, ability of heat radiation, work and heat energy, first law of thermodynamics , heat content function, simple operations of thermo dynamics in ideal gases, **Transitional operations**, molecular diffusion on gases, heat conduction energy, viscosity, first and second fik's laws, steady state .

MP 032 Physics-2

Electricity : electric charge, conductors and insulators, coulomb's law, electric field of a point charge, electric field of distributed charges, motion of point charges in uniform field, electric dipole, electric flux, gauss law and its applications in calculation of electric field produced by simple distributions of electric charges, Electrical potential energy and potential difference, electric potential of point charge, electric potential of distributed charges ,insulators, breakdown under high voltage, capacitors, calculating capacitance for different shapes, inserting capacitors in electric circuits, energy stored in charged capacitors, electrical insulating materials, induced point charges, electrical displacement factor and polarization, current density, electric current calculation in conductors, resistivity, temperature dependence of resistivity atomic model for electrical conduction. **Magnetism** : permanent and electric magnetic fields, magnetic force on moving charges, magnetic forces on a current carrying electrical conductor, torque on a coil in a uniform magnetic field, motion of point charges in uniform magnetic fields, magnetic dipole, biot–savart law and its applications, Ampere's law and its applications magnetic force between two current carrying parallel wires, magnetic force for atoms magnetic intensity vector, magnetic field vector , intensity vector magnetic induction, gauss law in magnetism, dia magnetic materials, hystresses loop, Maxwell's equations, electromagnetic spectrum, **Optics**: reflection refraction, snell's law, ferrmat principle, total internal reflection ,fiber optics, images produced through spherical surfaces, thin lenses, magnification, focal length of thin lenses, defects of images produced through curvature surfaces, spherical diffraction and color diffraction .

MP 133 Physics-3

Electromagnetic induction, magnetic circuits, thermal ionic emission, valves and diodes, scattering, pressure and vacuum determinants, temperature measurements.

MP-041 Engineering Drawing and Geometrical Projection - 1

Engineering Drawing: Drawing instruments and their uses, lettering and dimensioning. Geometrical constructions, conic sections and special curves (Involutes, Cycloid, Archimedean, Spiral, Helix). Theory of projection with applications in machine drawing, Isometric and oblique projections.

Geometrical Projection: Mongean projection (representation of points, straight lines, planes). Positional problems and metrical problems. Representation of surfaces of revolution (Sphere, Cone, Cylinder). Intersection and development of surfaces of revolution.

MP-042 Engineering Drawing and Geometrical Projection – 2

Engineering Drawing: Sectional views. Intersection of engineering surfaces. Civil drawing including retaining walls and some steel points. Some applications in architectural drawing. Introduction to computer aided design using AutoCad program in 2D and 3D drawings.

Geometrical Projection: Indexed projection (representation of points, straight lines, planes, intersection of planes). Applications of indexed projection (problems of cut and fill).

Architectural Engineering Department

AR 111 Architectural Design Fundamentals-1

An introduction to the theory and practice of architecture as an art and a science. The course covers manual and digital graphic techniques used in the perception of architectural design, basic freehand drawing techniques for architectural perception and design and the introduction to various skills, issues, and methods of thinking that bear directly on architectural design. Frameworks of architectural design, design methodologies, human and environmental factors are discussed. The examination of representative architectural building types enable the comprehension of various techniques and strategies of architectural design.

AR 112 Architectural Design Fundamentals-2

Definitions of typologies, taxonomies, prototypes, and precedents as the basis for architectural design projects and continuation of development of skills required to investigate and communicate the design process - Introducing the student to a viable understanding of the factors and issues that underlie the translation of human needs and purposes into specific architectural form - Familiarizing students with images of architecture and designs selected from various cultural and historic backgrounds - Specific topics include basic elements, attributes and organizational principles of architectural form and their relationship to design objectives.

AR 113 Building Construction-1

The course aims to increase the students' ability to comprehend various building components and behavior, where the student must demonstrate adeptness in acquiring the necessary theoretical background in building technology and developing the ability to identify basic building requirements in order to achieve better construction efficiency. The course covers the following topics: Building systems- wall bearing and skeleton systems; basic concept, main components, loads and structural behavior. Foundations- concept, types of foundations: isolated and continuous footings/ raft/ piles. Walls and partitions- types of bricks, stones, masonry and ashler/ wall details: coping, lintels, skirting, etc.

AR 114 Building Construction-2

This course is a continuation to develop the students' ability to comprehend building components, loads and behavior: ceilings and roofs: basic concepts, construction systems. / damp proofing: concept, materials and details./ stairs: basic concepts / construction requirements / finishing materials and details.

AR 121 Visual Studies and Theory of Color

Visual Studies: Introduction to the elements, principles and techniques of design that underlie and inform the analysis, creation and evaluation of visual compositions and are crucial to the design process and creative of form-making. The study of selected topics pertaining to the perception of visual compositions. The study of visual compositions entailing point, linear, two- and three-dimensional elements or their combinations. The study of color and its influence on visual compositions. A variety of studio exercises are utilized to apply the knowledge and skills acquired.

Theory of Color: The course introduces the basic principles, properties and stimulus of color and physiological aspects of vision. Topics include the nature, source, and perception of color sensation, color dimensions and optic system. The course will also investigate various color theories such as Munsell and Ostworlds, color relations and schemes. A variety of studio exercises are used for applications.

AR 122 Computer in Architecture-1
This course introduces the fundamentals of three-dimensional geometric modeling and associated computer-aided design and visualization applications in architecture, urban design and computer graphics production. It provides a theoretical foundation, an introduction to an array of current hardware and software tools, and an opportunity to explore space and artifacts through a digital representation project.

AR 123 Computer in Architecture-2
This course introduces the fundamentals of three-dimensional geometric modeling and associated computer-aided design and visualization applications in architecture, urban design and computer graphics production. It provides a theoretical foundation, an introduction to a selection of current hardware and software tools, and an opportunity to explore space and artifacts through a digital representation project.

AR 124 Theories of Architecture-1
The course provides an introduction to architectural theories, encompassing the definition of architecture and notions that have determined the forms of the built environment. Topics include the classical elements of architecture, theories of building types, theories of styles and forms. Study of design principles: unity, composition, proportion, balance, rhythm, repetition, contrast, orders, scale, symmetry, and hierarchy. The course introduces the principles and elements of form and the relationship between form and space, and the properties of space.

AR 125 Environmental Control in Buildings
This course addresses human needs and comfort in relation to the natural and man-made environments. It shows how environmental factors may be utilized, controlled and modified as an integral part of architectural design. Specific topics include: climate and weather; psychrometrics; solar radiation; wind patterns; heat gains and losses; air circulation in and around buildings. Study of the environmental factors that affects architectural design. Methods of protection from environmental factors and architectural treatment (building form, orientation, natural ventilation in buildings, building material, openings etc..). The course shows the climatic regions of Egypt and its characteristics.

AR 131 Shade-Shadow and Perspective
The aim of the course is the development of students' capabilities for visualization and presentation of architectural ideas by scientific methods.
Shade and shadow: The course introduces the principles of shade and shadow - Shadow of point, lines, plane, volume, and circle. Exercises on shade and shadow of architectural elements, shadows of circular solids and shadows on buildings, etc.
Perspective: The course introduces systems and methods of perspective drawing. Study of two-point perspective of simple objects, outdoor and indoor view of building, etc. One point and three point perspective of forms and buildings. Study of principles of perspective drawing with CAD techniques.

AR 211 Architectural Design-1
The course involves the study of the factors and issues that underlie the understanding of the rendition of human needs and purposes into significant architectural forms. The course presents architectural design as a synthesis of environmental concerns, behavioral responses, functional

requirements and technical systems. The course focuses on the architectural design process and its stages. Emphasis on the development of insight into the solution of building design problems: how they are studied (analysis), how they are approached and carried through (process) and how they are conceptualized and developed (synthesis). Issues of form and space, circulation patterns, geometry, space requirements, and structure systems, are explored through studio design exercises, projects and discussions.

AR 212 Architectural Design-2
This course aims to develop the student awareness and understanding of design theories with regard to the aspects of architectural problems, exploration and appropriate use of architectural ordering system, and understanding and the application of various analytic and design processes and methods. The course emphasizes the stimulation of creative abilities and the development of skills integral to the architect. The course focuses on the context and the influence of cultural and social factors on design. Course studio work focuses on the preparation and presentation of design projects that emphasize the acquisition of representational and analytical skills, and the development of ingenuity in design involving consideration of program, space, site context, character, symbolism, and structure, in addition to research subjects.

AR 213 Execution Design-1
This course aims at increasing students' knowledge of various finishing materials, their requirements and their methods of application. These include materials used on floors, walls and ceiling (criteria for application and maintenance). The course also covers building openings: doors and windows (basic concepts, materials and construction details).

AR 214 Execution Design-2
This course is explores the various principles of execution design, the preparation of working drawings and schedules for openings and finishing materials through a application involving a small scale architectural project. It is also concerned with drafting and presentation techniques

AR 215 Architectural design Principles
Introduction to building- systems and construction materials (bricks and stones) – architectural building elements (walls)- finishing materials for floors, walls and ceiling. External finishing materials for buildings- insulation in materials against water and moisture – principles of designing and finishing staircases and staircases.

AR 221 Theories of Architecture-2
This course presents the range of material factors (physical, cultural, social, and historical) that condition the formation of architecture and their interaction with the ideologies (interpretive, theoretical, and critical) that elaborate these factors at particular times. This attains the objective of introducing the disciplines of architecture, its distinct mode of thought and operation, recent history, and relation to other spheres of cultural production, such as art, science, technology, and politics by addressing issues related to the development of architectural theory.

AR 222 Lighting
This course deals with kinds of lamps and its components, in addition to the various lighting systems and the classification of lighting according to qualitative and quantitative standards.

Further more the course focuses on one of the methods of lighting calculation, by which the number of and type of fixtures could be determined according to the different architectural spaces

AR 223 Sanitary Installations
This course provides the student with a thorough knowledge of the components of the different sanitary conventional and modern systems (supply or waste). The course deals with the design concept of these systems and how it could affect the architectural design of sanitary spaces and its details; also it focuses on the execution phase to give the student a complete awareness of what is going to be faced in the real life in different sites.

AR 311 Architectural and Interior Design-1
Architectural Design: This part provides the student with knowledge, experience and skills required in analyzing and solving problems within the context of various architectural projects, with the intention of further developing the student's ability in the formation of spaces in complex building types and urban spaces that include diverse elements. The course also provides an understanding of the formative influence of building structure, construction and materials and of architectural strategies for environmental considerations.
Interior Design: The part aims at developing the students' skills with regard to the design of interior spaces through the exploration of the associated concepts and contemporary design movements. Principles of interior space design and formation and influential factors such as visual perception, color, functional requirements and physical determinants are examined through practical exercises.

AR 312 Architectural and Interior Design-2
Architectural Design: This part continues to develop the student's analytical, problem-solving, conceptual, design and presentation skills. The integration of the structural and environmental control courses and their relationship to architectural form, function, space and orientation are stressed. The course also explores the physical, social, economic, cultural, historic and symbolic context of architecture and other major technical, legal and human factors which shape the urban environment; the relationship between the individual building and the setting in which it exists.
Interior Design: This part aims to explore the application of architectural treatments in interior spaces with detailed studies focusing on interior design elements and associated systems. Aspects involved in the execution of interior design including finishing materials, technical installations, furniture design are incorporated in practical exercises.

AR 313 Execution Design-3
This course aims to develop students' ability to comprehend basic building components and construction details leading to the practical execution of building projects, whereby students are required to present a complete set of construction documents for a public-use architectural project. The course focuses on integrating the design concept and functional aspects of the building with the various systems and technical installations (electrical, plumbing, mechanical and HVAC) that govern its operation.

AR 314 Execution Design-4
This course aims to enhance students' ability to achieve an adequate understanding and coordination for various techniques of building components and finishing methods in relation to other technical installations. Students are to undertake professional drafting and presentation techniques, both manually and digitally (CAD).

AR 321 Theories of Architecture-3

The course provides an overall perspective of modern architecture through the review, analysis and criticism of concepts, philosophies, ideologies, and models such as Functionalism, Internationalism, Deconstruction and Post-modernism that promulgated contemporary architectural design and represent the foundation of modern architectural thought. The course explores issues of the integrity of structure and form, the nature and expression of materials, environment and context, the relation of moral and political issues to architectural expression, the role of formal themes, and the nature of meaning in architecture.

AR 322 Urban Planning and Housing

This course is an introduction to the bi-disciplinary studies of urban planning and housing. It addresses the basic definitions, objectives and fundamentals in the two closely related fields. Issues covered include the theories of planning practice and Housing studies at the urban level of towns and cities. The course also presents an overview of the following principal topics:

Urban Planning: Components of urban environments, site analysis, urban conservation, urban networks and processes, public participation and sustainable development.

Housing Studies: Factors affecting the housing field, typologies, economic and socio-cultural dimensions and context considerations.

AR 331 Quantities and Specifications

The course aims to develop students' ability to compose specification documents concerning building materials, construction work, execution methods leading to the issue of project tenders, bills of quantity, general regulations, price spreadsheets and their analysis. The course includes practical applications involving the previous documents.

AR 411 Architectural Design

This is an advanced studio course, focusing on intensive, progressively elaborated architectural design problem. The course addresses architectural problems/projects of increasing scale and complexity to be tackled within the context of modern technologically advanced applications to reinforce skills in all aspects of architectural design.

AR 412 Housing Projects

This is an advanced studio course, focusing on intensive, progressively elaborated housing design problems. The course addresses housing problems / projects of increasing scale and complexity tackled within the context of modern technologically advanced applications to reinforce skills in all aspects of architectural design of housing projects.

AR 413 Urban Design Projects

This is an advanced studio course, focusing on intensive, progressively elaborated housing design problems. The course addresses housing problems / projects of increasing scale and complexity tackled within the context of modern technologically advanced applications to reinforce skills in all aspects of urban design.

AR 414 Execution Design-5

The objective of this course is to explore the relationship between the ideas behind public building projects and the process of realizing these ideas in architectural terms. The course explores "design"

as a process that extends through to the completion of a building, where "detailing" is an integral part of the design process and in which the nature and assembly of the parts can be informed by or can inform the collective design issues of the building as a whole. The course emphasizes the selection of materials, integration of services and installations, their construction details both inside and outside the building.

AR 415 Execution Design-6

The objective of this course is to explore the relationship between the ideas behind housing projects and the process of realizing these ideas in architectural terms. The course explores "design" as a process that extends through to the completion of a building, where "detailing" is an integral part of the design process and in which the nature and assembly of the parts can be informed by or can inform the collective design issues of residential buildings as a whole. The course emphasizes the selection of materials, integration of services and installations, their construction details both inside and outside the building.

AR 416 Execution Design-7

The objective of this course is to explore the relationship between the ideas behind urban and landscape design projects and the process of giving those realizing ideas in architectural terms. The course explores "design" as a process that extends through to the completion of a building, where "detailing" is an integral part of the design process and in which the nature and assembly of the parts can be informed by or can inform the collective design issues of exterior spaces as a whole. The course emphasizes the selection of materials, related services, urban utilities, construction details and the integration all of the previous with the other elements incorporated into the design of exterior spaces.

AR 421 Architectural Theory and Criticism

This course examines contemporary architectural theory and criticism through the presentation and study of significant texts and buildings of the present and recent past and the architectural philosophy of contemporary architects. The goal of the course is to introduce and investigate the formal, technological, social, political, and philosophical debates at issue within the discipline. The course Introduces the principles of architectural criticism, and evaluation of architectural projects. Students learn to evaluate and articulate the interactions between theory and practice and develop tools of analysis and critique, thereby enabling them to formulate and assess strategies for the formation of architecture.

AR 422 Housing Theories and Economics

This course concisely introduces contemporary theories, approaches and concerns in the field of housing, with particular emphasis on Third World countries. Lectures address broad issues such as the roots of housing problem, and typology of housing. It reviews basic housing theories and their impact on the economics of the housing sector. Also presented, is a review of the mechanisms and forces shaping the housing market, and affecting both supply and demand at various levels. The economics of housing projects are examined as related to the stages of decision-making, feasibility studies, multi-level policies and role of actors, in order to present further insight into the different considerations, alternative approaches and definitions applicable in this field.

AR 423 Theories of Urban Design
This course introduces contemporary theories, approaches, and principles in the field of urban design. The course investigates the analysis and evaluation of the design of urban areas, spaces and complexes with emphasis on physical and social considerations and effects of public policies through case studies. The course focuses upon various themes in urban design and explores them in some depth. The course addresses issues such as theories of planning and design of urban spaces, building complexes, and new communities, neo- traditional town planning, suburban design, future trends in urban design, art in urban design, recent urban design theories, and urban design in practice.

AR 431 Research Methodology and Programs
This course provides a foundation for architectural research by introducing students to the methods and techniques used to investigate architectural topics, and architectural programs and by presenting a critical review and evaluation of these methods. The course aims to train students to conduct research from an initial proposal; carry out an appropriate research methodology; draw conclusions from the research and relate those conclusions to the original proposition; and write up and produce a formal research.

AR x41 Landscape Architecture
An overview of the fundamentals of landscape architecture, within the framework of the relationship between landscape and architectural design. Students are introduced to the study of exterior spaces as they relate to and complement building design, through the exploration of the theoretical and historical background of landscape design, site analysis, environmental issues and vegetation types. Associated fields include the study and classification of landscape elements, landform, plant life, microclimate, land use and preservation, landscape design methods, as well as the study of aesthetic and functional values. Selected projects cover a scope that includes open areas of variable scale.

AR x42 Contemporary Arts
This course aims to define and classify art in its various forms with specific emphasis on the artistic movements of the Renaissance and Modern eras. The course also discusses the correlation between art and its architectural counterparts encompassing the relationship between traditional art and architecture and the influence of the modernist movement on architectural design.

AR x43 Heritage Preservation
This course provides a comprehensive introduction to the problems and methods of historic preservation in urban, suburban and rural environments. A conceptual framework is advanced for comprehending and managing the full range of problems and techniques encompassing the field of historic preservation. Topics include the development of historic preservation, together with its international parallels and antecedents; problems of urban, suburban and rural preservation; techniques for developing, conducting and evaluating comprehensive surveys of preservation resources; national, state and local governmental programs; legal and economic aspects of preservation; historic district zoning and neighborhood preservation.

AR x44 Architecture and Environment
This course aims to define the principles of environmental design in architecture while providing a combination of knowledge, experience and facilities which enable students to relate ecological

awareness to innovation and design. The relationship between Built and Natural environments is explored and specific solutions are created. Topics include the environmental analysis of a site, ecological systems and processes, the fundamental and design principles of sustainable architecture in addition to various related topics of current interest.

AR x45 Site Analysis Studies

The course aims to study the aspects that affect site properties for various projects and methods of analytical site study and selection. Issues include climatological and topographical factors, transportation networks, traffic levels, land use, infrastructure and public utility capability in addition to service provision in the surrounding urban area. Building density, forms as well as the legal aspects that govern building and urban planning regulations are also investigated.

AR x51 Construction Project Management

An introduction to the techniques and tools of managing the design and implementation of large construction projects. Topics include management tools, cost-control and budgeting systems and professional roles. The course defines and classifies aims, responsibilities, organizational structures, time scheduling methods, implementation programs, related documentation, theories and operating methodologies. Case studies illustrate the application of techniques in the field.

AR x52 Construction and Building Technology

The course presents the various systems and techniques employed in the execution of building projects, principles of the mechanization in the construction process and pre-fabricated systems, including an overview of related mechanical equipment. Various systems are compared and evaluated in terms of appropriateness to local applications. Modern developments in execution techniques are also investigated.

AR x53 Project Feasibility Studies

The course defines the concept of feasibility studies and the importance of conducting necessary economic studies as a precursor to the determination of design criteria. Related issues include the economics of land use; preliminary and operating costs and overheads, and economic returns. The course also discusses the project development cycle, preliminary feasibility studies, the aspects and principles of feasibility studies (marketing, technical, financial, organizational, social gain, human resources and time/cost relationships).

AR x54 Housing in Developing Countries

The course aims to define the housing problems and housing communities crisis in developing countries with emphasis on the challenges present on the local level. Remedial approaches that consider the complex nature of comprehensive population and urban development are demonstrated and the importance of various social, cultural, economic, organizational and managerial aspects is discussed. Forms of unofficial housing settlements and its related issues, international housing policies and approaches are also outlined through research-based studies.

AR x55 Design of Rural Communities

The courses defines the nature of rural communities and outlines design approaches through the evaluation of rural development projects in Third-World nations, particularly the Egyptian experience in community development and rural house upgrading. General approaches to

development that emerged during the 1950s to the 1990s, as well as the current policies employed in the development of Egyptian rural communities are discussed with regard to the various socio-economic factors which have resulted in the trend of increasing urbanization of these areas.

AR x61 Urban Geography

The course introduces the concepts of urban geography and the study of urban areas and the inter/intra relationships between them. Topics include types of urban areas and location theories, industry and employment in urban areas, housing in urban areas, urban transport and transportation systems, the nature and problems of inner urban areas and recreation and leisure in urban areas. Practical application exercises are included.

AR x62 Urban Space

The course investigates the historical and theoretical perspectives on selected cities as case studies of the major issues informing the design principles of urban public space and defining its relationship with architecture. Themes encompass the definition of the public sphere, rights and responsibilities in a civil society, the social construction of space, ethical positions on the accommodation of individual and community in the city, the role of memory and symbolism in creating a sense of place, holistic urban design, the construction of systematic urban armatures, solutions for handling growth and harnessing new technologies, the city as spectacle, and architecture and urban design as forms of social control or social empowerment. Practical exercises and research-based studies are included.

AR x63 Urban Infrastructure

The course presents a comprehensive perspective in addressing infrastructure issues and its components. Planning principles of infrastructure systems (water supply, sanitation, sewerage and power), transportation networks and systems in addition to the relationship between infrastructure and urban planning are discussed. Modern technological techniques in the design and implementation of urban infrastructure systems are also outlined, through practical applications.

AR x64 Geographical Information Systems

An introduction to the concepts of GIS and its applications in urban design and studies. The course outlines the historical and chronological development of GIS, types of geographical information, basic and advanced data models, geo-references and coordinate systems, hardware and software for GIS communication and applications and data collection and data quality. Remote sensing methods and techniques in addition to GIS and Virtual Reality applications are also discussed. The course includes applied GIS case studies.

AR x65 Urban Economics

The study of the application of economic analytical methods to the comprehension of the functions of urban areas with an emphasis on the role of public policies with the urban framework. Economic analytical methods are applied as a remedial procedure aimed at urban dilemmas such as public transportation, social service funding, housing and equitable distribution of resources. Topics include the basic theories of economics, economic analytical tools, the economic determinants and the urban capacity of the city and the economics of urban development.

AR 402 Graduation Project (Public Buildings – Housing – Urban Design)

Students are required to select one architectural topic of their choice, get approval from course tutors, and under supervision carry out research and formulate a detailed program for the proposed project. The submitted architectural project should reflect the use of creative ideas and new philosophy to address architectural problems/concerns. Special consideration ought to be paid to innovative approaches and solutions based upon place-specific aspects such as social, economic, structural, environmental, and cultural. The process should also combine design concepts with advancement in science and technology, as to produce a contemporary architectural product.

Structural Engineering
Department

CE 161 Theory of Structures -1

Introduction. Scope. Types of structures and supports. Types of loads. Conditions of static stability. Calculations of reactions. Definition of internal forces (normal forces, shear forces, bending moments and twisting moments). Internal forces in the horizontal beams (cantilevers, simple beams, overhanging beams, compound beams). Differential relations between loads and internal forces. Internal forces in inclined beams. Internal forces in simple, hinged, compound, and arched frames. Analytical and graphical methods for finding the internal forces in simple ,compound ,and subdivided trusses and trussed beams.

CE162 Properties of Materials

Mechanical properties of engineering materials, stress, strain, strength, ductility, toughness, resilience - Testing machines - Calibration devices - Strain gages- Axial static tension, mechanical properties in tension, shape of failure, tensile tests - Static compression, mechanical properties in compression, mode of failure - Static bending, elastic and inelastic bending mechanical properties, bending mode of failure, bending tests- Static shear and Torsion - Hardness, hardness tests.
Building stone, classification of building stone, building stone uses, stone properties, different tests of building stone - Concrete aggregate and types, properties of aggregate, sieve analysis and quality control of aggregate, effect of surface area on concrete, volume increase of sand, alkali-aggregate reaction, different tests of aggregate - Cement, introduction of cement production, cement chemical components, cement chemical properties, properties and tests of different types of cement - Types and uses of wood, wood tests – Types, uses, properties and tests of bricks – Gypsum, types, mechanical properties and uses, gypsum tests – Lime, lime production, properties and tests of lime.

CE 163 Theory of Structures -2

Influence lines for statically determinate structures. Properties of plane areas: - principal axes and principal moments of inertia, Mohr's circle. Distribution of normal stresses: - normal stresses due to single and double bending in symmetric and non-symmetrical sections, eccentric normal forces, core theory. Distribution of shear stresses: - direct shear, shear in bending, line sections, shear flow, shear center, non-symmetrical sections. Torsion:- applications on power transmission shafts. Plane stresses and strains:- principal stresses and similarity between stresses and strains, strain rosette. Deflection of beams:- method of double integration, method of elastic loads, deflection of beams with variable cross sections. Buckling of compression members (columns):- critical loads for columns under centric loads, compression members under eccentric loads and lateral loads

CE 164 Testing of Materials and Theory of Structures

Forces. Stress and strain. Static equilibrium. Testing machines . Tension, compression, bending, shear, and torsion tests .Impact, fatigue, creep ,and hardness tests . Types of structures and joints . Structural elements . Diagrams of shear forces ,and bending moments . Applications for cantilevers and beams . Statically indeterminate beams . Trusses .

CE 165 Theory of Structures -5

Statics of structures. Internal forces in plane beams. Internal forces in trusses. Normal and shear stresses distribution. Concrete foundations for electrical equipments and the effect of vibrations.

CE 166 Structural Engineering -1

Shear forces and bending moments for beams ,frames. Internal forces in trusses . Tests and measurements of mechanical properties of materials (simple tensile test, compression test, shear test, torsion test, bending test). Impact and hardness tests . Rotating beam tests. Measurement of strains.

CE167 Material Properties and tests

Stress analysis basis – Types of destructive and nondestructive tests – Weld tests – Properties of stresses and strains relation – Experimental stress analysis.

CE 264 Theory of Structures -3

Analysis of statically indeterminate structures by the method of superposition:- beams with variable cross sections and beams on elastic supports . Analysis of statically indeterminate structures by the method of three moment equation. Maximum diagrams of shear forces, bending moments for statically indeterminate beams . Elastic strain energy . Theory of virtual work:– calculation of deformations in statically determinate structures due to loads and temperature changes. Analysis of statically indeterminate structures by the method of virtual work:- beams, frames, arches and trussed beams . Effect of yielding of supports and temperature changes

CE 265 Theory of Structures -4

Analysis of statically indeterminate structures by the method of moment distribution:– stiffness coefficients, distribution and carry over factors, fixed end moments ,structures without lateral sway, method of successive carry over, structures with lateral sway, elastic supports, yielding of supports and temperature changes . Influence lines for statically indeterminate structures using the different methods of analysis . Introduction to stiffness method for structural analysis .

CE 266 Properties of materials – 2

Non-metallic part: Fresh concrete properties: workability, consistency, bleeding, air-entrained, and factors that affect fresh properties and their corresponding tests. Concrete manufacturing: mixing, casting, transporting, finishing, concrete joints and formwork removal. Design of concrete mixes using different approaches. Introduction to concrete admixtures: accelerators, retarders, air-entraining admixtures water and high water reducing admixtures,. Introduction to concrete durability: permeability, chemical attack. Steel corrosion, sea-water attack. Hardened concrete properties: strength, elasticity, shrinkage, creep, compressive strength, splitting tensile strength, modulus of rupture, bond with reinforcement, shear strength, failure mechanism, including factors affecting these behavior and their relevant tests.

Metallic part: Impact and elastic energy in axial loading, bending, shear, and torsion. Mechanical properties and testing for impact loading; Charpy and Izod tests. Creep of metals and the effect of elevated temperature on metal properties. Time- stress relations and stress relaxation. Creep of metallic materials in axial, bending, and torsion loading. Fatigue properties of metallic materials, nature of loading, alternative stresses, fatigue and endurance limits. Factors affecting fatigue strength and their relevant testing procedures. Strain measurements, and experimental stress analysis. Evaluation of principal stresses based on experimentally measured strains using strain gauges. Introduction to failure theories. Non destructive tests.

CE 267 Theory of Structures -6

Study of the principles of statics for structures. Introduction to principle theories of structural systems .Concepts of structural behavior for building systems(reactions, equilibrium, stability, stiffness). Static analysis of forces. Study of internal and external forces and analytical solutions for rigid stable bodies. Diagrams of internal forces (bending moments, shear forces, normal forces).

CE 268 Theory of Structures -7

Methods of calculating structural deformations and deflection of statically determinate beams . Introduction to statically indeterminate structures, the analysis of statically indeterminate structures by the method of superposition and the method of three moment equation . Analysis of plane internal stresses (types of stresses, properties of areas, distribution of normal stresses, shear stresses in bending and torsion). Buckling of columns.

CE 269 Properties and testing of materials

Non metallic Building materials, Building stones, Bricks , Aggregate materials, Cement, Timber, glass and their physical, mechanical properties. Standard of testing materials . Introduction to fiber and composites laminates and light gauge steel . Mild and high tensile steel, copper, Aluminum and their mechanical behavior under static tensile and axial compression, shearing and hardness. Testing machines and strain gages. Devices specified in quality control technique in building industry.

CE 271 Reinforced Concrete – 1

Introduction to Reinforced Concrete – Materials used in reinforced concrete – Mechanical properties of hardened concrete and reinforcing steel – Methods of design – Load factors and material factors – Behavior of reinforced concrete sections subjected to flexure for: uncracked stage, working stress stage, and ultimate limit state - Design of sections subjected to flexure using both Ultimate Strength Limit state method and Working Stress method – Design of sections for shear – Bond, development length, and reinforcement splices – Design of sections subjected to axial loads – Design of sections under combined flexure and axial compression.

CE 281 Soil Mechanics– 1

Basic soil Properties: Weight – volume relations – Grain-size analysis – Clay minerals – Cohesive soil consistency – Soil classification. Compaction: Compaction theory – Proctor tests – In-situ Compaction – Field density tests. Permeability: Darci's Law – Layered-soil permeability – Laboratory tests – Field tests. Effective stresses: Total and effective stresses – Change in total stresses – Partially saturated soil – Soil absorption. Shearing resistance: Failure modes – Granular soil shearing resistance – Critical void ratio – Cohesive soil shearing resistance – Sensitivity and in-homogeneity in clay – Laboratory tests: Direct shear – Tri-axial – Unconfined Compression – Laboratory vane shear – Field tests: Standard, static and dynamic penetration – Vane shear. Laboratory tests: Unit weight – Water content – Specific Gravity – Atterburg limits – Compaction – Permeability – Shear resistance (Direct shear – Unconfined compression – Laboratory vane shear). Seepage: Theory – Flow net – mathematical model – Numerical analysis – In-homogeneous soil – Non-isotropic soil – Dykes and Dams – Seepage forces. Lateral Earth pressure: Active, at-rest and passive earth pressure – Rankin's theory – General wedge theory – Coulumb's theory – Lateral pressure due to surface loads. Slope Stability: Dry and saturated slopes – Seepage conditions – Stability analysis for cohesive soil – Stability analysis for general soil – Slope construction – Stability improvement. Stresses under surface loads: Theory of elasticity – Stress distribution under:

Concentrated, line and uniform loads on strip, rectangular and circular area – Newmark's chart – Pressure bulb – Effect of stratification. Compressibility and consolidation: Compressibility properties – Odometer test – Terzaghi's consolidation theory - Settlement due to consolidation – Degree of Consolidation – Secondary Consolidation – Coefficient of consolidation. Site Investigation: Exploration program – Sampling – Ground water – Boring log – Soil report – Field tests.

CE 361 Structural Engineering - 2

Construction materials – Design consideration and criteria – Design loads – Allowable stresses – Design of tension members – Stability of structures against lateral loads – Stability of multistory buildings – Buckling of columns – Design of axially loaded compression members – Design of laterally supported beams – Bolted and welded connections – Design of bracing systems – Column design by charts – Beam design by charts – Castellated beams – Design of floor decking sheets

CE 362 Structural Engineering – 3

Reinforced Concrete: Fundamental of Reinforced concrete structural design – Analysis and design of sections subjected to bending – Load distribution – Details of beam reinforced – Solid slabs – Columns stairs – Frames – Ribbed slabs – Slabs with beams – Joints of precast reinforced concrete element.

Soil Mechanics and Foundation: Properties of soils – Soil classification – Soil compaction – Stress distribution in soil – Consolidation theory – Lateral earth pressure – Shallow foundation – Deep foundation – Retaining walls –soil investigation.

CE 367 Structural Analysis by Modern Methods

Study of matrices, stiffness and flexibility for structural analysis, matrix structural analysis ,stiffness matrices for different structural members (plane and space),overall stiffness equation for the structure, boundary conditions, calculation of internal forces in the members, effect of yielding of supports and temperature changes, Influence lines. Grid systems. Use of computer for analyzing structures by the stiffness method . Use of software packages for structural analysis .Introduction to dynamics of structures.

CE 368 Advanced Engineering Materials

Polymers and Epoxies, polymers concrete, types, properties and applications of polymers concrete – Fibers, different types, of fibers reinforced concrete, properties, production and applications of fiber reinforced concrete, theory of failure of fiber reinforced concrete, properties of fiber reinforced concrete in compression, tension, bending and shear- Ferro-cement materials, behavior of Ferro-cement under different stresses - Introduction of theories of composite materials – Lightweight aggregate, natural and artificial aggregate, lightweight concrete, Insulating concrete, structural lightweight concrete, properties of lightweight concrete, design mixes of lightweight concrete, failure theories of lightweight concrete under different stresses – Massing and heavy concrete – Special concrete (Refractory concrete – Non shrinkage concrete) – Ceramics – Introduction of Egyptian and International Specifications.

CE 369 Design of Industrial Structures and High Buildings

Choice of concrete structures for halls and industrial buildings – Concrete arches – North-light structures – Double-roof structures – Cracks, causes and types – Strengthening of different concrete elements. Design of concrete structure subjected to lateral loads: wind, earthquakes.

CE 372 Metallic Structures - 1

Construction materials – Design criteria and considerations – Design loads of steel structures – Allowable stresses – Design of tension members – Stability of steel structures against lateral loads – Bracing systems – Column buckling – Design of axially compressed members – Design of bracing members – Design of laterally supported beams - Lateral tortional buckling of beams - Design of laterally unsupported beams – Design of beam-columns - Frames and trusses – Design of bolted and welded connections – Column bases – Introduction to cold-formed sections – Industrial buildings – Cranes – Tall buildings – Long span structures – Introduction to load and resistance factor design and ultimate design

CE 373 Reinforced Concrete – 2

Serviceability Limit states (deflection and cracking limit states) – Floor systems – Design of solid reinforced concrete one-way and two-way slabs – Design of floor beams – One-way and two-way hollow block slabs - Panelled beams – Design of slender columns (braced and unbraced) – Design of simple reinforced concrete frames – Design of slab-type and cantilever-type stairs – Design of reinforced concrete beams subjected to combined shear and torsion.

CE 377 Design of Concrete Bridges

Introduction to prestressed concrete – Materials used in prestressed concrete – Methods of prestressing – Prestress losses – Analysis and design of prestressed concrete sections (Pre-tensioned and Post-tensioned) subjected to flexure – Limit State of deflection and camber – Shear design – Bond for Pre-tensioned members – End anchorage and Cable profile for Post-tensioned members.

CE 378 Metallic Structures (2)

Plastic design of steel structures – load factors and ultimate strength of structural members – Plastic analysis of steel structures – Behavior of steel frames in plastic design – Design of cold-formed steel (CFS) sections – Effective width concept – Design of axially compressed CFS members – Design of flexural CFS members – Design of CFS beam-columns - Connections of CFS members: welded connections, bolted connections, screw connections

CE-382 Foundation Engineering

Bearing Capacity for shallow foundations: Definitions – Ultimate net allowable bearing capacity – Total and net bearing capacity – Soil-foundation interaction – Bearing capacity equations – Bearing capacity based on field tests (Standard Penetration – Static and dynamic cone penetration – Plate Loading). Settlement of shallow foundations: Instantaneous settlement – Long-term settlement – Total and relative settlement – Allowable settlement. Shallow foundation design: Types of footings: isolated, strip, combined and tied – Foundation depth – bearing capacity – Structural design (Working and ultimate stress) – Construction. Laboratory test program: Consolidation tests – Tri-axial test. Foundation construction: Excavation methods – Equipments – Excavation stability – Design of strutting systems – Site dewatering – Foundation protection - Under-water construction.
Retaining Structures: Types – Principals of design and constructing gravity walls – Sheet piles – Diaphragm walls – Reinforced soil – Bridge piers and supports. Pile Foundations: classification – construction materials and methods – Equipments – behavior of piles under load – Single pile capacity – Negative skin friction – Uplift-resisting piles – Dynamic equations for pile capacity – Pile loading tests – Behavior of pile groups – Pile cap design.

CE 384 Construction Engineering
Formworks, Moulds, Construction equipment, Crushers, Concrete equipment, Matching between different equipment, Concrete casting and different methods of Construction .

CE 385 Engineering Projects Management
Types of engineering projects, introduction to operations research, basic fundamentals, application of operations research in engineering projects, algorithms, linear programming, graphical solution, elements of mathematical programming modeling of engineering projects, scarce resource allocation, sensitivity analysis, algebraic solution, standard from for linear programming, simplex technique and its special cases, sensitivity analysis for optimum solution. Transportation problems and its application in engineering projects, assignment problems and its application in engineering projects, network. Dynamic programming and its elements, application of DP. Specialized software, inputs, user manual, outputs, applications, Case Study.

CE-386 Soil Mechanics – 2
Slope Stability in drained and un-drained conditions – Dewatering: surface dewatering – Well-point system – Shallow wells – Deep wells – Multi-stage dewatering – Settlement due to dewatering – Filter design – Charge wells – Pumping test. Compressibility and consolidation: Bi-axial consolidation – Vertical drains. Measurement tools and field testing: Purpose – Inclinometers – Settlement and swelling points – Observation wells – In-situ internal water pressure meters – Plate-loading test – Static and dynamic penetration tests – Piezocone - Pressure-meter – Dilatometer. Soil Improvement: Dynamic compaction – Deep compaction – Injection – Sand and lime piles – Soil replacement – Soil reinforcement.

CE 387 Inspection, quality control and repair
Testing methods, sampling, information, Methods, quality control charts, quality assurance, inspection of concrete materials, inspection of steel materials, concrete permeability, concrete durability, repairing materials, different methods for repair and their applications, welding, steel protection, cathodic protection, non destructive tests .

CE 474 Concrete Structures and Bridges - 1
Structural systems for concrete bridges – Loads on bridges – Design of concrete slabs under wheel loads – Design and analysis of slab bridges – Design of slabs, cross girders, and main girders for slab-beam bridges – Continuous main girders with either constant sections or variable inertia – Bearings – Bridges sub-structure.

CE 475 Concrete Structures and Bridges - 2
Expansion and movement joints – Design of different types of concrete frames – Hinged supports – Brackets – Wind Loads – Earthquake Loads – Structural systems for tall buildings – Design of concrete buildings as multistory frames subjected to lateral loads – Shear walls – factors affecting shear walls distribution – Analysis of tall buildings with shear walls.
Introduction to reinforced concrete water tanks – Design of concrete uncracked sections subjected to tensile forces, bending moments and eccentric tensile forces – Design of ground and elevated rectangular tanks- Design of ground and elevated circular tanks – Design of deep beams – Design of circular beams – Design of structures supporting water tanks. Advanced design of concrete bridges, Bridge of box sections, Methods of bridge constructions, Classical methods and cantilever methods

CE 476 – Metallic Structures and Bridges - 1

Introduction to steel bridges – Design criteria and considerations of steel bridges – Loads of different bridge types – Stability of bridges against lateral loads – Effect of fatigue on the allowable stresses in steel bridges – Design of floor beams of railway bridges and road bridges – Design of built – up plate girders – Design of main girders – for railway and roadway bridges – Bridge connections – Web stability of plate girders – Splices of Plate girders – Truss bridges – Design of bracing members – Design of bearings for bridges .

CE 479 Metallic Structures and Bridges - 2

Shells and suspended structures – Cracks and fatigue of metallic structures - Cable stayed and suspension bridges – Optimum design of structures – Behavior of bridges – Inspection, evaluation and strengthening of steel bridges

CE 483 Contracts, Quantities and Specifications-1

Engineering Contracts - Contract general conditions – Contract documents – Invitation to tender – Types of tenders – Evaluation of tenders - Responsibility of the Contractor – Specification of the structural Works – Cost estimation for different items – Cost analysis for the Works – Items in the Bill of Quantities.

CE 488 Contracts, Quantities and Specifications-2

Strategies of contracts and tenders-analysis and appraisals of contracts and tenders- Unbalancing in contracts – Risk allocation in contracts – Some new types of contracts (BOT) – Fidic contracts – Claims – Dispute solutions – Arbitration in Engineering contracts – Introduction to building appraisals – measurement methods – Quantity surveying – Bills of quantities – technical specifications : analysis and writing.

CE 402 Project

Under the supervision of staff members, the student selects the graduation project from the announced branches.

Irrigation Engineering and Hydraulics Department

CE 231 Hydrology

Hydrology cycle: Rainfall measurements, Average rainfall depth, consistency check and adjusting of station ,records, estimation of missing data, computations of evapotranspiration and infiltration values .Hydrology of Nile basin ; climatic conditions characterizing Nile basin, Nile water resources, major projects constructed on the river Nile, the suggested storage projects . Steam flow measurements: stage, velocity and discharge measurements, stage – discharge relationship, Hydrograph analysis; unit hydrograph and its derivation. Flood routing: Routing in a reservoir, routing in a channel reach. Storage operations: annual storage, long- term storage. Ground water Hydrology: occurrence and movement of ground water, abstraction of grand water, water wells, and ground water in Egypt.

CE 232 Hydraulics -1

Properties of liquids - static liquids – pressure intensity at point – Euler equations – pressure on submerged surface – equilibrium of floating bodies – relative statics for liquids – continuity equation – energy equation – momentum equation – discharge measurements – orifices and weirs – kinematics of liquids – flow of liquids under pressure in pipes – connecting pipes in parallel and or series – unsteady flow in tanks – pipe net works – water hammer in pipes.

CE 321 Irrigation and drainage Engineering

Planning of irrigation and drainage networks – water requirements for irrigation – control and management of irrigation water distribution – preliminary design of irrigation systems: surface irrigation, sprinkler irrigation (semi – stationary and pivot) and drip irrigation – design of drainage networks – environmental and economical aspects .

CE 322 Design of Irrigation Structures - 1

Design of water crossing structures: Culverts – syphons – aqueducts, Components and elements – Hydraulic and structural design -structural design of retaining walls for inlet and exit wing walls. Seepage under water retaining structures: (Theory of seepage through pours media – flow net – uplift pressures – design of floors – piping and heaving a long D.S bed – tail erosion . Design of weirs and escapes: Components and elements – Hydraulics design – structural design. Design of developed irrigation structures: Components and elements – Hydraulic analysis – structural design

CE 324 Design of Improved Irrigation Systems

Kinds of sprinkler and drip irrigation systems – Adaptability for different field conditions – design of sprinkler irrigation systems: stationary, semi-stationary and mobile systems (pivot, linearly – moving and guns) – turf irrigation – design of drip irrigation systems – water hammer problem in irrigation pipes – field evaluation – environmental and economical aspects.

CE 325 Design Of Pipelines Networks

Design discharges-Type of pipes-Horizontal alignment and longitudinal profile –Loads on flexible and rigid pipes –Structural design of pipes-Control, air and emptying valves –Expansion joints-Valve chambers-Design of intakes –Design and analysis of pipe networks-Ground and elevated tanks – Booster pumps – Water hammer analysis – Protection of pipelines against water hammer.

CE 333 Hydraulics - 2

Pipe lines and pumps: Economic Design of pipe line and pump curves – discharge control – connecting pumps in parallel and serves – pump choice – Hydraulics of open channel flow – classification of flow – equations of continuity, energy and momentum – flow resistance equations for uniform steady flow – velocity distribution in laminar and turbulent flow – shear stress distribution and critical shear stress – design of open channel cross – sections – hydraulics of channel bed variation – hydraulics jump – gradually varied flow – hydraulic models : dimensional analysis – Buckingham theorem – similarity : Geometric, kinematics, dynamics – modeling of pipes and open channel – distorted models .

CE 334 Applied Hydrology

Planning of catchment areas, determination of rainfall streams, computation of torrential flow discharges, protection of cities and structures against torrential flows, design of dewatering systems for construction of water structures, salt-water intrusion.

CE 335 Applied Hydraulics

Discharge measurements-Practical applications on gradually varied flow-Scour and related problems-Sediment transport in rivers-Local scour around bridge piers and downstream hydraulic structures-aggradations and degradation in rivers and natural streams-River training.

CE 337 Hydraulic structures

Planning of hydraulic structures, Acting forces and pressures on the hydraulic structures, Design and construction of rock –fill and concrete buttressed or arched dams, Design of pump stations, Design of construction of spillways, Design and construction of water drop structures, Energy dissipation and stilling basins structures, Protection of embankment slopes, and Lining of canals.

CE 423 Design of Irrigation Structures - 2

Regulators and Barrages: Types and components – Hydraulic design – design of the bridge on the regulator – design of gates and gate lifting devices – design of piers, floors wing walls. Navigation locks: Types and components – dimensions of lock chamber – filling and emptying – design of side culverts – structural design of land walls, floors and miter gates. Dams: Types of dams – structural analysis of concrete dams – design of earth fill and rock – fill dams – spillways for dams. Pump station: Components – types – design of the station.

CE 436 Computer application in Hydraulic structures

Flow in pipes and open channels. Hydraulics and structure design of culverts, syphons, and earth and rock fill dams. Pipe net works. Gates. Seepage under structures: Uplift pressure, Hydraulics of wells.

CE 402 Project

Under the supervision of staff members, the student selects the graduation project from the announced branches.

Transportation and Traffic Engineering Department

CE 141 Surveying and Topography - 1
Surveying classifications- principals of surveying- mapping using linear measurements- mapping using prismatic compass- plane table surveying- horizontal and vertical angle measurement- open, closed and connecting traverses- traverse networks and their adjustment- cadastral survey and map classifications- setting and of projects- computation of areas and land division- hydrographic surveying.

CE 142 Civil drawing-1
Introduce the students to the construction industry and the overall types of civil engineering project- brick bond methods- brick works and its different types retaining walls with its various types such as masonry, plain concrete or reinforced concrete- bridges abutments and piers- irrigation structures such as culverts, regulators, siphons, weirs and bridges- study of canals cross sections and the effect of changing bed level, berm level and road level on its cross sections and side slopes- roads cross sections and its intersections- simple curves, complex curves and vertical curves and its uses.

CE 143 Engineering Geology
Geology for engineering- origin of earth structural formations of rocks. Rock classifications. Physical and engineering properties of rocks- soil profiles. Under ground water- Geology of tunnels- Dams and reservoirs and their relations with soil properties- seismic methods of Geological investigations- Geological Maps

CE 144 Surveying and Topography - 2
Engineering leveling- precise leveling- barometric leveling- hydrostatic leveling- laser leveling- vertical sections- contour maps- volume computations- earthwork quantities- haul distances and mass diagram- land surface grading.

CE 145 Civil drawing - 2
Bridges entrances and exits- masonry arch bridges- reinforced concrete bridges- timber bridges- rolled steel joist bridges- pipe culverts- railway track- geometric design of bridges- various types of steel constructions such as trusses, frames, tanks and its various connections using rivets or welding- steel constructions using hollow sections- reinforced concrete structures- shallow foundations such as isolated footing- compound footing and strip footing- breakwaters and navigation channels.

CE 146 Application of Computer in Civil Engineering
Introduction to programming in FORTRAN modern computer systems (personal computers- computer networks- internet- operating systems- programming)- applications (statistical applications- numerical applications- engineering applications- applications in project management).

CE 246 Surveying and Photogrammetry 3
Tachometric surveying: methods of tachoemetry- determination of rate of slope- electromagnetic distance- measurement: sources of error and corrections- total station- satellite positioning- simple circular curves (parts and elements of simple curve and setting- out)- compound and reverse curves (parts, elements and setting- out)- simple and compound vertical curves (parts and elements)- theory of errors (precision criteria- gauss theory- portability- different methods of adjustment)-

photogrammetry: types of photogrammetry and their purposes- elements of aerial photogrammetry- aerial camera: types- calibration- vertical aerial- photographs: displacements- mosaics- execution of aerial surveying- pairs of photographs- stereoscopic measurements and instrumentation- oblique photography- plotting machines and map production- digital photogrammetry.

CE 251 Transportation Planning and Traffic Engineering

Dynamics of transportation - introduction to transportation planning (goals and objectives- planning process- mathematical models- technical, economic and environmental evaluation)- public transport (public transport systems- demand for public transport- optimum planning of public transportation in urban areas- routes- stations- lines- rolling stock- capacity, operation, and time tables)- freight transport (freight transport systems- transport chain- handling equipment- storage- terminals- capacity and operation)- transport and environment (noise- air pollution- environment-oriented transportation planning)- traffic engineering (traffic characteristic and level of service- traffic survey and analysis- unsignalized intersections- signalized intersections- parking- pedestrian and bicycle demand and infrastructure- geometric design of road traffic networks- traffic safety- traffic management).

CE 347 Geodetic surveying

Triangulation networks and specifications- geometrical conditions- strength of figure- adjustment of triangulation networks- trilateration networks- adjustment of trilateration- adjustment of pairs of observations trilateration- variation of coordinates- intersection- resection- trigonometric leveling- precise surveying networks- figure of the earth- curves on the spheroid- geodetic positions- map projection.

CE 348 Applications of new technologies and instruments in surveying

Use of electromagnetic waves in distance measurement- electronic tacheometry- total station- laser application in land surface grading- laser application in centerline layout- use of gyrotheodolite in mining and tunnel surveying- GPS application in horizontal and vertical positioning- geographic information systems (GIS).

CE 349 Alignment and setting out of civil engineering projects

Coordinates and its computations- intersection – resection- setting out of long projects using coordinates- longitudinal and cross- sectional alignment of simple, compound and reverse curves- setting out of transition curves- setting out of simple and compound vertical curves- fixing bench marks for different projects- tunnel surveying- horizontal and vertical adjustments of tunnel centerlines- alignment of railway lines- setting out of structures in water areas- centerline of bridges and its foundations.

CE 356 Coastal engineering

Waves and current movements- stability of shore line- erosion and sedimentation in unstable shoreline- movement of sediment particles- shore protection structures- groins- retaining walls and blocks- submerged, floating and detached parallel break water- modifying the wave property by changing geological bedies property and slope- Revetments of shore line- theoretical and empirical equations representing sediments movements in marine structure zones- sand nourishment.

CE 452 Railways Engineering

Introduction- train dynamics (train resistances- determination of maximum speed to achieve a certain commercial speed- ruling gradient- acceleration and deceleration- braking and stopping distance)- railway track (subgrade- ballast section- design of ballast section- sleepers- rails- fastenings and rail joints- track stresses)- track alignment (cant- superelevation- transition curves and its execution- element of track alignment- longitudinal and cross sections)- track junctions (turnouts- crossings- cross over- double cross over- slips- planning dimensions of track junctions- junctions)- stations (passenger stations- freight stations- planning of marshalling yards- locomotive and wagons yard)- signals (development of railway signaling systems in Egypt- types of mechanical signaling systems- track interlocking and train movement control systems- control systems- electrical signaling systems- automatic block sections- green wave- cabin signals- centralized control systems- automatic control of train movement).

CE 453 Harbor Engineering and Marine structures

Waves (wave properties predictions, changing of wave properties with depth, wave refraction and diffraction, Forces due to wave impact, currents and tides). Harbor Planning (water and land areas, berth classifications)- planning and structural and hydraulic design of break waters- rubble mound- walls- Mixed- floating- submerged- temporary)- Design of gravity quay walls (concrete blocks- counterfort- caissons)- sheet pile quay walls (classification and design). Design of marine platforms supported by off shore piles.

CE 454 Highways Engineering

Structural design: Soil classification for highways – Soil compaction – Drainage of highways and streets. Evaluation of soil strength for design of pavements – Methods of soil stabilization – Design of flexible and rigid pavements – Hot and cold asphaltic concrete– Asphaltic macadam – Maintenance of flexible and rigid pavements. **Geometric design:** Highway classification – Traffic volume – Study and analysis of highways capacity – Design of cross section – sight distances – Vertical alignment of highway – Horizontal alignment of highway – Intersections (at grade and grade separation) Highways and environmental (noise – pollution).

CE 455 Transportation Systems Planning

Transportation planning at national level- road transport- demand and infrastructure- road programs- road management- rail transport (passenger and freight transport)- air transport (airport planning- traffic management)- water transport (inland waterways- ports- handling equipment- warehousing)- pipe transport (pipe lines transport systems for different commodities)- planning elements- operation- transportation system evaluation.

CE 402 Project

Under the supervision of staff members, the student selects the graduation project from the announced branches.

Sanitary Engineering Department

CE 311 Sanitary Engineering

Water resources and characteristics, Water quality, Water collection works, Water purification works, Water distribution works, Sewer systems, Wastewater characteristics, Wastewater treatment works

Wastewater disposal works, Treated wastewater reuse.

CE 312 Water Supply Engineering

Water resources, Water supply work, Water purification, Design and operation of water networks, Water disinfections works

CE 413 Wastewater Engineering

Wastewater characteristics, Wastewater reuse, Wastewater treatment.

CE 402 Project

Under the supervision of staff members, the student selects the graduation project from the announced branches.

Mechanical Engineering Department

ME 111 Fundamentals and Measurements of Heat and Fluid Flow
Units – Energy conservation – Properties of a system – Forms of energy – State and equilibrium – Process and cycles – Heat and work – The first law of thermodynamics – Measurements of Temperature – Kinematics of fluids – Continuity equation – Energy equation – Measurements of pressure, velocity and fluid flow.

ME 141 Mechanics of Materials
Concepts of stress and strain – Stress strain relations – Hook's law – Ductility – Malleability - Thermal stresses and strains – Hertz contact stresses – Hardness – Impact properties of materials – Creep and temperature properties - Axial loading – Torsion – Bending – Transverse loading – Principal stresses – Deflection and stiffness of mechanical members.

ME 142 Mechanical Drawing
Projection and assembly of mechanical elements – Machining symbols – Fits and tolerances – Mechanical parts – Fasteners**.**

ME 143 Mechanics of Machinery-1
Joints – Mechanisms - Degrees of freedom – Analysis of some applied mechanisms – Graphical and analytical analyses of displacement, velocity and acceleration - Gear geometry – Gear trains.

ME 144 Computer-Aided Mechanical Drawing
2D and 3D detailed and assembly mechanical drawings using AutoCAD and similar computer programs.

ME 145 Mechanics of Machines-3
Kinematics: links, joints, pairs and mechanisms. Displacement, velocity and acceleration for mechanisms. Instantaneous centre and vectors methods. Cams. Piston effort and turning moment. Friction: power screw, belts and their drives, collars, brakes and thrust bearings**.**

ME 146 Mechanical Operations
Pipe networks (joints – stresses – deflection) – Pressure Vessels (wall and lid thicknesses) – Transmission (shafts – gears – belts and conveyors)

ME 147 Machine Drawing
Fundamentals of drawing and assembly – Applications in machine drawing and hydraulic systems – surface finish symbols – AutoCad applications

ME 211 Thermodynamics-1
Energy equation – Second law of thermodynamics – Entropy – Perfect gases – Air standard cycles – Compressors – Psychrometry of gas mixtures – steam generation and its processes – Carnot and Rankine cycles – Availability and irreversibility – Real gases.

ME 212 Thermodynamics, Refrigeration and Air Conditioning
Introduction and basic definition. First law of thermodynamics. Energy equation. Second law of thermodynamics. Perfect gas processes. Perfect gas cycles. Gas compressors. Steam. Refrigeration and air conditioning.

ME 213 Thermodynamics and Heat Engines
SI, MKS, and FPS units. Terminologies. Open and closed thermodynamics systems. Thermodynamic processes. First law and second law of thermodynamics. Internal energy. Enthalpy. Specific heat of gases. Application to closed and open systems. Steam boilers. Turbines. Condensers. Pumps. Heat exchangers. Internal combustion engines. Compressors. Perfect gases. Air standard cycles. Reversibility. Entropy. Reciprocating air compressors. Steam tables and charts. Steam processes and cycles. Combined cycles. Introduction to marine gas turbines. Computerized applications.

ME 214 Mechanical Systems
Fundamentals of air-conditioning – Psychrometry – Cooling and heating load calculations – Fire protection – Elevators and Escalators

ME 221 Fundamentals of Combustion Engineering
Engine types – Combustion systems, fuel systems, and ignition systems in reciprocating and rotary engines – Fuel properties and ignition quality – Types of combustion chambers in reciprocating and rotary engines – Combustion thermodynamics – Chemical kinetics – Flame theories – Flammability limits.

ME 231 Fluid Mechanics-1
Forces on immersed surfaces – Buoyancy – Kinematics of three-dimensional fluid motions – Fluid masses moving with acceleration – Vortex motion – Hydrodynamics – Momentum equation - Euler's and Bernoulli's equations – Fluid flow in pipelines – PI-Theorem.

ME 232 Fluid Mechanics and Flow Engineering
Fluid properties – Fluid statics and kinematics – Flow in pipes – Pumps – Valves – Dimensionless analysis and similitude

ME 241 Mechanics of Machinery-2
Synthesis of cam profiles for specified motion – Specified cam contours – Force analysis of mechanisms – Flywheels – Balancing of rotating and reciprocating masses – Introduction to robot systems – Direct and inverse robot kinematics.

ME 242 Computer Applications in Mechanical Engineering
Use of numerical methods and programming for solving applied problems in the various branches of mechanical engineering.

ME 243 Mechanical Design-1
Basics of mechanical design – Design considerations – Factor of safety – Theories of failure – Design for static strength – Design for fatigue strength – Deflection and rigidity considerations – Statically indeterminate members – Curved members – Column design – Pressure vessels.

ME 244 Mechanics of Machines-4
Design and construction of simple joints and parts. Fastening elements: threads, cotters, keys and welded joints. Power transmission with particular reference to marine applications (design of shafts, bearings and couplings). Mechanical vibration: properties of oscillatory motion. Free and damped vibrations. Harmonically excited motion. Rotating and reciprocating unbalance. Support motion.

ME 245 Mechanical Engineering
Theory and design of machines (stress and strain – bolts and nuts – belts – wire ropes – bearings – cams and gears) – Hydraulics (fluid properties – hydrostatics – flow in pipes – pumps) – Thermodynamics (first and second laws – compressors – cycles – steam generation)

ME 246 Stress Analysis and Machine Design
Force analysis – Simple stresses – Thermal stresses – Combined stresses – Mohr's circle – Safety factors – Theories of failure – Buckling – Applications)

ME 311 Thermodynamics-2
Steam cycles with reheat and regeneration – Steam flow through nozzles – Impulse and reaction turbines – Performance and control.

ME 312 Heat Transfer
Steady state conduction – Steady state conduction with heat generation – Fins – Unsteady state conduction – Forced convection – Free convection – Tube banks – Boiling and condensation – Heat Exchangers – Radiation properties of surfaces – Radiation shape factors – Radiation exchange in enclosures.

ME 321Internal Combustion Engines
Advanced injection systems in both spark-ignited and compression-ignited engines – Pressure and flow rate calculations in injection systems – Fuel-air cycles and combustion charts – Chemical equilibrium and dissociation – Emission control – Energy balance of engines – Testing and performance maps.

ME 322 Gas Dynamics
The concept of control volume – Compressible flow – Effects of friction and heat transfer on compressible flow – Shock waves and expansion waves – Aircraft engines – Wind tunnels.

ME 323 Thermal Engineering
Laws of thermodynamics – Air standard cycles – Steam boilers – Turbines – Internal combustion engines – Heat transfer – Refrigeration and air-conditioning.

ME 331 Fluid Mechanics-2
Unsteady flow through pipes – Networks of pipes – Dynamics of compressible and incompressible flow – Continuity equation – Navier-Stokes equations – Boundary layers – Fluid film lubrication – Turbulent flow – Two-phase flow.

ME x32 Fluid Mechanics-3

Introduction: Definition-properties-Measurements-total energy line and hydraulic gradient.
Flow through pipes: laminar and turbulent flow-secondary losses. pipes in series and in parallel-system curve.
Pumps: Dynamic pressure pumps, types, performance, cavitations, pumps in parallel and series.
Positive pumps types, performance.
Hydraulic circuits.

ME 341Mechanical Design-2

Design of shafts and couplings – Threaded joints – Riveted, welded and adhesive joints – Power screws – Mechanical springs – Clutches and brakes – Wire ropes.

ME 342 Mechanical Vibrations

Single and multiple degrees of freedom systems – Free and forced vibrations – Machine Insulation – Critical speeds – Dynamic absorbers – Vibration measurements – Torsional vibrations – Continuous systems.

ME 343 Mechanical Design-3

Gear drives – Belt drives – Sliding (journal) bearings – Anti-friction (rolling element) bearings.

ME 344 Automatic Control

System modeling – Block diagrams – Open and closed loops – Time response to standard inputs – Stability analysis – Error analysis – Frequency response – Polar plot – Bode plot – Root locus – Basic control actions – Control tuning – Compensation techniques – Logic circuits.

ME 411 Thermal Power Plants

Energy resources – Power plants: (Diesel – Gas –Steam – Nuclear – Combined) – Steam power plant: (Steam generators – Steam turbines – Condensers – Evaporators – Chimneys – Fans – Cooling towers) – Variables load problems – Economic and controls.

ME 412 Refrigeration and air Conditioning

Refrigeration methods: (Air refrigeration – Steam jet – Absorption – Thermoelectric) – Refrigeration equipment: (Evaporators – Condensers – Cooling towers – Expansion devices – Compressors) – Refrigeration (cold) stores – Insulation – Psychometric processes and cycles – Cooling and heating loads – Air conditioning equipment (units) – Duct design.

ME 413 Design of Thermal Equipment

Heat exchangers – Condensers – Evaporators – Air washers – Cooling towers – Chilled water systems – Pipes design and thermal insulation.

ME 414 Operation and Management of Thermal Power Stations

This course is intended to study the operation of power station including startup - shutdown - trouble shooting of boilers, turbines, condensers and cooling towers. The management of load between units and investments in energy saving projects is also included.

ME 415 Applications in Thermal Engineering
Refrigeration Applications - Air Conditioning Applications - New and Renewable Energy - Water Desalination Technology.

ME 416 Heat Transfer, Refrigeration and Air Conditioning
Heat transfer by conduction (steady and unsteady). Free and forced convection. Thermal radiation. Heat exchangers. Basic refrigeration cycles and concepts. Thermodynamics of refrigerating media. Cooling load calculation. Multiple evaporators and compressor systems. Refrigeration equipment and control. Necessity for ventilation and air conditioning. Psychromerty. Heating and cooling loads. Air conveying and distribution. Fans and duct designs. Air conditioning equipment and control. Marine ventilation. Purification. Computerized applications.

ME 417 Environnent and Energy
Energy World Resources -Elements of the environment – Sources of pollutants – Air and water pollution – Noise – Nuclear pollution – Permissible limits of pollutants- Standards – Treatment and waste management – Egyptian Law No. 4/94 – Environmental management of energy generation projects.

ME 421 Gas Turbines
Basic types of axial and radial turbines and compressors – Fuel systems – Combustion chambers – Design considerations and effects on performance parameters of turbines – Emission control in gas turbines.

ME 422 Advanced Topics in Combustion Engineering
Advanced studies of selected topics on reciprocating and rotary combustion engines – Emphasis on design, performance, and environmental assessment.

ME 423 Automotive Engineering
Advanced studies of automotive components, modules, and systems (engine – fuel systems – ignition systems – cooling – lubrication – power boosting – transmission – steering –braking – suspension and damping – starting and recharging – emission control) – Update of automotive technology.

ME 431 Hydraulic Machines
Pumps – Turbines – Hydropower stations – Hydraulic circuits.

ME 432 Industrial Fluid Mechanics
Hydro and pneumatic transportation of solid materials (special fluid pumping and flow control in pipelines). Mixing processes, cavitation in hydraulic equipment and pressure transient).

ME 433 Mechanical Engineering Laboratory
Experiments in the fields of Fluid engineering – Thermal engineering – Gas dynamics – Combustion - Mechanical design – Mechanical vibrations – Automatic control.

ME 434 Fluid Machinery
This course is designed to cover the important aspects of design, selection, operation and maintenance of pumps, compressors, fans and blowers beside the theory of each type (rotodynamic or positive displacement).

ME 435 Hydraulic Circuits
Design of basic circuits – Elements of hydraulic circuits and design factors – Performance of basic hydraulic circuits and applications on practical circuits.

ME 441Optimum Design
Formulation of optimum design equations – Methods of optimum design of mechanical parts – Linear programming – Numerical methods of constrained and unconstrained optimum design.

ME 442 Introduction to Mechatronics
Digital circuits and systems – Signal processing – Data acquisition systems – Sensors – Actuators – Fluidic logic – Fuzzy logic control – Artificial neural network control systems.

ME 443 Tribology
Scope and applications of tribology – Surface topography – Friction of metals and elastomers – Hydrodynamic lubrication – Boundary lubrication – Elastohydrodynamic lubrication – Wear mechanisms of metals and elastomers – Abrasion.

ME 401 Project
Students, under the supervision of staff members, shall study and analyze an engineering topic or a problem. They shall design the necessary equipment. The student selects the project in one of the 4 branches in the department.

ME 402 Project
The student continue his project

Textile Engineering Department

TE 111 Drawing and machine Construction -1

Study of principle of projection, engineering drawing and machine drawing. Study of specifications of fastening materials and its uses. Methods of fastening and representation in drawing.

TE 112 Drawing and Machine Construction -2

Representation, drawing, and the study of came, gears and springs. Application for assembly of the textile machine parts (Ginning, spinning, weaving, finishing, knitting and garment).

TE 121 Raw Materials and Fiber Physics

Firstly : Raw materials : Introduction citron on the importance of clothing-development of using cloth –general classification of textile fibers-required properties of textile fibers -natural vegetable fibers-natural protein animal fibers-natural mineral fibers-regenerated man-made fibers-synthetic man-made fibers-blending of natural and man-made fibers.

Secondly: Fiber physics: theories of molecular structure of fibers-method to deduce the fine structure of fibers-methods of fiber sampling-physical properties of fibers(length-fineness-maturity-theories of moisture absorption-mechanical properties of fibers and testing methods-electrostatic properties of textile fibers .laboratory for testing physical and mechanical properties of fibers(theory of instrument-procedure of test-analysis of results) length properties-fineness-maturity of cotton fibers moisture tests-strength test-breaking extension-breaking energy.

TE 213 Design and Theory of Textile Machinery

Introduction to stresses and strain and selection of factor of safely, fastening of machine parts ,bolts ,welds ,keys, pin joints and cottered joints. Shafts and coupling. Belts, ropes and chains. Mechanical springs. Clutches and brakes.

Kinematics A : Mechanisms. velocity and acceleration diagrams. Instaneous center of rotation.

Kinematics B : Velocity and acceleration for mechanisms. Eva wheels. Hook's join Toothed Gears Involute and cyclical profiles helical bevel and screw gears vibration of single degree Freedom free forced damped and undamped vibration transmission ratio balancing of rotating shafts.

TE 222 Yarn Physics and Testing

Yarn physics: Types of yarns-relation between structure and properties-Effect of twist on fiber coherence in yarn-yarn contraction due to twist-theories of yarn structure-fiber migration phenomena inside the yarn-blended yarns and their strength properties of stretch yarns and their strength-properties of stretch yarns and high bulk yarns.

Yarn testing: Uster statistical standards for yarns-uster tester 3 for yarn regularity- tensojet tester-yarn hairiness-automatic twist tester-uster dynamometer- Instron tester- Uster classimat tester-Uster expert system-collective yarn testing (by suberba tester) – yarn appearance tester-ballistic test for yarns.

TE 231 Spinning Technology

A fundamental study of cotton spinning operation, picking, ginning carding, drawing, roving and spinning Laboratory demonstration.

TE 241 Weaving Preparation
Warp and weft preparation processes, winding machines for all types of packages. Beam and sectional warping machines. Sizing and sizing formula and sizing calculation. Drawing-in and denting.

TE 242 Weaving Technology
Yarn and fabric calculations. Production calculations, simple fabric designs. An introduction to weaving machine motions, weaving machine timing. An introduction to knitting, knitting machines-main parts of knitting machines. Methods of knitting designs notations.

TE 314 Mechanics of Textile Machinery
Introduction - stress and strain in rotating parts, card-cylinder, OE-spinning rotor, machine construction, regenerated machine conduction, combing machine construction, vibration in draw - frames and spindles - theory of grinding and application on bobbin building mechanism in ring spinning-design of different bobbin builder systems, winding and building on roving machine and ring spinning - poriex required for weaving machine

TE 323 Textile Quality Control
Sampling, test of significance-statistic basis of control charts. Types of control charts, statistical methods for quality control. Control systems. Quality control principles ability of quality control system - quality control aspects - material control - process control - quality levels for processing product control - yarn quality standards - type of defects-causes and method of preventing and elimination.

TE 324 Physics and Fabric Structure
Physics: Structure of woven fabric-structure of knitted and non woven fabrics-fabric hand and drapability-effect of fabric structure on mechanical properties tearing strength-abrasion resistance-fabric tightness theory-tests of tensile strength and tearing strength-abrasion and pilling-fabric stiffness and drape-fabric hand and comfort –heat insulation-air permeability-water permeability-extensibility of knitted fabric-sewing seam strength- extensibility of knitted fabric-compressibility of of fabrics and carpets-crease resistance-bursting strength for knitted fabric-fabric examination by electron microscope.
Fabric Structure: Fundamental fabric designs and derivatives, analysis of fabric sample-warp dressing -theory of fabric cover factor, cover factor, color effect, crepe and cord designs, multi-layer fabrics, fabrics of reversed weft yarn, terry fabrics, Leno fabrics.

TE 325 Non Woven Fabric
Definitions-methods of production of non- woven fabrics-technology of bonding-raw materials used for non-woven fabrics-properties of nonwoven fabrics –different end uses of non-woven fabrics.

TE 332 Technology of Yarn Production
Introduction. Raw material properties. The principles, construction of main part of blowing room machines, carding drawing ,roving ,combing and spinning. Factors affecting the quality of the processed material, e.g. settings, speeds and drafts. The experimental study on the machine performance at the different stages of yarn production.

TE 333 Technology of wool yarn production
General introduction on wool fibers characteristics. Classification of wool spinning systems: worsted ,woolen, preparing sequence of operations of worsted wool spinning. Classing and sorting. Preliminary - opening and mixing .Scouring ,dyeing and oiling. Worsted card and woolen card and how they differ. Back-washing pre-combing gelling operation .Combing operation .Finisher gelling operation of tops .Drawing stages and their different systems. Roving Spinning operations for different systems. Laboratory demonstration: Systems of spinning worsted and man-made fibers. Yarns.

TE 334 Technology of Synthetic Yarn Production
Different methods of producing regenerated "cellulose" fibers .Preparation of spinning solutions and formulae of Polaner formation. Developments made on technology of fiber production to produce different forms of regenerated cellulose fibers. The effect of production - parameters on the properties of fibers produced-different methods of producing synthetic fibers "polyamides - polyesters, of spinning solution or melt and the formulae of polymers produced - effect of spinning parameters on properties of fiber produced.

TE 343 Weaving Technology
Main weaving machine mechanisms cam shedding motion- types of shedding cams-design of shedding cams-Dobby shedding motion-weft yarn insertion control of shuttle movement and brake-slay mechanism and its calculations-types of slay mechanisms-let-of mechanism and its calculation, types of let off mechanisms-take-up mechanics, types of take up mechanisms and its calculations.

TE 347 Garment Industry
Essential materials and accessions-body sizes-fashion-garment design and manufacturing technology - processing technology: spreading-cutting-sewing-finishing and packaging-quality and production control.

TE 348 Manufacturing and Use of Industrial Fabrics
Concepts of industrial fabrics - comparison on between conventional fabric and industrial fabrics - material used for fabric manufacturing - manufacturing and application of industrial fabric in buildings structures, in filter manufacturing, geotextile, medical fabrics, protective fabrics, in paper industry in special sport equipments, in transport.

TE 351 Computer Application in Textile Industry
Theory of information, computer network, application of CAD systems for different stages of spinning, weaving preparation and weaving (production control, maintenance…etc.)Application of CAD systems in garment industry (Storage, line formation, production control, costing, design,..etc).

TE 352 Information Systems
General theory of information systems, principles and characteristics of different systems, contents, programs design, application on design and data bases for industrial factories (spinning, weaving and garment mills).

TE 435 Technology of Texturizing
Conventional methods of producing continues filament and staple fiber yarns. Tow-to-top conversion systems. Tow-to-yarn direct spinning method. Different methods of producing texturized filament yarns. High-bulk staple (acrylic) yarn. Non-conventional yarn production methods.

TE 436 Theories of Spinning
Some theoretical aspect in yarn formation on different spinning systems. Theory of fiber blending – theory of fiber carding theoretical approach for the fiber drafting. Theory of balloon tension, spinning, winding.

TE 437 Technology of Non conventional yarns production
Technology of yarn formation, factors. Effect of yarn physical and mechanical properties wrop yarn, foney yawn, 60 mrosit yarn, siro spyn yarn fascitated yarn, sewing threads. Industrial application of non conventional yarns.

TE 438 New spinning systems
Modern development in spinning mills Introduction to open End spinning formation of yarn on jet, friction, compact, spinning machines technology, fancy, colored bobtix yarns technology,

TE 444 Weaving and Knitting
Firstly: Automatic weaving machines attachments, warp stop motion, warp protector, weft changing mechanism, multi shuttle box mechanism,
Jacquard: Introduction-types of jacquard machines single and double stroke verdol-special jacquard machines jacquard-speed limitation jacquard calculations (different types of jacquard head)
Secondly: Knitting: A) weft knitting machine-production calculations some basic weft knitting designs, factors affecting on knitting machine performance.
B) Warp knitting machines- Technology of socks production and band production some warp knitting designs, factors affecting warp knitting machine performance.

TE 445 Garment Engineering
Production planning in garment mill, garments design, sizes distribution, losses and waste calculation, material control and handling, loading of labors, production calculations.

TE 446 Technology of Non-Conventional cloth production
Definition of non conventional fabrics, material used in production machine properties and performance.

TE 449 Finishing Technology
Introduction to the fabric characteristics dealing with finishing operations .Dyeing: different classes of dyeing with its technical application and machines .Printing: different methods and application .Functional finishing operations: mechanical and chemical finishing to change fabric appearance ,handle and characteristics .Drying processes and their effects on fabrics. Impact of textile industries on environment and wastewater pollution control.

TE 440 New Weaving Systems

Shuttless weaving machines: advantages of shuttless weaving machines-history of shuttless weaving machine and its development. Air - jet weaving machines: main parts of the air jet weft insertion system, factor affecting the air consumption. Water jet weaving machines: main parts of the water jet weft insertion system, practices and require - meanest for water jet weft insertion-factors affecting water consumption. Projectile weaving machine: main Parts of projectile weft insertion system, factors affecting insertion force. Rapier weaving machines: types of repair weaving machines-main parts of rapierweft insertion system.

TE 454 Automatic Control and Robot in Textile Industry

Theoretical analysis of yarn irregularity sources of unevenness of yarns and their effects. Principles of automatic control systems - Evenness regulating equations, Presentation of Robotics, systems application of Robotic system in textile mills.

TE 401 Project

Students, under the supervision of staff members, shall study and analyze an engineering topic or a problem in the area of waving and textile from what he studied in the department

TE 402 Project

Students, under the supervision of staff members continue the projects selected in the first semester

Production Engineering Department

PE 011 Production Technology
Introduction, Types of industries, Casting processes: Main steps of sand casting, Pattern design, Melting of metals, Cleaning and inspection of casting, Metal forming processes: Forging, Rolling, Extrusion, Drawing, Bending, Joining Processes: Temporary and permanent joints, Welding techniques, Cutting Processes: Principles and elements of cutting processes, Basic cutting and machines (Turning-Drilling-Milling…), Cutting time, Engineering Materials, Measurements, Introduction to management and industrial systems, Production techniques, Factory planning, Costing and Break even analysis, Principles of production planning and control, Introduction to quality control.

PE 111 Operations Research
Definition, Area of application, Linear programming: formulation, graphical solution, simplex method, sensitivity analysis, duality, Transportation, Assignment, Goal programming, Introduction to Queuing theory, Solving operations research problems using available software.

PE 121 Materials Technology - 1
Introduction, Material classification, Material properties, Solidification mechanism, Microstructure of metals, Alloying theory, Solid solutions, Equilibrium diagrams, Iron carbon equilibrium diagram, Types of steels, Types of cast irons, Copper alloys, Heat treatment of steels and cast irons, Polymers, Polymers structure and types, properties of polymers, Processing and uses of polymers.

PE 122 Foundry and Welding
Steel making, Ingots, Ingot defects, Continuous casting, Castings microstructure, Microstructure after re-crystallization, Melting furnaces, Casting technology, Patterns and their design, Mold design, Mold sand, Core sand and core making, Shell molds, Ceramic molds, Permanent molds, Die casting, Centrifugal casting, Casting defects, Heat treatment of castings, Types of welded joints, Gas welding and cutting, Types of arc welding, Plasma welding and cutting, Ultrasonic, Electron beam welding, Types of weldments, Welding Metallurgy, Welding Defects.

PE 123 Production Engineering - 1
Manufacturing techniques, Casting technology, Hot and cold forming, Metal cutting, Non conventional machining, Finishing and surface protection, Welding processes, Measurement and inspection, Introduction to planning and scheduling.

PE 128 Metal Engineering and Technology
Crystalline and Non-crystalline structure of metals, Ceramics, Polymers and composite materials, Iron-Carbon alloys, Heat treatment, Casting of Metals, Plastic Forming of metals, Forging and Extrusion, Wire Drawing, Welding processes.

PE 131 Machining Processes
Introduction to metal cutting, Tool geometry, Tool materials, Cutting forces, Force and velocity diagrams, Specific energy and machining power, Built up edge -Stress distribution in the cutting area, Tool life and tool wear, Motion transmission in machine tools, Stepped and stepless mechanisms, Machining time, Machining economy, machining sequence.

PE 151 Machine Tool Elements Drawing - 1
Drawing as engineering practice, Views, sections, and hatching in machine drawing, Freehand sketching, Drawing of helical surfaces, threads, keys, pins, splines, sliding and rolling bearings,

lubricating devices, locking and packing elements, jigs and fixtures, Assembly drawing and working drawing.

PE 152 Machine Tool Elements Drawing - 2
Dimensioning (limits of size and geometrical tolerances), Designation of surface characteristics and materials, Drawing documents, Assembly Drawing gears, springs, power transmission devices (belts, chains, wire ropes…etc.), detachable joints, welding joints, Computer aided Assembly and Working drawing.

PE 232 Forming Technology
Classification of forming processes, Bulk metal forming, Rolling, Flat rolling, Rolling of sections and shapes, Special rolling operations, Extrusion, Direct and reverse extrusion, Impact extrusion, Forging, Open die forging, Closed die forging, Wire drawing, Bar drawing, Tube drawing, Ironing, Sheet metal forming, Shearing, Bending, Spinning, Stretching, Deep drawing, Forming dies, Forming machines.

PE 224 Solid Mechanics
Basic principles of Stresses and strains, True stresses and strains, Thermal stresses, Compound bars, Bending and deflection, Torsion, Principal stresses in two dimensions, Three dimensional stresses, Three dimensional strains, Stress strain relationships in the elastic range, Strain energy and yield criteria, Thin and Thick cylinders, Residual stresses, Theory of plasticity -Experimental stress analysis (Strain gauges), An introduction to fracture mechanics.

PE 225 Materials Technology - 2
Aluminum alloys, Titanium alloys, Magnesium alloys, Steel alloys, Heat treatments of non-ferrous alloys, surface treatments (case hardening, coatings, surface alloying), Powder metallurgy, Ceramics structure, Manufacturing of ceramics, Properties and applications of ceramics.

PE 226 Technology of Electrical Material
Introduction and terminology, Mechanical properties of materials: Tension, Compression, Bending, Shear, and Torsion, Structure of material and manufacturing processes, Properties of conductors, resistances, semi-conductors, Electro-thermal materials, Magnetic materials, Isolating materials, Optical fibers, Polymers, Forming of sheet metal.

PE 228 Production Engineering - 2
Metal cutting, Forces and cutting angles, Machining time, Cutting fluids and tool materials, Turning processes, Milling processes, Gear cutting, Indirect measurements and methods of magnification.

PE 232 Theory of Metal Cutting
Tool materials. Tool wear and life. Machinability. Mechanics of metal cutting for single and multi point tools. Orthogonal and oblique cutting. Cutting forces diagrams, velocity diagrams. Specific energy and power. Rate of metal removal. Thermal aspects in metal cutting. Cutting forces analysis and Thermal aspects for: Turning, Drilling, Milling processes. Machine Tools Dynamometers

PE 241 Dimensional Metrology
Concept, principles, and applications of dimensional metrology. Standardization, specifications, and units. Measurement process. Calibration of measuring equipment. Measurement errors. Dimensional tolerances and fits. Limit gauges principle, design, and applications. Concept, principles, and applications of amplification and magnification systems.

PE 253 Theory of Machines
Machine kinematics, Principals of motions, Motion and inertia, Mechanisms, Velocity and acceleration in machines, Cams, Gears relations, Analog computing mechanisms, Machine dynamics: Inertia forces, Flywheel, Gyroscopic effects, Speed systems (governors).

PE 261 Machine Tool Elements Design - 1
Concept of design, mechanical design, simple and compound machines, machine elements, power for driving machines, mechanical advantages and efficiency, Designing based on Modes of failure– Engineering materials, Types of loading, (Simple, compound and fatigue stresses), Stress raisers, Factor of safety, Design stress, Axles, shafts and spindles, Design of Shafts (under static and cyclic loads), Design of belts, wire ropes and chains.

PE 262 Machine Tool Elements Design - 2
Design of bolts, power screws, keys and spline. Design of detachable and permanent joints (threaded, welded, and riveted joints), Design of: Springs, couplings, clutches, gears (spur, helical, bevel, worm and worm wheel).

PE 313 Facilities Layout and Design
Production systems -Material requirement, Process requirement, Flow Analysis, facilities Layout and location, Factory buildings, material handling equipment -warehousing

PE 326 Plasticity and Metal Forming
Introduction, Stress, strain relations in the plastic range, effect of strain-rate, Empirical equations, Slab method for calculation of forming loads, Plane strain and slip-line fields, Effect of friction, Upper bound theory, Visu-plasticity, Finite element analysis in plasticity, Applications (upsetting, flat rolling, extrusion, drawing, bending), Sheet formability.

PE 327 Non Destructive Testing
Types of defects in raw materials and products, Fundamentals of non destructive tests, Visual inspection technology, Die penetrate test, Magnetic particle test, Eddy currents test, Gamma-ray and X-ray tests, Properties of X-ray films, Reading of X-ray results, Fundamentals of ultrasonic test, Test equipment and transducers, test methods, Applications of ultra sonic test.

PE 328 Non Conventional Forming Processes
Effect of high speed on material formability, Mechanical high speed forming machines, Electro-hydraulic forming, Electro-magnetic forming, Explosive forming.

PE 334 Production and Operations Management
Types of industries and types of production, Demand Forecasting, Determining the optimum capacity of the production unit, aggregate production planning, Inventory control, Production lines balancing.

PE 335 Abrasive Machining
Mechanics of abrasive cutting. Theories and technologies of abrasive particles machining, Machining processes and induction cycle theory, Features of abrasive particles, Grinding. Honing. Lapping. Polishing (Aspects to be covered for these topics: Principle of Process. Operations. Tool shape and geometry. Working conditions. Thermal aspects).

PE 336 Non Conventional Machining Processes
Classification of non-conventional machining operations. Mechanical non-conventional machining operations. Electric non-conventional machining operations. Thermal non-conventional machining operations. Chemical non-conventional machining operations. Rapid Proto Types for manufacturing. Manufacturing of Gears.

PE 342 Geometrical Metrology
Geometrical features and tolerances. Measurement and evaluation of geometrical errors. Measurement principles, methods, and applications for screw threads, gears, bearings, and surface texture.

PE 343 Metrology and Sensors
Principles of dimensional and geometrical measurements, Error in measurements, Interferometry, Laser measurements, Surface texture measurements, Sensors.

PE 363 Theory and Design of Machine Tools - 1
Theory of vibrations:, Introduction, vibrations in industry, Vibration measurement and analysis, Vibration Instrumentation, Theory of vibration of a single degree of freedom system (free vibration, damped free vibration, forced vibrations), Introduction to multi degree of freedom system, Dynamic Balancing of Rotating Equipment, Theory of vibration Isolation.
Hydraulic and pneumatic drives: Definitions, Generation of pressure, Piping systems, Types and properties of pumps and compressors, Control valves, Hydraulic and pneumatic circuits and applications.

PE 364 Theory and Design of Machine Tools -2
Machine tool frames, Guide ways and its types, installing and removing spindles, Spindle Bearing Design -Power transmission in machine tools, Speed and Feed gears boxes, Jigs and Fixtures (Design principles, Fixation instruments and methods), Principles of machine foundation.

PE 411 Engineering Management and Organization
Management talent, Engineering organization, Scientific management in engineering, Fundamentals and concepts of new trends in engineering management, The engineer and the environment, Engineering and its influence on the modern engineering management.

PE 412 Knowledge Engineering
Knowledge engineering, knowledge acquisition, Fundamentals of expert systems, Information systems: Principles, Types, Technology, Processing, Executives information systems, and Decision support systems, artificial intelligence

PE 413 Industrial Systems Modeling and Simulation
Queuing theory: single service channel, multi service channel, and applications, Simulation: Simple examples, random numbers, verifying simulation models, Marcovian chains.

PE 427 Advanced Materials Technology
Composite materials: Introduction, design of composite products, lamina properties, reinforcement forms, fabrication processes, environmental effects, non-destructive testing of composites. Smart Materials: Introduction, Piezoelectric materials (properties, actuation of structural components by piezoelectric crystals), Shape memory alloys (Constitutive modeling of the shape memory effect,

shape memory actuators, applications), Rheological fluids and their applications, Optical fibers and their applications.

PE 428 Engineering Material Selection
Main properties in material classification, Material behavior: mechanical resistance, effect of chemical corrosion, limit of material use, environmental effects, biological effects, customer requirements, Material selection according to (mechanical strength, wear, hardenability, high temperature).

PE 429 Failure Analysis
Introduction, Brittle fracture, Ductile fracture, Griffith's Theory and Irwin's theory, Crack initiation, Crack propagation and spreading, Fracture toughness, Reasons of failures, Procedures of failure analysis, Metallurgical failure analysis, Creep, Case studies.

PE 420 Die Design
Classification of dies, Main components of the die and the auxiliary components, Die materials, Die manufacturing, Design of forging dies, Design of extrusion dies, Design of drawing dies, Design of sheet forming dies, Design of plastic forming dies, Standard die instruments, Feed mechanisms, Mechanization and control.

PE 431 Advanced Machining Technology
Introduction to modern machining processes, Classification of advanced machining processes, Theories and mechanisms of metal removal and surface formation, Machine systems and control, Design considerations, Special precautions in product design, Wire cutting, Die cutting, Abrasive cutting, Chemical etching of electric circuits.

PE 432 CNC Machine Tools
Introduction to machine tools and development in control systems, Fundamentals of numerically controlled machine tools, Machining systems using numerical control, Programming systems for numerically controlled machine tools, Tool selection and arrangement, Consideration of tool geometry in programming, Standard and automatic subroutines, Product drawing, Work piece considerations in programming, Reasons for using numerically controlled machining systems, Machine capabilities, Numerically controlled machines testing

PE 443 Mechatronic Systems
Introduction and definitions. Mechatronic systems design. Modeling of systems. Sensors and transducers. Actuating devices. Hardware components for Mechatronics. Signals and Systems control. Advanced applications in mechatronics and examples.

PE 444 Advanced Metrology Systems
Design concept and principle of metrology systems. Optical interference, laser based, and fiber optics based measuring systems. 3-D coordinate measuring machines. Automated measuring systems. Introduction to computer aided, intelligent, and virtual metrology systems.

PE 445 Quality Control
Principles and standards of quality systems. Models and inferences for process/product quality. Tools for quality. On line and off line quality control techniques. Implementation of quality control systems. Principle and implementation of quality control charts for variables and attributes. Acceptance sampling principle, plans, schemes, systems, and implementation.

PE 446 Quality Improvement and Management

Quality improvement concept, principle, and approaches. Organizational subsystem for quality improvement. Supply chain. Project approach and problem solving. Benchmarking. Quality function deployment. Quality costing. Quality improvement implementation process. Concept and principle of TQM. Quality management standards. Traditional process, and system approaches to quality management systems. Standard, nonstandard, and tailored approaches to implementation of TQM.

PE 447 Computer Aided Metrology Systems

Concept and principle of computer aided metrology systems. Metrology system's physical elements. Data analysis and feed back systems. Image and pattern recognition systems.

PE 465 Advanced Machine Tools

Automation in machine tools. Automatic and Semiautomatic machines. Turret lathes. Automatic machines. Cam design for automatic lathes. Introduction to numerically controlled machines. New trends in Machine Tools.

PE 466 Automatic Control

Historical review on Automatic control, Open and closed control circuits, feed back control, control measuring instrument, design of control systems, analysis of control systems, errors of control systems, stability of control systems, computerized control, data input and programming.

PE 467 Machine Tools Dynamics

Introduction, Dynamic properties of machine tools and their testing, Dynamic testing of machine tools, Modal analysis of Machine tool, Applications of machine dynamics (Predictive maintenance, Machine tools structural Design).

PE 468 Principles And Applications Of Noise Control Systems

Sound and Noise, Noise measurements and analysis, definition of noise, Noise control measurements, Methods for noise reduction, Applications, Examples of noise control, Noise absorption, Noise magnification in closed air tunnels, Noise of air motion, Noise in liquid carrying pipes, Noise reduction in transportation.

PE 469 Maintenance Technology (Machine Condition Monitoring)

Maintenance methods and technologies. Why machine monitoring, What to measure, Equipment for measurements, Recording and analysis, Mechanical measurements, Machine condition diagnostics, Defining and evaluating machine defects, Case studies, Monitoring programs.

PE 401 Project

Under supervision of staff member student study, analyzing of an engineering problem or subject.

PE 402 Project

The student continue his project

Marine Engineering and Naval Architecture Department

MR 111 Ship Machinery Drawing

Types of fastenings: screws, bolts, rivets, welds and separable joints. Springs. Assembling of machine parts. Use of available computer applications (AutoCAD, Origin, etc.) in preparing the necessary drawing projections and details. Marine propellers projections. Different ship outfittings: piping connections, valves, deck machinery, hatch covers, manholes, couplings, shafts, stern tubes, rudders.

MR 112 Naval Architecture-1

Types of ships. Ship lines. Form coefficients. Hydrostatic curves and calculations. Bonjean curves. Transverse stability at small angles. The inclining experiment. Stability when grounded. Longitudinal stability and trim. Statical stability curve and cross curves of stability. Effect of changes in form on stability. Stability criteria. Intact stability of unconventional ship forms. Use of available computer applications in preparing complete calculation sheets and plots of ship hydrostatic particulars (Excel, AutoCAD, Autoship, etc.).

MR 113 Ship and Machinery Drawing

Definition of ship form. Ship dimensions and related nomenclature. Drawing and fairing of ship lines. Lines plans for different ship types. Drawing of different types of bows and sterns. Free-hand sketching. Three-dimensional sketches. Use of available computer applications (AutoCAD, Autoship,etc.).

MR 141 Ship Structural Analysis-1

Definitions: Coordinates, Forces, Moments. Types of stresses and strains. Types of structures and supports. Types of simple loads. Equilibrium equations. Geometrical properties of sections. Simple beam theory. Pure bending moment. Shear force and bending moment diagrams for statically determinate beams under general loads. Statically determinate trusses. Combined and principal stresses. Mohr's circle in 2-D. Introduction to column buckling. Use of available computer programs to carry out necessary calculations and appropriate drawings.

MR 211 Naval Architecture-2

Floatation calculations by the lost buoyancy and added weight methods. Floodable length curve. Subdivision and damage stability criteria. Methods of transferring ships into and out of water. Launching calculations. Tonnage calculations. Load line calculations for type A and type B ships. Use of the available computer applications in carrying out all the necessary calculations and the appropriate illustrative plots.

MR 224 Computer Programming

Introduction to computer programming languages, Rules and details for a scientific programming language (FORTRAN, BASIC, PASCAL, C), Computer applications in the maritime field.

MR 231 Fluid Mechanics

General properties of fluids. Fluid static. Pressure distribution on planar and curved surfaces. Kinematics. Mass conservation. Continuity principle. Stream functions and velocity potential. Potential function. Application to basic flows (uniform, source, sink, doublet and vortex flows). Flow past circular cylinder. Blasius relations. Kutta-Joukowski theorem. Flow mapping. Transformation. Airfoil theory. Added mass principle. Computer applications and lab sessions.

MR 232 Fluid Mechanics and Hydraulic Machines
Conservation of momentum. Momentum equations. Energy conservation. Energy equation. Bernoulli's equation. Laminar and turbulent flows over flat and curved surfaces. Boundary layer theory. Application to pipe flows. Energy and hydraulic gradient head losses. Applications to pumps and pipe arrangements. Pump types and performance charts. Applications to ship systems. Use of available illustrative material and computer applications.

MR 241 Ship Structural Analysis-2
Structure and load idealization. Deformation of structures. The principle of superposition. Compatibility equations. Statically indeterminate structures. Classical methods of solution (Three-moment equation. Slope deflection method. Moment distribution). Energy theorems. Transverse strength of ships. Buckling of elastic beams under general loading. 3-D stress-strain analysis. Design of pressure vessels. Computer applications.

MR 242 Material Technology
Types of materials. Material properties: physical, chemical and metallurgical. Phase changes. Phase equilibrium diagrams. Welding metallurgy. Corrosion and corrosion protection. Brittle fracture. Computer applications.

MR 261 Ship Construction
Ship types, configurations and characteristics. Classification societies, class symbols. Shipbuilding materials. Framing systems. Ship structural elements, connections and details. Structural assemblies (bottom, side, deck, etc.). Midship section of different ship types. Fore end, aft end, rudder, engine foundation, superstructure, stern tubes, etc. Use of available illustrative computer applications and/or available illustrative material in demonstrating the construction details of the ship.

MR 311 Probabilistic Methods in Marine Systems
Basic concepts of probability. Random variables. Probability density functions. Stochastic processes. Fourier series and transforms. Spectral analysis. Ocean wave spectra. Linear systems. Input-output relations. Applications to marine systems: vehicle dynamics, structural design, etc.

MR 321 Ship Design-1
Process and procedure of ship design: specifications, tenders, offers, contracts. General procedures for cargo vessel design. Definition of speeds. Classification of ship's weights for different purposes. Steel weight estimation methods and comparisons. Development of ship hull lines and corresponding powering methods. Modifications to ship hull lines. Mathematical ship hull surface definition and variations.

MR 322 Ship Outfittings
Cargo handling gears. Deck equipment and machinery. Anchoring systems. Cargo access and hatch covers. Mooring of ships. Stairs, ladders and railings. Doors and windows. Steering gears and rudders. Ventilation and air conditioning. Life saving equipments. Fire-fighting systems. Ship piping systems. Joiner work. Insulation in ships. Corrosion control and paint systems. Internal fittings in cargo holds.

MR 331 Ship Hydrodynamics-1
Dimensional analysis for the problem of ship resistance. Detailed calculations of ship resistance components. Model testing techniques. Extrapolation of model results to full scale. Resistance prediction from standard series. Resistance in shallow and restricted waters. Methods of reducing

ship resistance. Wind forces. Beaufort scale. Waves and wind. Sinusoidal water waves. Standing waves. Depth effect. Pressure in waves. Wave energy. The frequency of encounter. Uncoupled heaving, pitching and rolling motions. Use of available illustrative material and computer applications

MR 332 Ship Hydrodynamics-2

Powering prediction. Propulsion systems and devices. Airfoil theory. Screw propellers. Theories of propeller action. Law of similitude for propellers. Interaction between hull and propeller. Cavitation. Propeller design. Steering and maneuvering. Ship motion in horizontal plane. The turning path of a ship. Maneuvering tests and trials. Directional stability. Rudder design. Use of available illustrative material and computer applications.

MR 333 Dynamics of Marine Vessels

Forces initiating ship motions at sea. Linearized equations of motion for a ship in six degrees of freedom. Undamped motion in still water. Damping. Analytical treatment of added mass. Motion in regular waves. Stabilization of rolling motion. Experimental methods of studying ship motions. Irregular waves. Wave spectra. Motion in an irregular seaway. Use of available illustrative material, computer programming and plotting applications.

MR 341 Ship Structural Design-1

Hull girder loads and response. Statistical representation of wave loads. Geometric characteristics of ship hull sections. Hull girder shear and bending stresses. Failure theories. Classification society's rule strength requirements. Computer applications to ship structural design.

MR 351 Ship Propulsion Systems

Review of ship powering. Requirements of marine power plants. Classification of marine power plants. Selection of marine propulsion systems. Propulsor types. Propulsion transmission system. Shaft alignment. Energy saving in marine power plant. New and renewable energy. Use of available illustrative material and computer applications

MR 352 Marine Power Plants

Types of marine power plants. Requirements of marine power plants. Selection of marine power plants. Engine room layout of various marine power plants. Performance assessment of marine power plants (heat balance, torsional, longitudinal and lateral analysis of shafting system). Ship piping systems. Electric power generation and distribution. Electric load analysis. Use of available illustrative material and computer applications.

MR 361 Shipbuilding Technology

Types of shipyards. Shipbuilding materials. Material handling. Fabrication processes. Outfitting processes. Planning and scheduling. Production and material control. Ship tests, trials and delivery. Launching and docking ships. Life cycle analysis of ships. Ship hull maintenance and repair. Ship conversion. Ship scrapping.

MR 411 Risk Analysis

Introduction and definition of main risks. Risk Assessment: qualitative and quantitative risk assessment. Hazard identification. Accident consequences. Tolerability of risk and ALARP principle. Safety in design. Formal safety assessment.

MR 421 Ship Design-2
Inland navigation: cargo and passenger transportation units, hydrodynamic problems of shallow water units. Use of alternative materials in shipbuilding. Simplified study of the design and performance of unconventional units: planning and semi-planning hulls, SWATH, hydrofoils and hovercrafts. Use of straight framed ships. Techno-economical evaluation of ship offers.

MR 422 Computer Aided Ship Design
The concept of computer aided drafting. CAD system: shape and size description or generation, constructing engineering drawings, editing and facilitation, 3-D modeling, graphics partial programming. CAD/CAM process and their industrial applications. Applications to different ship design processes.

MR 441 Ship Structural Design-2
Matrix stiffness analysis of frames and grillages. Plate bending. Orthotropic plate bending. Elastic buckling of plates. Limit state analysis and ship structural failure. Computer applications.

MR 442 Marine Structural Dynamics
Overview of structural dynamics. Single degree of freedom systems. Multi-degree of freedom systems. Response of continuous structures. Response of lumped mass systems. Vibration of ship's hull. Use of computer programs and/or applications.

MR 452 Auxiliary Machinery
Requirements of marine auxiliary machinery. Components and characteristics of marine auxiliary machinery. Valves. Pumps and pumping. Air compressors. Oil water separators. Centrifuges and sewage plants. Heat exchangers. Stabilizing systems. Desalination plant.

MR 461 Shipyard Engineering
Distortion control in shipbuilding. Excess and shrinkage allowance standards. Shipbuilding economics and cost analysis. Accuracy control. Work content and breakdown structure. Integrated hull construction, outfitting and painting (IHOP). Role of computers in shipbuilding. Robotics in ship building. Shipyard design systems. Design for Production.

MR 471 Offshore Engineering-1
Drilling systems. Ocean structures. Support systems. Mooring and buoy systems. Pipe-laying. Salvage and rescue systems. Ocean mining. Offshore oil production systems. Modules and integrated decks. Diving and submersibles. Role of classification societies.

MR 472 Offshore Engineering-2
Environmental loadings. Energy spectrum of the sea. Design environmental conditions. Offshore platform jacket structures. Offshore platform pile foundation. Mooring and towing cable design. Introduction to the dynamic analysis of offshore platforms.

MR 401 Research Project in the Marine Field
The student is required to carry out a research report in a subject of his/her choice under the supervision of a faculty member in one of the following fields: ship hydrodynamics, ship structural design, ship design, marine engineering, offshore engineering, etc. in order to develop his/her research and writing skills.

MR 402 Design Project

The students are divided into groups; each group is required to study and carry out a marine design project, mostly a ship, yacht or offshore structure, under the supervision of a faculty member. Oral presentation, discussion and written report are required.

Electrical Engineering Department

EE x11 Electric Circuits
DC circuit analysis: reduction methods, mesh/loop and node methods, transformation methods, Network theorems. First-order transients. AC circuit analysis: sinusoids and phasors, steady state conditions, impedance and admittance, power and energy, Balanced and unbalanced three-phase circuits. Computer applications.

EE 112 Electrical Engineering Fundamentals
Electrostatics. Electromagnetics. Transformers. Electromagnetic energy transformation.

EE 121 Electric and Electronic Measurements
Accuracy of measurement and error analysis. Analog instruments and CRO: construction and applications. Comparison methods. Bridges and potentiometers: construction and applications. Instrument transformers. Primary sensing elements and transducers. Signal conditioning, Data acquisition and conversion. Fundamentals of digital measurements. System instrumentation and applications.

EE 131 Modern Physics
Special relativity. Quantum effects: particle aspect of electromagnetic radiation and wave aspects of material particles. Atomic physics. Introduction to nuclear, molecular and solid-state physics. Introduction to crystallography.

EE 132 Electronic Devices and Circuits
Introduction to semiconductor theory. Ideal diode. Junction diodes: construction; i-v characteristics and diode equation; circuit models; various applications. Special-purpose diodes. Bipolar Junction Transistors (BJT) and Field Effect Transistors (FET): Types and physical structure; variables and symbols; Basic configurations and characteristic curves; modes of operation and their models; Large signal models and biasing circuits; Small signal models; Small signal amplifier configurations; Computer aided analysis.

EE 141 Introduction to Logic Circuits and Programming
Number systems, codes, and Boolean algebra. Logic gates. Combinational sequential circuits. PLA. Memory systems: RAM and ROM. Input-output devices. High level language programming.

EE 151 Introduction to Energy Systems
Conventional (thermal and hydraulics) and non-conventional (nuclear, solar, and wind) energy sources and applications. Batteries: types, construction, testing, and applications. Energy utilization. Lighting/Lamps: characteristics and applications. Lighting systems: design, standards and specifications, installations, and testing. Lighting contours: calculations and computer graphics. Electric transformers.

EE 212 Electric Circuit Analysis
Resonance in electric circuits. Second-order Transients. Magnetic coupled circuits. Network functions and s-domain analysis. Frequency response and filters. Fourier series technique applied to circuit analysis. Laplace transform and its application to circuit analysis. Two-port networks. State-variable analysis. Topological and sensitivity analysis. Computer applications.

EE 233 Solid State Electronics
Introduction to quantum mechanics principles: Schrödinger wave equation and its applications in one dimensional problems. Energy distribution functions. Free electron theory of metals. Band theory. Semiconductors. Dielectrics. Ferroelectrics. Ferromagnetics. Superconductivity.

EE 234 Electronic Circuit Analysis
BJT and FET Amplifiers: types, circuit models and frequency response: Bode plot. Differential and multi-stage amplifiers. Large signal analysis and power amplifiers. Operational amplifiers: characteristics, applications, and imperfections.

EE 235 Electronic Engineering
Small signal amplifiers. Large signal amplifiers. Feedback oscillations and Op-Amp circuits. Power supplies. Timers.

EE 236 Electronics
Models of electronic equipments. PN junction diode. Bipolar Junction Transistors (BJT). Field Effect Transistors (FET). Transistor inverting circuits. Logic gates circuits. Unsaturated gates. Semiconductor memories.

EE 242 Logic Circuit Design
Quine. McClusky procedures for logic circuits simplification. Multiple-output networks and PLAs. Synchronized counters. Synchronous and asynchronous sequential networks.

EE 243 Microprocessor Fundamentals
Organization of digital computer: Bus concept, memory mapping, representation of data, instruction sets, addressing modes, microprocessor families, Assembly language programming, surveys of operating systems, issues and principles of storage management.

EE 252 Electric Power Engineering -1
Introduction to power systems. Transmission lines: parameters, solution, electric performance, physical interpretation of TL equations, reactive power compensation and voltage control. Low voltage distribution: design, systems, associated power equipment and switch gear. Power factor correction. Load study.

EE 253 Electric Power and Industrial Electronics
Transmission lines. Insulators. Cables. Distributed loads. Electrical protection methods. Diode and rectifier circuits. Thyristor circuits. Controlled rectifiers. AC voltage controllers. DC choppers. Inverters.

EE 261 Electromagnetic Fields
Electrostatics: Coulomb's law, electric field, Gauss's law, divergence theorem, energy and potential, conductors and dielectrics, capacitors and capacitance. Magnetostatics: Biot-Savart law, Ampere's circuital law, Stoke’s theorem, magnetic forces, materials, and devices. Inductors and inductance. Faraday's law. Time varying fields. Maxwell's equations. Wave equation.

EE 267 Acoustics
The course includes the study of the nature of sound and design measures. Sound absorption. Frequencies. Sound transmission. Noise and requirements for good listening. It also covers the principles and applications of sound processing inside buildings and sound behavior in architecture.

It also studies the control of sound in closed rooms and surrounding spaces. The course gives the student a good knowledge in modern acoustical techniques and electrical acoustic systems.

EE 271 Electric Machines and Power Systems
Electric machines: DC machines (generators and motors) introduction to ac machines: windings, fields, Electro-motive force, armature reaction. Introduction to electrical power systems: transmission lines, load characteristics, distribution systems, underground cables.

EE 272 Electric Machines Engineering -1
Electro-Mechanical Energy Conversion: conservation of energy, fields and relevant energy, singly excited systems, energy conversion, force and torque equations, applications, doubly excited systems, dynamic equations, applications. DC Machines: construction, winding and commutation, dc generators, types and characteristics. DC Motors: types, starting, characteristics and speed control, parallel operation of DC generators, efficiency and losses in dc machines, applications of dc motors.

EE 313 Electric Engineering Materials
Introduction and units, Potential, Energy, and mobility, conducting materials. Electric conduction, mean free path of charged particles, energy levels, conductivity and factors affecting, boundary conditions, type of conductors and industrial applications, elements, alloys, and extra conductors. Insulating materials : Properties in static fields, loss factor, loss angle, surface resistance, internal resistance, and combined resistance, permittivity, polarization, electric strength, boundary conditions, factors affecting choice of dielectrics, surface and volume resistivity of dielectrics. Magnetic materials: Definitions, magnetability, permeability, theory of magnetism, dipoles, field intensity, boundary conditions, types of magnetic materials and their industrial applications, effect of extra low temperature. Superconductivity in semiconductors and applications: cryogenic materials, superconducting theory, B.S.C theory, Messner effect. Modern industrial applications.

EE 314 Electric and Electronic Engineering
Introduction, electronic systems and application, integrated circuits, amplifiers, transmission and reception of waves, digital circuits and its components, electro-optical devices, industrial electronics.

EE 322 Measurement Systems
Current transformers: Conventional and modern, potential transformer: Conventional and modern. Sensors and Transducers of non-Electric quantities (temperature, force, pressure, displacement, speed, level, flow), Signal conditioning (filters, amplifiers, transmitters), Counters and their applications in modern measurement systems, Analogue to digital conversion and its application in digital multimeters, Data acquisition and automated measuring system with reference to SCADA applications, Microprocessor controllers measuring system.

EE 331 Electronic Circuits and Pulses
Introduction to semiconductors, PN junctions and their applications, Bipolar junction transistors and their applications, field effect transistors and their application, operational amplifiers and their applications, digital converters, frequency converters

EE 336 Semiconductor Devices
Fundamentals of carrier generation, transport, recombination, and storage in semiconductors. Physical principles of operation and first order device models of PN junction, metal-semiconductor

contact, BJT and MOS transistors, and other related devices. Basis of semiconductor devices fabrication.

EE 337 Analog Integrated Circuits
Feedback amplifiers, oscillators and multivibrators. Introduction to analog ICs. Basic single-stage IC-MOS amplifier. Differential and multistage IC amplifiers. The 741, CMOS and BiCMOS Op Amps. Some special purpose ICs.

EE 338 Introduction to Integrated Circuits
Fabrication of IC's. Differential amplifiers. Operational amplifiers. Some special IC's, 555. Timer and PLL. Switching characteristics of electronic devices. Comparators. Logic circuit families

EE 339 Power Electronics -1
Introduction. Circuits with switches and diodes. Power Semiconductor Switches. Controlled Rectifiers. AC Voltage Controllers. DC to AC Converters. Inverters. AC to AC Converters.

EE 345 Microprocessors -1
Microprocessor architecture and bus concept. Microprocessor families. Addressing modes. Representation of data. Instruction sets. Assembly language programming. Memory and input/output mapping.

EE 353 Electric Power Engineering -2
Medium Voltage Distribution: design, system, associated power equipment. Transmission Lines: corona, insulators, towers, mechanical design, Traveling Waves and Transients on T.L, Power Cables.

EE 354 Protection of Power Systems -1
Per Unit System. Symmetrical Faults. Symmetrical Components. Unbalanced Faults. Theory of Protection. Electromagnetic Relays: types, theories of operation, characteristics. Systems of protection. Protection of Power Equipment (Generators, Motors, OHTL, Cables, Buses, Transformers...). Protection of Complete Power Systems. Primary, Secondary, Control and Tripping Circuits. Damage Characteristics of Power Equipment. Relay Coordination.

EE 362 Electromagnetic Waves and Acoustics
Plane wave solutions for the wave equation. Wave in material media: dielectrics and conductors. Polarization, reflection and transmission of waves. Propagation of electromagnetic waves: space, ground waves. Wave propagation in the troposphere and ionosphere.
Acoustics: Acoustical wave equation. Plane and spherical acoustical waves. Sound power and loudness. Reflection, transmission and absorption of sound. Environmental Acoustics and noise control. Electroacoustics and sound systems.

EE 363 Microwave and Optical Transmission Media
High-frequency transmission lines. Smith chart. Stub matching techniques. Rectangular and circular waveguides. Microstrip lines. Cavity resonators.
Physics of light. Optical fibers: types, modes, characteristics, and configurations. Mode theory for cylindrical waveguides. Single-mode fibers. Integrated optical waveguides. Signal degradation in optical fiber: attenuation, modal distortion, and dispersion. Fiber materials, fabrication, mechanical properties, and cabling.

EE 364 Microwave Devices
Microwave tubes: klystrons, traveling wave tubes, backward wave oscillators, magnetrons. Microwave semiconductor devices: bipolar transistor, FET, tunnel diode, transferred electron devices, avalanche transit-time devices, parametric devices.

EE 365 Optical Devices
Light Sources: Light emitting diodes, semiconductor laser diodes. Power launching and coupling: Source-to-fiber power launching, fiber-to-fiber joints, and fiber-to-detector coupling. Light detectors: Semiconductor photodiode, pin photodiode, avalanche photodiode. Electro-optic, acousto-optic, and magneto-optic devices. Optical amplifiers: Semiconductor optical amplifiers, erbium-doped fiber amplifiers, amplifier noise, wavelength converters. WDM components: Multiplexers, couplers, interferometers, diffraction gratings, tunable optical filters.

EE x73 Electric Machines Engineering -2
AC three-phase. EMF and MMF development. Synchronous machines: Basic theory and construction. Voltage regulation. Circle diagram. Parallel operation. Machine performance. Three-phase induction machines: Basic theory and construction. Equivalent circuit. Machine performance. Circle diagram. Starting. Speed control. Other modes of operation.

EE 374 Electric Machines Engineering -3
Unbalanced operation of three phase induction motors, Two-phase induction motors, Single phase motors, Universal motors, Stepper motors, Variable reluctance machines, Switched reluctance machines, Introduction to generalized machine theory. Primitive in direct and quadrature axes. Primitive AC machines. General solution. Examples and problems.

EE 375 Electrical Machines and Electronics
DC machines, Transformers, 3-phase induction motors, special machines: single phase induction motors, stepper motor.
Power electronics, semiconductor devices, power electronic circuits: rectifiers, inverters, choppers, AC voltage controllers. Electric drives: DC and AC.

EE x76 Electrical Engineering
DC circuits. AC circuits and their applications. Electric batteries and measuring devices. Distribution panels. Types and sizes of electric cables. Electric generator and motor types. Control systems: Hydraulic, pneumatics, electric. Control systems adjustment applied in industry, transformers.

EE 381 Signals and Systems
Types of signal and systems. Impulse, step and sinusoidal response of systems. Block diagram representation of systems. Fourier Transform and theorems. Linear time invariant networks. Energy and power spectral densities. Sampling theorem. Discrete Fourier Transform DFT. Z- Transform. Correlation function. Spectral analysis of discrete random signals. Transmission of continuous and discrete random signals through systems. Application of tapped delay line filters

EE 382 Analog Communications
Introduction to Communication systems. Linear modulation techniques: AM, DSB, SSB, VSB. AM transmission and superheterodyne receivers. Frequency-division multiplexing (FDM). Exponential modulation techniques: FM, NBFM, PM. Analog pulse modulation: PAM, PPM, PDM

(PWM). Mathematical representation of filtered white noise. Noise effects on linear and exponential modulation techniques. Noise effects on analog pulse modulation techniques.

EE 383 Communications for Electrical Power Systems
Signal Analysis. Linear Modulation: AM, DSB, SSB, VSB. Exponential Modulation: FM, PM. Pulse Modulation: sampling theory, PAM, PPM, PWM, PCM. Applications: data transmission, telephony, broadcasting and telemetry.

EE 384 Signal Processing for Electrical Power Systems
Sampling and reconstruction of signals. DFT and FFT. Introduction to digital filters. Design of digital filter (FIR and IIR). Application of Digital Signal Processing.

EE 391 Control Systems and Their Components
Introduction to Control Systems. Block diagram representation of feedback control systems. Signal flow graphs. Electric analogy for mechanical components and systems. Transfer functions of servo motors. Frequency response of control systems. Root locus. Bode diagram. Nyquist diagram. Compensation. Control machines and components.

EE 392 Control and Computer Applications
Introduction to Control Systems, The Concept of Feedback, Control Systems Components: the comparators, transducers, tachogenerators, System Modeling, The Transfer Function Block Diagram Representation, Signal flow diagram, Time response of 2^{nd} order systems. Steady state error analysis, stability.
Peripheral Devices: A/D, D/A, I/O ports. Interfacing Protocols: serial, parallel, modes of operations (handshaking). Interfacing Concepts: interrupts, parallel processing. Applications: micro controllers, PLC's, microcomputers

EE 393 Automatic Control Engineering -1
Frequency Response, Root Locus, stability in frequency domain, Cascade and Feedback Compensation, Design Methods Using the Root Locus and the Frequency Response Plots. Introduction to digital system: analysis using the Z-transform, digital filters and equalizers design.

EE 423 Electronic and Microwave Measurements
Microwave passive components, scattering parameters. Microwave measurements. Computer controlled measurement. Other topics in modern electronic measurements and equipment which may include: spectrum and network analyzers, ultra-sonic imaging, nuclear magnetic resonance, ECG, CAT Scan, etc. Time and frequency measurements, magnetic and digital recording.

EE 431 Digital Integrated Circuits
Switching characteristics of electronic devices. Performance parameters: speed limits, noise margins, and power dissipation. BJT digital integrated circuits: TTL, ECL, and I^2L. MOS digital integrated circuits: single channel MOS, complementary MOS, and dynamic MOS.

EE 432 Modeling and Design of VLSI Integrated Circuits [PR: EE431]
Introduction to MOS technology. Stick Diagrams. Subsystem design and layout:
Pass Transistor, Transmission gate, Multiplexers, PLA, and Clocked sequential circuits. Memory cells, Registers, Aspects of system timing. CAD and EDA tools for VLSI.

EE 433 Biomedical Engineering
The electrophysiology of excitable cells: membrane equations, H-H model, stimulation and impulse transmission. Mathematical analysis of intracellular and extra-cellular fields. The electro-cardiography and lead system. Cardiac model. Simulation of the cardiovascular system. Penetration of ultra-sonic and electromagnetic waves through tissues.

EE 434 Power Electronics -2
DC to DC converters (choppers), inverters, Data Logging Circuits, Industrial Telemetry and Data transmission, firing circuits for controlled rectifiers, choppers and inverters, microprocessor applications to control electric machines.

EE 435 Power Electronics -3
Review of semiconductor devices for power electronics. Triggering circuits of power thyristors and MOSFETs. Thermal balance of power semiconductor devices (heat sinks). Protection of power semiconductor devices (snubber circuits) as active and passive circuits. Series and parallel operation of devices. Active power filters. Reactive power controllers. FACTS.

EE 447 Microprocessors -2
Architecture and design of microprocessor-based systems. Principles of hardware and software interfacing. Applications include interfacing to instruments, data acquisition systems and other examples selected from several disciplines.

EE 449 Industrial Automation
Hardwired controllers. Electronic controllers. Digital controllers. Programmable logic controllers (PLC). Embedded controllers. Industrial communication

EE 450 Electric Power Systems
Electric power transmission, underground power cables, electric power distribution systems, closed loop current for power distribution devices, protection systems, fuses, circuit breakers, earthing protection.

EE 455 Protection of Power Systems -2
Static Relays: theories, types, circuits, characteristics and applications. Digital relays: principles, types, operation, facilities, programming and applications. Relay Coordination of Complete Power System. Comprising Electromagnetic, Static and Digital Relays.

EE 456 Power System Analysis
Modeling of power system component. Performance equation. Load flow. Electric dispatch. Power system stability Voltage and reactive VAR control. Frequency and real power control.

EE 457 Industrial Applications and Installation Engineering for Power Systems
Industrial power generation and distribution. Application of electric technology to industrial process. Installation and maintenance of industrial electric systems equipment and plants. Electric services in industry. Installation practice in industrial plants. Industrial lighting. Alarm and security systems. Electric systems applicable in industry.

EE 458 High Voltage Engineering
Ionization process in gasses. Electric breakdown in gasses, residual charges, corona and arc discharges. Insulating liquids. Solid insulation, electric treeing in solid and liquid insulators. High

voltage generation ac and dc, high voltage measurements. Testing techniques. High voltage switch gears. Circuit barkers. Grounding systems. Over voltage on power systems. Transient performance of power systems (ferro-resonance). Protection against over voltage insulation coordination.

EE 459 Operation and Planning of Electrical Power Systems
Reliability calculation in power systems. Economics of power systems. Load forecasting. Generation. Transmission and distribution system planning. Power system quality

EE 466 Antenna Engineering
Antenna parameters. Linear antennas. Loop and helical antennas. Traveling wave antennas. Antenna arrays: linear, planar and circular. Aperture antennas. Reflector antennas. Microstrip antennas. Antenna synthesis. Antenna measurements.

EE 475 Special Electric Machines
Permanent magnet AC and DC motors. Brassless DC motors. Printed motors. Linear motors. Induction generators. Stepper motors. DC Motors: types, characteristics, methods of speed control, braking using solid state devices. AC Motors: types, characteristics. Electric Drives Using Solid State Devices. Special Types of Motors: brushless dc motors, reluctance motors, switched variable reluctance motors, stepper motors.

EE 476 Electrical Drives
Definition of Drives and its Components. Types of loads. Choice of motors. Types and Considerations. Speed Control. Starting. Braking. Transmission of Drive. Thermal Considerations. Motor Insulation. Load Cycle and Motor Rating. Applications: traction systems, electric lifts.

EE 477 Solid State Drives
DC drives, induction motor drives: performance features, stator control, rotor control, current control, closed loop control. Synchronous motor drives, stepper motor, switched reluctance motor.

EE 481 Digital Communications
Introduction to information theory. Pulse code modulation, Delta modulation. Baseband coding transmission. Optimum detection. Correlation techniques. Matched Filters. Probability of error of baseband modulation, Power spectral analysis. Time-division multiplexing (TDM). Digital carrier modulation: ASK, PSK, DPSK, FSK, MSK, GMSK, QPSK, M-ary transmission. Bandwidth efficiency. Coherent and Noncoherent detection. Noise effects on digital modulation techniques. Probability of error in carrier modulation. Introduction to error correcting and detecting codes

EE 482 Optical Communications Systems
Optical modulation: Analog modulation formats, digital modulation formats. Noise and detection: Shot noise process, signal-to-noise ratio, bit-error rate, receiver front-end circuits. Point-to-point system design: Reading data-sheets, power budget, dynamic range, rise-time budget. Introduction to optical networks: Network topologies, multiple-access techniques, WDM. Wavelength routing: Single hop and multihop routing. Network design.

EE 483 Digital Signal Processing
Review of discrete signals and systems. FFT (fast Fourier transformer). Realization of system using different structures (parallel, lattice, etc,…). Design of digital filters. Digital filter design from

analog filters. Multirate sampling. Linear predictive coding (LPC) analysis and applications. Error analysis.

EE 484 Communication Systems
Audio systems. Telephony, Facsimile and Teletext systems. Teletrafic engineering, TV and video systems. Satellite communication systems. Line of sight radio links. Cellular communication systems

EE 485 Advanced Communication Systems
Multiple-access techniques, FDMA, TDMA. spread spectrum techniques. Applications: CDMA and GPS. Radar: Basic Radar System. Pulse compression radar systems. Mobile communication systems: GSM, CDMA based systems. Next generation mobile communication systems

EE 486 Communication Networks
Communication networks models. Data encoding. Data communication interfaces. Data link control, Packet switching. Statistical multiplexing. Wide area networks. Routing and congestion control. Local area networks. Internetworking, IP protocols, Ethernet, network topologies, Bluetooth technology, Network security. ATM Networks, ISDN, ASDL systems.

EE 494 Digital Control Systems and Robotics [PR: EE483]
Sampling process, A/D and D/A. Block diagram and signal flow diagram of digital control systems. Time and frequency response. Design of compensating digital controller. Synthesis of digital controller. Robotics: kinematics and dynamic equations of robots - control of robot manipulators- applications

EE 495 Automatic Control Engineering -2
The state space representation for analog and digital control. State space solution. Stability, Controllability and Observability. Pole assignment problems. Observers. Linear Feedback design to control analog and digital systems.

EE 496 Mechatronics and Robotics
Electric and mechanical sensors. Transducers. Actuators. Implementation of control schemes. kinematics and dynamic equations of robots. control of robot manipulators. applications

EE 497 Control of Electrical Power and Machines
Modeling of synchronous machines. Excitation systems. Automatic voltage regulator (AVR). Automatic load-frequency control (ALFC). Control of multi-machines power systems. New trends in control of power systems.

EE 401 Project
An opportunity for the student to become closely associated with a professor in a research effort to develop research skills and technique and/or to develop a program of independent in depth study in a subject area in which the professor and the student have a common interest. This course extends through two terms, 4 hours each term

EE 402 Project
The students continue the study performed in the first semester.

Computer and Systems Engineering Department

CS 021 Computers and Programming
Historical introduction, computer classification, computer and society, data representation, number systems, computer components, operating systems, programming, flowcharts, structured programming, algorithms for engineering applications, high-level languages. Laboratory: practical experience using operating systems and application programs.

CS 111 Probability Theory and Computer Applications
Techniques of counting,, Probability Spaces and Models, Independence, Conditional probabilities, Random variables, Expectations, Variance and Moments, Discrete Spaces, Binomial, Hyper-geometric, Poisson Distributions, Continuous Spaces, Exponential, Gamma, Normal, Law of large Numbers, Central Limit Theorem.

CS 121 Programming-1
Fundamental programming constructs: Syntax and semantics of a higher level language; variables, types, expressions; input/output ; conditional and iterative control structures; functions and parameter passing; structured decomposition, Fundamental data structures: Primitive types; arrays; records; strings and string processing; pointers and references, Recursive algorithms.

CS 122 Data Structures-1
Representation of elementary data types, Arrays. Linear structures and list structures, Queues and Stacks, Tree structures and Graph representation, High-level language data handling facilities, Algorithms for searching and sorting.

CS 123 Computers
Introduction to C^{++}, Principles of FORTRAN programming, New Computer Systems (Personal computers, Computer Networks, Internet, Operating Systems, Programming), Applications (Statistical Applications, Engineering Applications, Project Management Applications)

CS 131 Computer Fundamentals
Number Systems, Boolean algebra & gate circuits, Combinational circuits, Arithmetic/ logic unit, logical design, Function Minimization (Karnaugh map – tabular method (Binaty & Decimal)), Ripple Adder & Subtractor, binary Comparator, Multilevel functions (NAND – NOR- Exclusive – OR & Equivalence), Multifunction Minimization – MSI & LSI logic design (Ripple Adder – BCD adder – Carry lookaheadadder, Magnitude Comparator – Decoder & Encoder – Multiplexer & Demultiplexer –ROM – PLA).

CS 211 Mathematics for Computers
Functions, relations, and sets, Cardinality and Countability, Predicate logic, Proof techniques, Basics of counting, Graphs and trees.

CS 212 Statistical Methods for Computers
Statistical Inference and decision theory, The chi-square, twelve, F distributions, Confidence Interval, Estimation. Test of Hypothesis, Regression. Analysis of Variance.

CS 213 Numerical Analysis and Computer Applications
Linear algebra, matrix relations, systems of linear equations, vector space and basis, Eigen values and eigen vectors, Error analysis and numerical instabilities, Approximation of roots of equations, Simultaneous linear algebraic equations and matrix inversion, Numerical differentiation and

integration, Interpolation and extrapolation, Least square approximation, Ordinary differential equations.

CS 221 Programming-2
Object-oriented design; encapsulation and information hiding; separation of behavior and implementation; classes, subclasses and inheritance; polymorphism, UML and requirement analysis, Using an object-oriented language; classes and objects; syntax of class definitions; methods; members; message passing; operator overloading; genericty, Using APIs.

CS 222 Systems and Components Programming
Programming in Assembly Language, Macro assembler, Loaders and linkers, Debugging tools, Languages for system programming, Desktop, and window manager systems, Internationalization issues.

CS 223 Data Structures-2
Advanced topics in searching and sorting, Trees: representation, traversal, search trees, threaded trees, AVL trees, applications, Graphs: representation, traversal, minimum spanning trees, shortest path problems, Hashing: functions, collisions, resolution policies, B-, B*, and B+ trees and indexing. File organizations: sequential, relative, indexed sequential and multi-key organizations.

CS 231 Digital Systems-1
Memory element, Input output devices & Interfaces, Synchronous sequential systems (Analysis – synthesis – State equivalence & m/c minimization), Incompletely specified m/c, Control unit (Hardwired control – sequencer – Fixed counter – start / stop counter – Variable counter – Finite state m/c).

CS 232 Digital Systems-2
Microprogramming, Asynchronous sequential systems (Analysis – Synthesis & Design Procedure), Instruction formats, Addressing modes & I/o and interrupt, Memory hierarchy, Main memory organization and operations. Cache memories, Linear machines, Measurements, Control, state identication (Simple control, general control, final state identification, initial state identification), Synchonizable m/c, finite memory m/c, Definite m/c, Memory span w.r.t. output span & Information lossless m/c, fault detection, machine identification.

CS 241 Linear Control Systems
Feedback, types of systems (linear, nonlinear), Control system components (transducers, actuators, amplifiers), System representation and simplification (transfer function, block diagram, signal flowgraph), Time-domain analysis (transient, steady state, Routh's criterion, root locus), Frequency-domain analysis, Solution of linear differential equations using analog computer.

CS 311 Analysis of Algorithms
Proof techniques, Basic algorithmic analysis: Asymptotic analysis of upper and average complexity bounds; best, average and worst case behaviors; big–O, little–o,Ω, and ∅ notation; standard complexity classes; time and space tradeoffs in algorithms, Fundamental algorithmic strategies: brute-force; greedy; divide- and-conquer; backtracking; branch-and-bound; heuristics, Graph algorithms, number theoretic algorithms, geometric algorithms, Complexity classes, NP-hard and NP-complete problems, Approximation algorithms.

CS 312 Operations Research and Computers
Techniques and models of operations research, Linear programming, Network flows, Dynamic programming, Markov chains, Queuing Cost models.

CS 321 Programming Languages and Translators
Overview of programming languages, Introduction to the theory of formal languages, Fundamental issues in language design, Virtual machines, Introduction to language translation, Lexical analysis, Syntactic analysis, Semantic analysis, Run-time storage management, Code generation, Code optimization.

CS 322 Database Systems
Database system concepts and architecture, Data modeling, The relational data model, relational integrity constraints and relational algebra, Relational database design, Database query languages, Query optimization, Transaction processing, Distributed databases, Current trends in database systems .

CS 331 Microprocessor Systems
Fundamentals of microprocessors, Examples of microprocessors, Instruction set, Microprocessor bus, I/O interface, memory hierarchy, System design and organization.

CS 332 Digital Signal Processing and Transmission Algorithms
Digital filters, orthogonal transforms, processing of digital images, Signals, information and the entropy, Communication channels and channel capacity, Signal encoding and transmission media, Error detection and error correcting codes .

CS 333 Operating Systems
Overview of operating systems, Operating system principles, Concurrency, Scheduling and dispatch, Memory management, Device management, File systems, System performance evaluation, Security and protection, Current trends in Operating Systems, Case studies.

CS 334 Embedded Systems
Introduction and Overview of VLSI, NMOS, CMOS, and BiCMOS Technologies, Layout Fundamentals : Stick diagram-design rules, NMOS, CMOS, and BiCMOS Logic: static Logic-dynamic Logic, precharge Logic-layout issues, VLSI Subsystem Design: register-decoders-datapath functional units-datapath control-layout issues, Design for testability, MOS Memories: static RAM cells-dynamic RAM cells-sense amplifiers-address decoders-memory expansion-layout issues, VHDL and its Applications in VLSI Digital Design. Laboratory: FPGA Based Digital Circuit Design: Design implementation on FPGA Kits (e.g. XILINX), accompanied with software for VHDL programming, simulation, and synthesis, Layout Exercises using Software Packages (e.g. MAGIC or LASI).

CS X35 Computer Architectures
Basics of computer architecture, Virtual machines, RISC, CISC machines, Parallisim, pipline, array and systolic arrays, Data flow machines, Architecture for networks and distributed systems, Security and architecture issues.

CS 341 Discrete and Nonlinear Control Systems
Compensation using time and frequency domain analysis, Introduction to system design, Discrete time systems, Sampling, reconstruction, z-transform, Stability of discrete time systems, Analysis

and design of discrete time systems, Nonlinear control systems, the describing function, phase plane analysis, stability, Lyapunov method.

CS 411 Switching theory and Models of computability
Theory of Automata, Regular expression, Models of computability and their applications, Finite state machine, push - down automation-turing machine, Petri net.

CS 412 Optimization Techniques
Optimization techniques for unconstrained unidimensional problems, Unconstrained multidimensional problems, Optimization techniques for constrained multidimentional problems, Analysis techniques for choosing the best method to use.

CS 413 Special Topics in Computer Science
The department select the topics from the current trends in computer science.

CS 421 Special Topics in Information Systems and Software
The department selects the topics from the current trends in information Systems and Software technologies.

CS 422 Computer Graphics
A brief history of Computer Graphics (CG), Uses of CG and interactive CG, Basic raster graphics algorithms for drawing, filling and clipping 2-D graphics (lines, circles, and ellipses), Graphics hardware (display devices and printers), Geometrical transformations, Viewing in 3-D, Object hierarchy and Geometrical models, Input devices, interaction techniques, and interaction tasks, Representation of curves and surfaces. Achromatic and colored light, Visual realism, Visible surface determination, Illumination and shading.

CS 423 Artificial intelligence
History and applications, Knowledge representation techniques, search strategies, Languages and programming techniques for A.I.

CS 424 Pattern Recognition
Introduction to pattern recognition (PR) as a process of data analysis, Representation of features in multidimensional space as random vectors, Similarity and dissimilarity measures in feature space, Bayesian decision theory, Discriminant functions and supervised learning, Clustering analysis and unsupervised learning, Estimation and learning, Feature extraction and selection. Introduction to syntactic PR, Selected applications .

CS 431 Computer Networks and Communications
Data transmission and signal encoding, The OSI and the Internet reference models, The physical layer, analog and digital channels-modems-media-CRC, The data link layer : ARQ protocols, Framing techniques, standard DLC's, and the PPP Protocol link initialization and disconnect, Local Area Networks: Ethernet standards, repeaters and bridges, Wide Area Networks: packet switchers and routers, bridged LANs, Mac and IP addresses, X.25 and TCP/IP packet delay, throughput and good routing, Routing protocols: spanning tree and source routing in bridged LANs, Distance Vector and link state routing, the Bellman- Ford algorithm, optimal routing.

CS 432 Distributed Systems and Net-Centric computing
Introduction to net-centric computing, Protocols at the application layer, Middleware, Client-Sever and peer-to-peer computing, Multimedia systems, The web as an example of client-server computing, Current tools for building network and Client-Server applications, Mobile and wireless computing.

CS 433 Performance Evaluation of Computer Systems
Work load characterization, Performance indices, Single and multiple job processing models, Scheduling, Queuing systems, Networks of queues, Simulation.

CS 434 Software Engineering
Software life cycle and process models, Requirements analysis and specification, Software design, Software verification and validation, Software evolution, Software project management.

CS 435 Special Topics in Computer Engineering
The department select the topics from the current trends in computer engineering technologies.

CS 436 Topics in computer Networks:
Network Topology, network architecture, Date link layer, IEEE standards (Ethemet, Token bus & token Ring), Packet Radio Network, Fast Ethernet, Distributed Queue Dual Bus, FDDI Network layer, Routing Routines & congestion control.

CS 441 Modern Control Systems
Introduction to modern control approach (definition and representation), State variable approach, linear continuous system, linear discrete system, Controllability, observability and stability, Observers and controller design, Stability, Introduction to optimal control (minimum time problem, regulator problem), Introduction to intelligent control systems.

CS 442 Special Topics in Systems Engineering
The department select the topics from the current trends in engineering technologies.

CS 401 Project
Project topics are selected by the department .

CS 402 Project
Project topics are selected by the department.

Nuclear and Radiation Engineering Department

NE111 Modern Physics
Special Theory of Relativity, Photoelectric Ionization, X-Rays, Compton Scattering, Waves and Particles, Atomic Structure, Atomic Models, Uncertainty Principle, Pauli Exclusion Principle.

NE112 Computers and Numerical Methods
Computers components, Representation of numbers, Storage and internal presentation, Codes and flowcharts, FORTRAN programming, Numerical Methods: Integration, Roots of equations, Solution of linear equations, Introduction to analogue computers, Introduction to Boolean algebra

NE121 Introduction to Engineering Materials Science
Atomic Structure and Atomic Bonding, Crystalline Structure of Solids, Defects in Solids, Diffusion, Phase Diagrams, Characterization of Materials.

NE122 Properties and Testing of Nuclear Materials
Mechanical Testing of Metals (Elastic and Plastic Deformation), Failure of Materials (Fracture, Fatigue, Creep), Mechanical Properties of Ceramics, Mechanical and Thermal Properties of Polymers, Electrical Properties, Thermal Properties, Magnetic Properties, Optical Properties, Nuclear Properties, Determining the Mechanical Data of Materials, Diagnosis of Internal Structure of Materials, Heat Treatment of Steels, Nondestructive Testing.

NE131 Introduction to Nuclear and Radiation Engineering
Nuclear Reactions and Radiation, Protection and Control of Radiation, Production and Use of Nuclear Energy, Nuclear Fuel Cycle, Reactors Safety, Controlled Nuclear Fusion, Nuclear Wastes, Applications of Radiation, Health Physics.

NE211 Nuclear Physics
Nuclear Radii, Nuclear Charge and Mass, Bonding Energy and Nuclear Stability, Natural and Artificial Radioactivity, Nuclear Transmutations: Alpha, Beta, and Gamma Transmutations, Nuclear Reactions, Nuclear Forces and Models.

NE221 Nuclear Reactors Materials
Thermal Behavior of Nuclear Fuel Elements, Restructuring Behavior and Redistribution of Fissionable Materials, General Requirements of Nuclear Materials, Operating Conditions in Nuclear Reactors, Choice of Materials for Different Types of Reactors (Fuel, Coolant, Clad, Containment, Control).

NE241 Radiation Safety
Natural and Artificial Radiation Sources, Biological Effects of Radiation, Principles of Radiation Protection, Dose Calculations, Estimation of Exposure to Ionizing Radiation, Laboratory Radiation Safety, Surveying of Radiation Area, Transportation of Radioactive Materials, Radiation Protection and Organizational Standards, Policies and Organizing Rules for Handling Radioactive Materials.

NE242 Radiochemistry
Applications of Radioisotopes in Chemistry, Techniques in Nuclear Chemistry, Separation of Elements Using Radiochemistry, Analysis of Radioactivity by Neutrons, Nuclear Processes for Chemical Exploration, Chemistry of Hot Atom, Production of Radioisotopes for Medical Applications.

NE251 Thermodynamics and Kinetic Theory of Gases
Basics and Definitions, Properties of Pure Materials, Heat and Work, The First Law of Thermodynamics, The Second Law of Thermodynamics, The Entropy, Introduction to the Kinetic Theory of Gases, Maxwell-Boltzmann Distribution, Deduction of the Properties of Gases.

NE311 Quantum Mechanics
Schrödinger Wave Equation, Synchronized Oscillator, Multi Particles Systems, Potential Wells, Angular Momentum, The Scattering Problem.

NE312 Plasma and Electromagnetic Theory
Vector Algebra (Revision), Electric Potential and Field, Gauss' Law, Magnetic Field, Ampere's Law, Faraday's Law for Induction, Maxwell's Equations and the Limits Conditions, Introduction to Plasma, Single Particle Motion, Fluidized Plasma, Waves in the Plasma, Diffusion and Resistance, Equilibrium and Stability, The Kinetic Theory, Introduction to Fusion Reactors and Devices, Fabrication of Semiconductors Using the Plasma, Polymers, Plasma Spray Coating.

NE321 Characterization of Materials
Principles of Characterization Techniques, Sample Preparation, Electron Beam Devices, Interaction of Electrons with the Sample, Explanation of Diffraction Results.

NE322 Computational Methods in Materials
The Use of Computational and Statistical Facilities to Design and Analyze Materials, Applications of the Statistical Principles for Materials Problems, Designing Experiments using Computers.

NE331 Nuclear Reactors Physics
Nuclear Physics (Revision), Reactions Cross Sections, Nuclear Fission, Reaction Rates and Energy Threshold, Fission Products, Neutrons from Fission, Energy Released from Fission, Nuclear Fission Theory, Neutrons Diffusion, Fick's Law for Diffusion, Methods for Solving the Diffusion Equations with Different Boundary Conditions, Neutrons Moderation without Absorption in Hydrogenous Media, Neutrons Moderation using Non Hydrogenous Moderators, Equation of Neutron Moderation and Diffusion, Neutrons Moderation and Diffusion with Absorption, Numerical Methods for Solving Diffusion Equations in Homogeneous Media.

NE332 Simulation of Nuclear Stations
Types of Nuclear Reactor Simulators, Meaning of Nuclear Safety Systems, Introduction in Dependence Tree, Errors Tree, Events Tree, Introduction to the Safety Features Systems in the Nuclear Industry, Introduction to Artificial Intelligence and Relation between Man and Machine.

NE333 Safety of Nuclear Reactors:
Engineering safety, Feature systems, Fault trees, Event trees, Decision trees, Artificial intelligence, Man-machine interface

NE341 Radiation Detection
Radiation Sources, Interaction of Radiation with Matter, General Characteristics of Radiation Detectors, Counting Statistics, Gaseous Radiation Detectors, Ionization Chambers, Proportional Counters, Geiger Counters, Scintillation Detectors, Semiconductors Detectors, Neutrons Detectors, Miscellaneous Detectors.

NE342 Radiobiology
History and Definitions, Cells and Tissues, Reproduction Kinetics, Ionizing Radiations, Sub cellular Radiobiology, Cell Radiation Harm, Treatable Harm, Internal Radiation Sensitivity, Heavy Ionizing Radiation, Oxygen Effect, Protectors and Radiation Sensors, Normal and Abnormal Cells, Science of Radiation Diseases, Whole Body Radiation, Reproduction Kinetics after Radiation, Partial Radiation Therapy, Delayed Radiation.

NE343 Introduction to Simulation of Radiation Transport
Analytical Methods used to Analyze Radiation Transport Described by Different Differential and Integral Equations, Numerical Methods: Finite Difference, Finite Elements, Finite Orthogonal Coordinates, Monte Carlo Method.

NE351 Heat Transfer
Fundamental Laws for Heat Transfer, Steady State Conduction in One and Multiple Dimensions, Variable Conduction, Heat Transfer by Natural and Forced Convection, Condensation and Boiling, Heat Exchangers, Heat Transfer by Radiation.

NE352 Thermal Power Stations
Irreversibility and Availability, Air Standard Cycles, Compressors, Energy Cycles, Turbines, Condensers, Evaporators.

NE421 Nondestructive Testing
Radiography, Ultrasonic Testing, Magnetic Particles Detection, Eddy Currents Testing, Dye Penetrant Testing, Rarely used Methods, Physical Fundamentals of Testing: Type of Tested Material, Types of Detected Defects, Calibration Measurements, Certified Safety Precautions.

NE422 Materials Radiography
Fundamentals of Radiography, Properties of Ionizing Radiation and Radiation Recording (Revision), Fundamentals and Sensitivity of Photography Methods, Representation of Sensitivity, Pictures Interpretation, Safety Problems in Radiography, Picture Condensers, TV Systems and Medical Photography, Special Methods.

NE431 Nuclear Reactors Analysis-1
Neutrons Moderation to Normal Temperature, Thermal Neutron Flux, Properties of Neutron Flux Diffusion in the Medium, Criticality Equation, Solving Diffusion Equations in Different Reactors Geometries, Nuclear Fission Rates, Energy Resulting from Fission Reaction, Energy Released after Reactor Shutdown, Heat Diffusion Equations in Media, Solving Heat Diffusion Equations in Nuclear Fuel for Different Geometrical Bodies.

NE432 Radiation Shielding Design
Gamma Ray Attenuation, Shielding against Gamma Rays, Point Kernel Method, Neutron Reactions, Shielding against Neutrons, Buildup Factor, Energy Attenuation in Media.

NE433 Reactors Automatic Control
Laplace Transformation (Revision), Modeling of Different Systems, Block Diagrams and Flow of Signals, Analysis of Time Response, Cyclic Response (Bode and Nyquest Plots), Stability, Repeated Response of Closed Circuits, Substitution, Different Reactors Models and Different Feedbacks.

NE434 Nuclear Fuel Cycles

Fuel Cycles in Nuclear Reactors, Metals Extraction by Organic Solvents, Ion Exchange Processes, Mining, Crushing, Concentration and Purification of Uranium, Production of Uranium Dioxide and Uranium and Plutonium Metals, Calculations of Fission Products Inventory, Fuel Reprocessing, Radioactive Wastes Management, Principles of Isotopes Separation, Uranium Isotopes Separation.

NE435 Nuclear Reactors Analysis-2

Neutrons Energy Groups, Neutron Transport between Different Energy Groups, Heterogeneous Reactors, Solving the Neutron Diffusion Equation in Heterogeneous Reactors, Perturbation Theory in Reactors, Boiling Curve, The Critical Neutron Flux, Using Fins in Heat Transfer, Variation of Temperature in Different Parts of the Reactor, Safety Limits of Temperature, Hot Spot Factors and its Calculations, Introduction to Simulation, Types of Simulators, Engineering Safety Systems, Automatic Operation of Nuclear Reactors, Introduction to Statistical Safety Analysis, Accidents Analysis.

NE436 Reactors Kinetics

Point Kinetics with and without Delayed Neutrons, Average Age Time, Reactors Response to Increase of Reactivity, Stability Period, Instantaneous Jump, Instantaneous Criticality, Small Reactivity, Negative Reactivity, Reactivity Change with Temperature Change, Fission Products Poisoning, Fuel Depletion, Properties of Reactors during its Age, Determining Reactor Core Age.

NE437 Nuclear Power Stations

Thermal Equilibrium (Revision), Thermodynamics Cycles and its Efficiency (Revision), Different Types of Nuclear Power Stations (Boiling Water, Pressurized Water, Gas-Cooled, Fast-Breeders), Simulation of Different Types, Methods of Choosing the Nuclear Power Station Type, Choosing the Materials used in Different Reactors.

NE438 Measurements of Nuclear Stations

Measurement Devices and Auxiliary Systems Required for Control and Protection in Nuclear Power Station, Radiation Measurement and the Principles of Reactor Operation used in Developing Measurement Devices in Pressurized and Boiling Water Reactors, Design and Use of Energy Sources, Signals Emitters, Abundance and Dependability.

NE441 Applications of Radioisotopes

Principles and Methods of Measurement by Radiation, Measurements using Charged Particles, Electromagnetic Rays and Neutrons, Applications of Radioisotopes in Industry, Medicine, Scientific Studies, Radiation Manufacturing, Nuclear Examination, Radiotherapy, Nuclear Medicine Diagnosis, Nuclear Analysis Methods.

NE442 Introduction to Medical Radiography

Basics of Physics and Medical Photography Systems Using: X-Rays, Nuclear Magnetic Resonance, Positron Emission, Single Photon Emission, Fundamentals of Medical Radiophotography, Effects of Clarity on Statistics, Clarity of Internal System and Human Factors.

NE443 Radiation Health Physics

Interaction of Radiations with Matter (Revision), Dose Measurement, Radiation Shields, Radiation Measurement Theory, Comparison of Human Radiation Level, Biological Effects of Radiation, Internal and External Exposures, Environmental Radiation Diffusion, Measurement and Different Levels.

NE401 Project

The Student Performs an Applied Research on: Reactors Design, Reactors Dynamics, Materials Science, Nuclear Measurements, Fusion Energy, Applications of Radioisotopes, Automatic Control, Computer Applications and Numerical Methods in Nuclear Engineering, Heat Transfer in Nuclear Systems, Nuclear Fuel Cycles and Wastes Management.

NE402 Project

The Student Performs an Applied Research on: Reactors Design, Reactors Dynamics, Materials Science, Nuclear Measurements, Fusion Energy, Applications of Radioisotopes, Automatic Control, Computer Applications and Numerical Methods in Nuclear Engineering, Heat Transfer in Nuclear Systems, Nuclear Fuel Cycles and Wastes Management.

Chemical Engineering Department

CH011 Engineering Chemistry

Ideal and natural gas: General equations of gases, Dalton`s law for summution of partial pressures, Graham`s law, material balance, **Binary solutions system:** types, separation ofsolution component by freezing or distillation, solubility of gases in liquids, Raoult`s law, ideal solutions, avanced theory of inonization, chemical equlibrium, factors affecting reactions velocity, LeChatelier`s principale, The law of mass action and its application, dilution law and ionic product of water, pH, solubility product and effect of commom ion, galvanic cells and metals corrosion, Nernest`s theory, electrode potenial, water treatment, pollution and its control, air pollution, cement, alloys.

CH 111 Programmed Calculations for Chemical Engineers

Introduction to engineering calculations, units and dimensions, dimensional analysis, analysis of engineering operations data, mathematical analysis for data, programming languages, engineering software package, simulation tools, spread sheets, data base, simple system applications in chemical engineering.

CH 112 Organic Chemistry 1

Type of carbon-carbon bonds, electronic theory of valency, aromatic hydrocarbons, resonance and electron displacement, study of paraffins, olefins, acetylenes, alcohols, phenols, structural isomerism.

CH113 Inorganic Chemistry

A comparative systematic study of halogens, alkali metals and alkaline earth metals, Common metals of the periodic table, selected topics in inorganic chemistry

CH 114 Physical Chemistry

Order of a reaction, reactions of the first order, reactions of the second order, reactions of the third order, Reactions occuring in stages, the rate determining step, parallel reactions, consecutive reactions, chain reactions, opposing reactions and equilibrium, determination of reaction order, method of trial, time to complete a definite fraction of the reaction, the differential method. Theory of reaction rates, Arrhenius equation, the collision theory of reaction rates. The activated-complex theory of reaction rates. Heterogeneous reactions, catalysis. Ionic equilibria, electrolytic conductance, Ostwald dilution law, ionic product of water, common ion effect, solubility product, hydrolysis, buffer solutions.

CH 115 Surface Chemistry and Phase Equilibrium

Solutions, binary solutions, phase rule, ternary solutions system, surface chemistry, surface tension, zeta potential, activated surface substances, Vander Waal forces, coloidal state, osmotic pressure.

CH 116 Organic Chemistry 2

Sulfonation, nitration, halogenation, oxidation, intermediate organic compounds, mechanism of polymerisation, analysis of organic compounds using ultra Violet rays, Chromatography, magnetic resonance.

CH 117 Inorganic and Analytical Chemistry

Systematic qualitative analysis, fundamentals of gravimetric analysis, theoretical principles of reactions in solutions, volumetric analysis, introduction, acidimetry and alkalimetry, precipitation analysis, oxidation-reduction titrations, error statistics, spectrophtometry, infrared

spectrophotometry, sepctrofluorometry, atomic emission spectroscopy, atomic absorption spectoscopy, chromatography.

Ch 118 Materials Science
Introduction to materials science, atomic structure, bonds, crystalline structure, mechanical properties of materials, metals, ceramics, polymers, composites, electrical, thermal, and magnetic properties of materials, materials selection for engineering applicatios.

CH 121Chemical Processes
Definitions, chemical technology, unit operations, standard specifications for thr flow diagram in chemical processes, symbols used in flow diagrams, various examples of some equipments and units used in chemical industries, safety in chemical industreis.

CH 211 Organic Chemistry-3
Carbohydrate chemistry, cellulose, polymers, Alicyclic and hetereocyclic compounds.

CH 221 Engineering Metallurgy
Crystalline structure of metals,, internal defects, Miller indices, thermal equilibrium diagrams, binary systems, plastic deformation, recovery and recrystallization. Age hardening, Plain carbon steel, cast iron, heat treatment of steels, alloy steels, stainless steels, copper and its alloys, aluminum and its alloys.

CH 222 Chemical Engineering Fundamentals-1
Processes system and its variables, mass, volume, flow rates, chemical composition, pressure, fundamentals of material balance (batch and continuous), single and multiple unit calculations; recycle, bypass and purge calculations; balance for reactive systems, balances on reactive systems, balances on single phase systems, balances on multiple systems, balances on liquid solution, balances on adsorption processes.

CH223 Chemical Engineering Thermodynamics -1
First law of thermodynamics, heat effect on chemical reactions, flame temperature, second law, entropy, free energy and chemical equilibria, fugacity and activity coefficients, analysis of chemical operations.

CH 224 Heat transfer
Modes of heat transfer: Conduction, the rate and field equations, steady conduction for one, two, and three-dimensional shapes, Numerical and graphical solution of unsteady-state heat conduction problems. Classifications, applications and optimization of thermal insulations. Convection, the rate equation, the overall heat transfer coefficient; the mean temperature difference, dimensional analysis as applied to convection (natural convection, forced convection, condensing vapours, boiling liquids, molten metals, ...). Heat exchangers: the overall heat transfer coefficient, fouling factors, and types of heat exchangers. Radiation, definitions, selective emitters and gray emitters, the black body concept. Laws of Kirchoff and Lambert. Radiation exchange between surfaces. The

Stefan-Boltzman law, radiation from luminous flames. Combined convection and radiation. applications.

CH 225 Fluid Mechanics Engineering
Fluid statics and its applications, fluid flow phenomena, basic equations of fluid flow, flow of incompressible fluids in conduits and thin layers, flow of compressible fluids, flow past immersed bodies, transportation and metering of fluids, agitation and mixing of liquids, two-phase flow (gas-liquid, gas-solid, liquid-solid and liquid-liquid systems).

CH 226 Chemical Engineering Fundamentals-2
Fundamentals of energy balance, forms of energy, the first law of thermodynamics, closed and open systems, thermodynamic tables, energy balance for non-reactive systems, pressure and temperature change, mixing operations, energy balance for reactive systems, heat of reactions, heat of formation, heat of combustion.

CH 227 Chemical Engineering Thermodynamics-2
Power and refrigeration cycles, vapor cycles, carnot, rankine, reheated, regenerative, gas power cycle, gas turbine, reciprocating engine cycles. Refrigeration and heat pump cycles, vapor compression cycle, absorption refrigeration cycle, thermodynamic tables.

CH321 Separation Processes-1
Phase Equilibria (fundamentals), binary and multicomponent distillation, design of plate fractionating columns, types of distillation, Evaporation: heat transfer coefficients, multi-effect evaporation, vacuum producing equipment, nucleate boiling, forced convection boiling, Crystallization: fundamentals and theoretical background, Adsorption, isotherms, Ion exchange: theory, types of ion exchangers, Membrane separation processes: reverse osmosis, ultrafiltration, electrodialysis, liquid membranes, dialysis, hemodialysis, hemoperfusion, hemofiltration, artificial cells.

CH 322 Corrosion Engineering
Corrosion, its economic effect, environmental and metallurgical aspects, mechanism of corrosion, types of cells responsible for corrosion e.g. dissimilar metal corrosion cells, differential aeration cells, differential strain cells, stress corrosion cracking, stray corrosion current, atmospheric corrosion, corrosion and protection of metals against corrosion,, the H_2 scale, the e.m.f, Nernst equation. thermodynamics of galvanic cells, corrosion resistance: coating (metallic coating, inorganic coating, organic and temporary coating), Inhibitors (cathodic inhibitors, anodic inhibitors and adsorption inhibitors), cathodic protection, anodic protection, selection of the suitable material of construction.

CH 323 Separation Processes-2
Principles of mass transfer, Diffusion: types of diffusion - Gas-absorption: two-film theory, capacity of packed towers, values of transfer coefficients, absorption with chemical reaction - Liquid-liquid extraction: general considerations of process, calculation of number of stages, continuous extraction in column apparatus-Leaching: mass transfer in leaching, calculation of number of stages - Drying: principles, humidity chart, rate of drying, theories of drying. Humidification and dehumidification: theory-Types and design of equipment for the aforementioned mass transfer operations.

CH 324 Chemical Reactions Engineering

Kinetics of chemical reactions, order and molecularity of reactions, reactions of the first order, reactions of the second order, reactions of the third order, complex reactions, temperature effect, Activation energy, entropy, catalytic reactions, engineering principles of reactor design, design of batch and continuous tubular reactors, design of continuous stirred tank reactors, catalytic reactors, isothermal and adiabatic reactions, concentration and flow rate effect on residence time, recycling and its effect on reactor volume.

CH 325 Fuel and Combustion Engineering

Fuel; definition and classification, fuel sources, solid fuel, nuclear fuel, some liquid fuel, gaseous fuel, town gas, synthetic gas, furnace description and operation, furnace thermal analysis.

CH 331 Modeling and Simulation in Chemical Engineering

Importance of modeling and simulation in chemical engineering, programming, Mathematical formulation of the problems, The continuity equation, the energy equation, the equation of motion, transport equations, equations of chemical and physical equilibria, chemical kinetics equations. Examples on the use of mathematical models in solving chemical engineering problems.

CH 332 Electrochemical Processes

Electrical energy storage, classification of batteries, primary cells e.g. the Leclanche cell (construction, reactions and characteristics, Secondary cells (the lead acid accumulator fuel cells (The H_2/O_2 fuel cell) voltage efficiency factors affecting battery performance, fuel cells, Faraday's law and current efficiency, concentration polarization, mechanism of mass transfer during electrolysis, the limiting current, methods of increasing the rate of diffusion controlled reactions, activation polarization and charge transfer controlled reactions, electrochemical reactor design and operations, calculation of the cell voltage, voltage efficiency, energy efficiency and power consumption, types of electrochemical reactors (the parallel plate reactor, the fixed bed reactor and the fluidized bed reactor). Derivation of the basic design equations for different electrochemical reactors (the plug flow reactor, the continuous stirred tank reactor, the batch reactor and the constant concentration reactor), mass transfer equations used in the design and operation of electrochemical reactor (mass transfer at a vertical plates under natural convection, mass transfer in a channel under forced convection, mass transfer in fixed bed under forced convection, mass transfer in fluidized bed under forced convection, mass transfer in a rotating cylinder electrode) selection of the most economic operating current density. Arrangement of cells in the plant. Calculation of the specifications of the accessory equipment e.g. pumps and heat exchangers. The energy balance equation for electrochemical reactors. Electrochemical industries: theory of electrodeposition of metals (simultaneous and consecutive deposition). Electro winning of metals, electrorefining of metals, electroplating, electrochemical machining and electroreforming, chloro alkali production (the diaphragm cell, the flowing mercury cathode cell and the membrane cell). Pollution control by electrochemical methods e.g.; elimination of heavy metals, cyanide oxidation, phenol toxicity elimination, sulphur removal from waste gases, electrochemical analysis methods.

CH 333 Water Treatment

Impurities in natural waters, External water treatment, clarification, carbon filtration, lime treatment, ion excahnge treatment, reverse osmosis. Internal water treatment, corrosion control, deposite control, microbiological control, treatment of cooling water, treatment of boiler feed water.

CH 334 Biochemical Engineering

Introduction to biochemical engineering, classification of microorganisms, reaction kinetics in biochemical engineering, transport

Bioreactor analysis and design, fermentation processes, synthesis of some organic compounds, economics of biological processes, application of biotechnology in pollution control.

CH 335 Alternative Energy Resources

Wind energy, solar energy, hydrogen energy, biogas, case study and applications.

CH 336 Silicate Industries

Classification of silicates industries, raw materials, impurities in kaolin, theories of plasticity, unit operations in silicate industries, preparation of the body, shaping, forming methods, drying and dryers, firing and kilns. Chemical and physical changes during firing, ceramic products, structural clay products, electrical insulators, glasses, engobes, enamels. Refractories: basic refractories, acidic refractories and neutral refractories, silica bricks, fire clay refractories. Cement technology, raw materials, manufacture, unit operations and unit processes, setting and hardening, types of cement. Glass technology, raw materials, unit operations and unit processes, furnaces, shaping, annealing, finishing. Other building materials ceramic calculations, phase diagrams in ceramics.

CH 337 Extractive Metallurgy

Gas-solid reactions; gas-liquid reactions; slag-metal reactions; electrolysis in extraction metallurgy; modern features in extraction metallurgical processes.

CH 338 Dying and Tissues

Textile technology, different textile fibers, cotton, wool and silk.Man made fibers. Properties of desizing, kierboiling, bleaching, mercerisation, dyeing and finishing. Dyeing machines, batch and continuous.

Dyestuffs, classes, sources of raw materials, sulphonation, nitration, halogenation processes. Reduction processes. Unit processes. Diazo and intermediate compounds in dyestuff preparation.

CH 341 Fertilizers Technology

Manufacture of nitrogen fertilizers, ammonia, urea, ammonium nitrate. Coating of fertilizers. Manufacture of phosphate fertilizers, normal super-phosphate, triplesuperphosphate, nitrophosphates, ammonium phosphate, ammonium polyphosphate. Potash fertilizers, compound and mixed fertilizers, liquid and suspension fertilizers

CH 342 Technology of Natural Fibers and Tissues

Reaction of lignin and hemi celluloses during pulping processes. Material balance of pulping. Material balance of evaporation and chemical recovery. Stock preparation processes e.g. digestion, washing, screening. etc...., flow to paper machinery. HB pressing and drying calculations.

Leather tanning, structure of protein fibers, keratin and collagen, curing and preservation of hides and skins. Structure of mineral and vegetable tanning agents e.g. chromium salts, processing of hides and skins. Technology of production, steps of upper leather and sole leather, physical and chemical properties of finished leather.

CH 343 Technology of Oils and Fats

Chemical structure of oils and fats. Reactions of oils and fats and its application in oil and fats. Analysis and preparation of fatty derivatives. Unit operations in the oil and fat industry: extraction, refining, bleaching, hydrogenation, deodorization. Soap industry, raw materials, production methods. Chemical calculations of the oil and fat and related industries. Experimental work and methods for determination of the different constants of oils and fats.

CH 421 Mechanical Unit operations

Flow of fluids past particles: flow of fluids through granular beds, filtration, centrifugation. Operations involving relative motion between fluid and particles: sedimentation, fluidization, conveying, gas cleaning. Size-reduction of solids: power requirements. Classification of solid particles. Mixing and agitation: mixing of solids and pastes. Equipment used in all the aforementioned mechanical operations.

CH 422 Chemical Process Control

Mathematical tools for control systems analysis, the Laplace transform, definition, properties of Laplace transform, solution of differential equations using the Laplace transform, Laplace transform solution procedure, Inversion of Laplace transform by partial fractions expansion. Linearization and deviation variables, deviation of function of one variable such as Arrhenius equation, Antoine equation,...etc. Linear open-loop systems, response of first-order system, physical examples of first order system, response of first-order systems in series, higher order system: transportation lag. Linear closed-loop systems. The control system, controller and final control elements, block diagram of a chemical reactor control system, closed-loop transfer functions, transient response of simple control systems, stability, root locus, sensors, transmitters and control valves. Sensors: pressure sensors, flow sensors, level sensors, temperature sensors and composition sensors. Transmitters, pneumatic transmitter, electronic transmitter, types of control valves, reciprocating stem, rotating stem.

CH 423 Petroleum Refining Engineering

Chemical composition of crude petroleum oil, classification methods, petroleum products properties and methods of analysis, different unit operations in a refinery distillation. Thermal and analytical cracking and catalytic reforming. Refining of different petroleum products by physical and chemical methods. Refinery equipment e.g. distillation columns, ovens, heat exchangers, extraction equipment and cracking and reforming units. Chemical calculations on refining process and design of some units of a refinery.

CH 424 Natural Gas Engineering

Introduction to natural gas, composition, classification, treatment processes, gas – vaopr equlibrium, distillation, hydrates, its effect and control, vapour and gases removal, gaseous treatment, gaseous acids injection, sulphur recovery, nitrogen removal, liquid hydrocarbons recovery.

CH 425 Safety Engineering and Explosives

Fundamentals of fire explosion, hazardous materials, hazardous operations, fire protection systems, explosion protection systems, accident insurance. Chemistry and Technology of propellants, chemistry and technology of high explosives, chemistry and technology of initiators, initiator ballistics, chemical warfare.

CH 426 Polymer Engineering
Definition and importance of engineering polymers, classification, molecular weights, structure of polymers, crystalline and non-crystalline state, thermal characteristics, mechanical properties, effect of time and heat on polymers properties, rheology.

CH 431 Chemical Processes Industries
Synthetic gases, nitrogen indusutries, Sulphur and sulphuric acid, hydrochloric acid, fermentation industries, rubber and intermediate compounds, dyes, synthetic fibers.

CH 432 Chemical Process Design
Process design development; the design approach; feasibility, flow diagram; the preliminary design; general design considerations (plant location, plant layout), scale up, fluid transfer in pipes, raw materials, intermediate compounds and prducts deposition.

CH 433 Wastewater Treatment
Sources and characteristics of wastewater, measurement of toxicity, waste control in plants, water reuse, wastewater treatment operations, primary treatment, sedimentation, coagulation and clarification, precipitation and heavy metal removal, aeration and material transport, fundamentals of aerobic biological oxidation, biological wastewater treatment, adsorption, ion exchange, chemical oxidation, sludge handling and treatment.

CH 434 Treatment of gaseous and solid wastes
Air pollution, methods of pollution degree determination, removal of waste gases, and dust, from air, solid wastes, methods of removal, economic aspects of treatment methods.

CH 435 Desalination
Water desalination processes and its economic importance desalination by distillation, Multiple–effect distillation, Desalination by flash vaporization, single–pass and recycle systems, Production and recovery, Vapor–compression desalination, Multi-stage processes, advantages and disadvantages, Diffusional desalination, Multi-stage systems, Dual-systems (desalination and power generation), Reverse osmosis, Osmotic pressure, Membranes, Mass transfer equations in reverse osmosis; Batch and continuous systems, Single array and multi-array systems, Flow regimes and brine recovery, Desalination by electro dialysis, Ion–exchange membranes, Ionic transfer in electrolytes; Flow, potential and ionic concentration, Ionic flow.

CH 436 Non-Newtonian Fluids
Difference between Newtonian and non-Newtonian fluids, Types of non-Newtonian fluids, Equation of motion for viscous liquids, Shear behavior of different types and related equations, Methods of determining viscosity, Flow applications in specific conduits with simple geometry, Relation of flow with pressure and temperature, Detailed description of some non-Newtonian fluids, Pumping of non-Newtonian fluids, Types of impellers used for stirring the different types of non-Newtonian fluids

CH 437 Composite materials
Definition, uses, classification of composite materials, constituents of composite materials and their roles, mechanical and thermal properties, some models used in design, micromechanical and macro mechanical calculations, methods of preparation, applications, new materials, nanotechnology.

CH 438 Petrochemicals

Synthesis and reactions of carbon monoxide, hydrogen mixtures ammonia, urea, ammonium nitrate and methyl alcohol, oxidation, chlorination, nitration and sulphonation of parraffins to obtain different chemicals. separation of gases for preparation of olefins, ,hydration of olefins and production of ethyl alcohol and isopropyl alcohol. Oxidation of olefins and synthesis of ethylene oxide, acrolyne, vinyl chloride, allyl, Diolefins and production of butadine. Naphthenes and the production of nylon from cyclohexane. Aromatics and the production of benzene, toluene, xylene, ethyle benzene, styrene and phenol. Surfactants from petroleum raw materials.

CH 401 Project

Under supervision of staff member student study, analyzing of an engineering problem or subject.

CH 402 Project

The student continues his project

Humanities

HS 011 English language

Characteristics of technical English language: A review of grammar rules and composition mechanisms and some composition rules, and active sentences and their characteristics and defining some of the most common mistakes in writing the technical English sentences, making paragraph and main ideas, types of paragraphs, reading and analyzing some parts of technical writing in various engineering fields to improve communicating skills .

HSx12 Technical Report Writing

Types of reports, contents of reports, reduced reports, detailed reports, importance and object of reports, text writing, means of graphs representation, means used for representation of report writing principles of speech, types and contents of representation screens for spech, means of research references, references, training on writing the technical reports and speech.

HS 021 History of Engineering Sciences

Definitions of art, science, technology and engineering: Development of civilizations and its relationships with both physical and human sciences, history of technology and engineering with all its fields, historical correlation between science and technology, the relationship between the engineering development and the environmental development in both social and economical perspectives, examples on development of engineering activities.

HS 122 History of Architecture-1

This course surveys the architecture of the historical time period spanning from the prehistoric era, including Ancient Egyptian and Mesopotamian (Assyrian and Babylon) civilizations, to that of the Greek and Roman periods. The survey investigates innovations and challenges in architectural concepts, stylistic expression, building typology and construction techniques. The course focuses on the social, cultural and technical factors which influenced specific characteristics of a given time and place.

HS 123 History of Architecture-2

The course surveys the history of architecture of the early Christian period, Medieval, Romanesque, Gothic, and Renaissance architecture in Europe of 18th and 19th centuries. They will be discussed in relation to principles and trends, addressing issues of function, structure in relationship to the cultural context, including philosophical, religious, political, economic and environmental factors. The course covers an introduction to the theories and trends of contemporary architecture.

HS 128 History of Chemical Engineering Science

Defining of Chemical Engineering, Chemical Engineer Duties and function, development of Chemical Engineering science, different examples for Chemical Engineering science, effect of politics and wars on Chemical Engineering techniques, common and different areas between Chemical Engineer and other chemical and engineering professions.

HS 129 History of Nuclear Engineering

Historical development of Nuclear Energy, Nuclear Energy and public opinion, Ethical use of Nuclear Energy, Egyptian Nuclear Energy program, Technology transfer in the Nuclear field.

HS 132 - Law and Engineering Economy

Law: Definition of law and its duties, Principles and regulations of statutes, Highlights on the ciil law(general principles with emphasis on contracts and compensations), Highlights on criminal law (criminal responsibility on the engineer as a professional), Highlights on the laws of syndicates

(responsibilities, disciplines, charter of honor), Highlight on the law of enterprises (foundation, individual enterprises, incentive and guarantee for the investment), Highlight on the laws of taxes and their types, Highlights on law of environment protection, Investigation and litigation
Engineering Economy: General economical conditions- factors affecting the economical studies of projects (economical definitions- investment- costs- expenses- feasibility studies- projects evaluation- alternatives comparison- general budget)

HS x33 Laws for Engineering Profession
Definition of law and its duties, Principles and regulations of statutes, Highlights on the ciil law(general principles with emphasis on contracts and compensations), Highlights on criminal law (criminal responsibility on the engineer as a professional), Highlights on the laws of syndicates (responsibilities, disciplines, charter of honor), Highlight on the law of enterprises (foundation, individual enterprises, incentive and guarantee for the investment), Highlight on the laws of taxes and their types, Highlights on law of environment protection, Investigation and litigation.

HS x41 Environmental Sciences
Introduction on water resources, water pollution and sources of pollutants, Surface water, Dissolved oxygen, Biological oxygen demand, Chemical oxygen demand, Properties of water in lakes and reservoirs, Ground water and its pollutants, Water quality control, Drinkable water, Water treatment systems, Dangerous and toxic wastes and their treatment, Ground waste dumping, Air pollution, Reference measure for air pollutants, Types of air pollutants, Transportation exhausts, Sound pollution.

HS x52 Industrial Safety
Introduction, Principles of Industrial safety, Risk sources safety requirements (Gases, Dust, Fire,), Occupational diseases, Safety regulation for industrial facilities, Prevention and control of industrial risks, accidents, and fire, Safety procedures and Occupational Health, Rescue and Evacuation, Safety improvement, Performance evaluation.

HS 161 Management Information System
Introduction, Hardware, Software, Database structure, Importance of Communication technology, Types of Information Systems, Information systems in industry and business, Information system development.

HS x66 Accounting and costs
Nature of accountancy and its scopes, theoretical principles of accountancy, basic accountancy operations, concepts and elements of costing systems of measuring production cost, introduction for cost measurements, recording the cost items.

HS 171 Computer and Productivity Support
Production Support Tools, Computer application in Humanities, engineering and medical sciences.

HS 172 Computers and Society

History of computing and the information industry , Social context of computing , Economic issues in computing , Intellectual property , Copywrite, patents, trade secrets issues , Professional and ethical responsibilities , Codes of ethics , Current trends of computer applications in industry and management , Impact of information revolution on the society , e-society, e-bussiness, e-commerce and e-government.

HS 224 History of Islamic Architecture

The course surveys the art and architecture of the Islamic civilization from its beginning to the Ottoman Empire. The course covers the period of the beginning of Islamic architecture, Umayyad and Abbasid architecture, early and classic architecture in North Africa and Asia. This includes the study of Islamic architecture in Egypt during its various eras: Fattimid, Ayyubid, Bahari Mamluk, Circassian Mamluk and Ottoman. These will be discussed in relation to social and cultural context in addition to religious, political and environmental factors.

HS 225 Town and Site Planning

Town Planning: The course concerns the study of the physical design of cities with particular emphasis on the emergence of settlement patterns and their relationship to land forms and social intentions. The course covers a historical review of the Islamic cities planning, utopia, and garden cities and the impact of industrial development on cities, rural settlements. The course introduces theories of town planning and planning process.

Site Planning: The course aims to enhance the understanding of the fundamental relationships between buildings, people, and the landscape they inhabit. The course focuses on site inventory and analysis, site planning, and site design with particular emphasis on the relationship to architectural practice. Case studies of existing projects are used to examine the theoretical and practical aspects of site planning.

HS x27 Psychology

Introduction to vocational psychology, Psychology of individual differences, Job analysis and job description, Vocational choice, Vocational Guidance, Vocational training, Psychology of accidents and industrial security, Human Engineering, Vocational diseases and mental health in industrial and organizational fields.

HS230 Laws and Statutes

Laws and Regulations for keeping and use of Nuclear material in Egypt.

HS 234 Maritime Law and Marine Insurance

The legal nature of the ship. Ship persons. The maritime contract of carriage. Shipper and carrier liabilities. Maritime sale contracts: Liabilities of contractors, Sale at departure (CIF and FOB), Sale on arrival. Marine lien and mortgage. Marine accidents: Collision, assistance and salvage, total loss. Marine insurance.

HS 238 Laws and Ethics for Engineering Professions

Laws for Engineering Professions: Definition of law and its duties, Principles and regulations of statutes, Highlights on the ciil law(general principles with emphasis on contracts and compensations), Highlights on criminal law (criminal responsibility on the engineer as a professional), Highlights on the laws of syndicates (responsibilities, disciplines, charter of honor), Highlight on the law of enterprises (foundation, individual enterprises, incentive and guarantee for the investment), Highlight on the laws of taxes and their types, Highlights on law of environment protection, Investigation and litigation

Ethics for Engineering Profession: Scope and objectives of the ethics of the engineering profession, Theories for duties and rights, Nature of the engineering professions (experimentation, safety, risk and carelessness), Professional behavior, Responsibilities towards customers and supervisors, Rules

HS x61 Project Management
Project Planning, Scheduling, and control, Project activities and network construction, Critical path method, PERT, Introduction to Resource scheduling, Project Economy.

HS x 64 Engineering Economy
Principles of Economy, Economical Analysis, Comparison between alternatives, Present worth method, Future worth, Depreciation, Taxes, Inflation, Risk and uncertainty, Introduction to Engineering cost analysis and budgeting.

HS 326 Regional and City Planning
This course presents an introduction to the comprehensive studies of planning at the regional and city levels. It addresses the basic definitions, early utopias, planning process and stages, and planning fundamentals. Issues covered include the distribution of land uses, urban functions, and zoning of activities. The course also presents an overview of planning topics such as the neighborhood unit, new towns movement, and densities of built areas and population.

HS 345 Nuclear Energy and Environment
Sources of nuclear wastes, Importance and diffusion of nuclear particles to the environment, Accumulation, Environmental transfer, Biological effects.

HS 353 Total Quality Management
Quality management, Level of quality, Quality standards, Quality circles, Reliability, Maintenance, Quality principles in industry

HS 362 Engineering Economy and Project management
Design and production evaluation, Value os systems and services, economic analysis of alternatives, costing and prices. Project Planning, Scheduling, and control, Project activities and network construction, Critical path method, PERT, Introduction to resource scheduling.

HS 363 Human Factors
Introduction, Man machine systems, Environmental Effect (Noise, Lighting, Heat, Pollution…) introduction to Man-Machine design adaptation, Industrial safety, Accident prevention, Safety systems, Risk analysis.

HS 365 Ship Economics
Ships and cargoes. Principles of economics. Economic analysis for engineering decision making: cash flow, time value of money and interest rates. Measures of merit and evaluation of alternatives. Influence of corporate income tax, leverage, inflation, accelerated depreciation plans, etc. Break-even analysis. Replacement analysis. Shipbuilding and operating cost estimates. Applications in ship design, building and operation. Optimization problems.

HS 368 Economics of Electrical Energy
Load management. Lighting systems. Power factor. Efficient motors and energy saving loads. Generation management. Local and privet generators. Connection with utility system. Co-generation. Combined cycles.

HS 373 Man-Machine Interface-1
Information transfer, Work design, Physiology and human control systems, Efforts and ergonometrics fatigue.

HS 374 Man-Machine Interface-2
Man interface capabilities: vision, hearing, Reaction and response times, measurement of effort and fatigue, Computerized scanning and mapping techniques in medicine, Outlook of the role of computers in biomedical technology

HS 375 Philosophy of Field Research
Basic principles and correct bases for samples selection, study and analysis; Different methods of sample classification through numbering or specific clustering for field research and laboratory experiments; Methods of designing questionnaires to attain optimum best results; Design by complete and partial factorials; Sources of errors; Statistical error analysis; model evaluation, ; Samples and clusters; Analysis of variables; Case studies and applications

HS 431 Architectural and Planning Legislations
This course is intended to provide an opportunity to explore the essential elements of the legal context of architectural practice including the laws and regulatory legislations of construction practices and urban planning in Egypt. Legal rights and responsibilities, ownership privileges and associated contracts and documentation are outlined.

HS 435 Maritime Statutes
Introduction and definition of the Egyptian and international laws and statutes applied to the maritime field. Study of the Egyptian statute in the inland navigation. Maritime laws and statutes issued by the maritime organizations and accredited by the different countries, e.g., SOLAS, MARPOL, etc. Study of the Egyptian laws and statutes regulating the sea and inland navigation with particular emphasis on passenger and tourist ships.

HS 436 Communications Laws and Codes
Communication laws. Codes for communication and electronic commerce activities. Laws and codes for intellectual rights for communications, internet and electronic signature. Laws and rules concerning the use of electronic equipment. Safety rules for communication systems and electronic equipments. Rules and conditions for installing mobile base stations. Laws and rules of communication regularization authorities.

HS 437 Laws and Rules of Electrical Safety
Sources of Electric accidents. Safety earthing. Electrostatic charges and lighting protection. Hazardous locations. Special installations.

HS 439 Contracts and Specifications
Contracts: Contracts of engineering projects and their contents, Quantitative quotation for list of works and phase of the preparation of quantities table, specifications of engineering works,

Analysis of cost elements, and estimation of cost categories, strategies for tenders, Disputes, requisitions and control, Project time and duration , Expedite the execution of projects planning
Quantities and specifications: methods for retrieving quantities, methods for accounting and cost analysis, preparation of quotations, preparation of conditions and specifications, applications and case studies.

HS 442 Environment Protection
Definition, effect of engineering projects on the environment, Control of waste disposal, Laws of environment protection, Relationship between water projects, liquid wastes and water pollution.

HS 443 Marine Pollution
The marine environment. Sources of pollution. International conventions on marine pollution (MARPOL 1973/1978, OPA '90, etc.). New design considerations for oil tankers. Oil spill prevention. Oil spill containment and cleanup. Environment–friendly shipbuilding and scrapping. Environment–friendly ship operation. Sewage treatment. Sewage and pollution. Example problem.

HS 444 Social Risks and Security of Computer Systems
Social implication of networked communication and the Internet, Risks and liabilities of safety-critial systems, Privacy and civil liberties, Computer crimes, Economic issues in computing , Methods and tools for safety and security.

HS 451 Professional Practice
This course will address itself to covering the legal, contractual and ethical responsibilities of the architect in pursuance of his professional services. The following topics will be addressed: the architect and the law, the building industry, architectural practice, design phases, contract document and their handling, construction and contracting practice, completion and final documents, arbitration. Relationships with the client, contractor, professional institutions, the Association of International Architects in addition to the regulatory role of the local syndicate will also be discussed.

HS 454 Specifications and Feasibility Study
General and detailed technical specifications. Specifications according to component study. Local and international standards. Preliminary feasibility studies for engineering projects. Project cost estimation. Financial structures. Replacement analysis. Asset evaluation.

HS 455 Industrial Operation Management
Linear programming application in operation management, Mathematical and graphical solutions, industrial organization, job description, management duties,

HS 456 Professional skills and Marketing
Methods of presenting and documentation of technical, engineering and administrative data; Precise analysis of documents, reports and articles; Ideal methods of writing and presenting of the curriculum vitae; Types of technical and administrative correspondence; Modern methods for exchanging, presenting and discussing information; Managing personal and general meetings; Ethics and management of professional meetings; Types of marketing means; Relation between marketing and applied fields; Marketing tools; Relation between means of presentation, marketing and marketing return; Measuring marketing returns.

HS 460 Plant Organization and Management

Concepts of organization and factory management concept of organization in plants, management, plant planning, site, machinery, building, production economics and production planning, cost and, depreciation, time and motion study, material control and material handling, selection, arrangement and adaptation of machinery for different raw material and porting of products, details of lay-out of machinery, maintenance routines, process control, staff, functions and responsibility of personnel, allocation of labor in the various departments, working load assignment and job evaluation, measure of labor productivity, methods of costing different products, law of work contract, relation between labor and the owner, fundamentals of economics, organization by times and charts

HS 461 Feasibility Study

Definition of feasibility study, Project development procedure, Project-Environment relation, Basic feasibility studies (Marketing, Regulation, Environment, and Technical) Comparison of alternatives, Economical Analysis, Project Evaluation, Applications.

HS 463 Marketing

Definition of marketing, Objective of marketing systems, Hierarchy of marketing systems, Role of marketing for the economic unit with planning strategy, Process of marketing, Marketing information system, Consumer markets and purchasing behavior, Pricing strategy, Marketing channels, Communication marketing means: advertising and promotion.

HS 464 Economics of Energy

General review of energy economy, utilization of stagnant energy resources, utilization of nuclear energy, renewable energy, fuel cells, energy storage and transportation, economical efficiency in energy engineering, effective use of energy.

HS 467 International Trade

Principles of international trade theory, Concept of international equilibrium, Trade balance, Balance of payments, Economical unions, International economical relations, Exchange of goods and services (exports and imports), Labor forces, Capital exemplified in direct and indirect foreign investments, Aids and their types, Long and short terms loans, International institutions (World Bank, International Bank for Reconstruction and Development – IBRD, International Monetary Fund – IMF), International agreements: General Agreement on Tariff and Trade – GATT.

HS 469 Specifications and Project Management

Quantities and specifications: methods for retrieving quantities, methods for accounting and cost analysis, preparation of quotations, preparation of conditions and specifications, applications and case studies. Management: basics types of projects.

Business Administration: Basic types of projects, Stocks of data, Net components, Planning, Vision mission and value, Hierarchical ladder, Cost control in projects, Finance of projects, Decision making for productivity, Marketing, Personnel, Purchasing, Principle of scheduling, Resources distribution, Management of information systems, Pert Statistical Method, Case studies.