FUTURE
UNIVERSITY IN EGYPT
جامعة المستقبل

# Faculty of Engineering and Technology

# Curriculum
# For The Bachelor of Science Degree
# In Engineering

# INTERNAL REGULATIONS
# FOR THE BACHELOR OF SCIENCE DEGREE
# IN ENGINEERING

## 1. MISSION

The main objective of the faculty of Engineering and Technology from its inception would be to provide the opportunity of learning engineering sciences and technical applications that are of high quality. This would be provided for all students from all over Egypt, the neighboring Arab countries and other nations, who fulfill the acceptance requirements of the Supreme Council of Egyptian Universities. In addition, the faculty would also participate in developing engineering and technical applications in Egypt.
The aim of the faculty would be to achieve professional excellence for its graduates through the continuous development of the educational programs; upgrading the laboratories and libraries through providing them with state of the art equipment, publications and top quality personnel; Recruiting outstanding Faculty members and teaching assistants highly capable of utilizing the latest educational technology and updating teaching methods as well as pursuing original research work.

Accordingly, the objectives of the faculty would be to:

1 - Prepare graduates that are specialized in different fields of engineering, technical and applied science to help society in the different specializations.
2 - Conduct studies and research in the different fields of engineering to upgrade society and solve its problems.
3 - Participate in the future planning through setting development strategies.
4 - Set the rules for the continuous development of educational programs and assessing the performance.

In addition, the faculty will strive hard to seek suitable job opportunities for its graduates.

## 2. DEPARTMENTS

The faculty of Engineering and Technology includes the following Departments:

1 - Architectural Engineering (175 Credit Hours)

2- Electrical Engineering

This department consists of the following scientific specializations:

- Electronics and Communication Engineering (176 Credit Hours)
- Electrical Power Engineering (176 Credit Hours)

3- Mechatronics Engineering (175 Credit Hours)

4- Petroleum Engineering (176 Credit Hours)

5- Structural Engineering and Construction Management (176 Credit Hours)

## 3. EDUCATION SYSTEM

The system of study in the faculty is a credit hours system, in which courses are offered over two semesters per year, the duration of each semester is fifteen teaching weeks. Courses may, also, be offered in a summer semester of five teaching weeks duration. The Credit hour is an educational measuring unit for determining each course weight and it is equivalent to one weekly educational theoretical hour or laboratory of duration not less than two hours a week (unless otherwise stated in the educational plan) over the period of one semester.

The education plan requires the accomplishment of about 175 credit hours successfully for obtaining the bachelor degree in any of the faculty departments. Students can achieve the graduation requirements in ten regular educational semesters. Each department has proposed a program that allows the fulfillment

of these requirements. The flexibility of the credit hour system enables the students to increase or decrease the duration of these programs through exceeding the permissible registration of 12 to 19 credit hours per semester or through attending summer courses.

It should be noticed that exceeding the maximum or minimum number of credit hours is not allowed without the permission of the dean and the consultation of the academic advisor and is subject to the faculty regulations guide.

## 4. ACADEMIC PLAN

The number of credit hours required for obtaining the Bachelor of science degree in Engineering is about 175 credit hours. These are classified as follows:

1 - University Requirements: …… (12 Credit Hours)

- Compulsory Courses: (8 Credit Hours)
- Elective Courses: (4 Credit Hours)

2 - Faculty Requirements: …… (32 Credit Hours)

3 - Departmental Requirement: …… (About 131 Credit Hours)

## 5. CODING SYSTEM

**Courses Internally Taught by a Department**

The course code starts by the abbreviation of the department (Specialization), followed by the Course level, followed by the subject number and the course number within the subject.

**General Courses Such as Humanities and Language**

The course code starts by the abbreviation "GEN" followed by the number of the course level, subject number and the course number.

**Departments' Coding System**

| No. | Department or Branch | | Code |
|---|---|---|---|
| 1 | Engineering Mathematics and Physics (Non-Degree Dept.) | Mathematics | MTH |
| | | Physics | PHY |
| | | Mechanics | MEC |
| | | Chemistry | CHM |
| | | Graphics | GRA |
| | | Geology | GEO |
| | | Mining | MIN |
| 2 | Architectural Engineering | | ARC |
| 3 | Biomedical Engineering | | BME |
| 4 | Computer Engineering | | CMP |
| 5 | Communication Engineering | | COM |
| 6 | Electronics Engineering | | ELE |
| 7 | Electrical Power Engineering | | EPR |
| 8 | Manufacturing and Production Engineering | | MAN |
| 9 | Mechanical Power Engineering | | MPR |
| 10 | Mechatronics Engineering | | MKT |
| 11 | Petroleum Engineering | | PET |
| 12 | Structural Engineering and Construction Management | | SCM |

# 6. MAIN REGULATIONS

## 6.1. Academic Advising

The faculty assigns an academic advisor to each student to help the student in his registration and to guide him all-over his study towards his B.Sc. degree. The advisor would, also, help the student in solving any academic or social problems.

## 6.2. Registration Procedure

- Before the beginning of each semester, students should register the courses which they select, in specified templates designed especially for this purpose, at the date indicated by the faculty before the semester starts.
- The ordinary load for the semester ranges between 12-19 credit hours. Each department specifies the suitable load according to its courses and rules. The maximum load of the summer semester is 7 credit hours.
- Excellent students (GPA $\geq$ 3.5) are allowed to register up to 21 credit hours. For this purpose, the approval of both the academic advisor and the Dean is needed.
- After the primary registration, students are allowed to cancel or remove courses, during the first three weeks of the semester. This may be achieved after the advice of the academic advisor, through specially designed templates provided by the faculty.

## 6.3. Course Withdrawal and Addition

- The student should follow the instruction of the faculty's registration office for the addition of (or withdrawal from) any course that had been previously registered
- Students are not allowed to add (or withdraw from) any course without the permission of the Dean after the approval of the academic advisor.
- It is not possible to add any course to the student's time table after the end of the registration period.
- After registration, the student may withdraw from a course or more during the first 12 weeks provided that the number of the remaining

registered hours is not less than the minimum requirement of the semester. In this case, the student is not considered a fail student in these courses.

- It is not allowed for a student to withdraw from a course after the allowed period (the first 12 weeks of the semester) without an excuse accepted by the faculty council.

## 6.4. Attendance and Absence

- Attendance of lectures, tutorials and labs is an essential issue in the educational process in the faculty, as the student gets benefits from the interaction inside the class room between him and the staff members, teaching assistants and colleagues. Therefore, students should attend regularly so that their grades are not affected by their absences.
- Students who do not attend a term exam without an excuse acceptable by the academic advisor and the course's instructor are not given a make-up exam.
- Students are allowed to withdraw from a course if the absence ratio exceeds 25% of the lectures, during the first **12** weeks of the semester, but if the absence ratio exceeds 25 % after the first **12** weeks, students are not allowed to withdraw the course, attending lectures or attending the final term exam .The student gets an (F) grade in this course.
  The students have to be warned at least once before preventing them from attending the final exam.
- The final exam may be delayed for a student till the beginning of the next semester if he/she has an acceptable excuse. In this case, the student's semester work marks are kept for him/her, and the student is allowed to attend the final exam at the beginning of the next semester; and gets a final grade “I” (incomplete) in this course in the semester in which he/she did not attend the exam.

## 6.5. Semester Withdrawal

- The student has the right to withdraw from an academic semester within the withdrawal period announced in the academic calendar of the semester.

- The student will be considered failed if he withdraws after the aforementioned period above, unless he has a valid reason which is acceptable by his advisor, and the Dean.

## 6.6. System of Examinations

The final mark of a given course is composed of the sum of semester's work and the final exam marks, as follows;

Final Exam: **40 Marks**
Semester's work: **60 Marks**, which is composed as follows:

1. Two written exams at the end of the 6th and the 11th week.
2. Quizzes.
3. The oral and practical exams, if exist.
4. Student's performance and capability for understanding and participation.

**The distribution of the Semester's work:**

**25 Marks**: For the evaluation of students at the end of the 6th week.
**25 Marks**: For the evaluation of students at the end of the 11th week
**10 Marks:** For evaluation of the student's performance during the whole semester.

**The course instructor may suggest a suitable distribution for all the course marks.**

## 6.7. Grading System

At the end of the semester students receive a final grade in each course. The grade is the professor's official estimate of the student's achievement as reflected in examinations, assignments, and class participation. The final grades are recorded on the student's permanent record at the Office of the University Registrar.

**The following grading system is used:**

| Grade | Range | Points |
|---|---|---|
| A<br>A- | From 90% to 100%<br>From 85 to < 90% | 4.0<br>3.7 |
| B+<br>B<br>B- | From 80 to <85%<br>From 75 to < 80%<br>From 70 to < 75% | 3.3<br>3.0<br>2.7 |
| C+<br>C<br>C- | From 65 to < 70%<br>From 60 to < 65%<br>From 55 to <60% | 2.3<br>2.0<br>1.7 |
| D+<br>D | From 53 to < 55%<br>From 50 to < 53% | 1.3<br>1.0 |
| F | < 50 % | 0.0 |

The Grade Point Average (GPA) is calculated as follows:

$$GPA = \frac{\sum CH\ of\ each\ course * points\ earned\ for\ that\ course}{\sum Hours\ of\ graded\ courses}$$

## 6.8. Failure and Re-registration of Courses

1. **Re-registration of courses in the case of failure**

- If a student fails a compulsory course in any semester, he should restudy this course. However, if he fails an elective course, he may restudy the same course or register in another elective course but after the approval of his academic advisor.
- If the student succeeds a re-registered course, the F grade remains in his academic record, but its mark is replaced by the new mark which is then used in calculating his GPA.

**2. Re-registration for improving the G.P.A**

- A student is allowed to register one course or more in order to improve his G.P.A. In this case, the student gets the higher mark and the other lower mark is canceled together with its credit hours from his academic record.
- In case a student wants to re-register a course for the second time for improving, he has to attain the permission of his advisor and the approval of the faculty council.

## 6.9. Students with GPA less than 2.0

- If the GPA of a student in any semester drops below 2.0, he/she is put under close observation for the next 2 semesters and is not allowed to register more than 12 credit hours in these two semesters**.** He/She may be allowed to register in addition the English language course.
- The student has to raise his/her Cumulative Grade Point Average (CGPA) to 2.0 at least by the end of the next semester otherwise he/she will be subjected to dismissal from the university. In this case the student may appeal to the Dean for continuing his study. The Dean has to discuss the case with the faculty council for approval subject to a study of the student social and health conditions.

A written warning is sent to the student under probation and a copy of it is forwarded to his/her parent.

## 6.10. Graduation Requirements

To be awarded the Bachelor of Science Degree in Engineering &Technology, students must earn a minimum of about 175 credit hours depending on the concerned department. The student must earn a grade D or better in all the required courses and earn a grade-point average of C or better in order to graduate.

| RATING | G.P.A | Rank of Honor ** |
|---|---|---|
| Distinction | 3.7 to 4.0 | With Rank of Honor |
| Very Good | 3.0 to < 3.7 | With Rank of Honor |
| Good | 2.3 to< 3.0 | - |
| Pass | 2.0 to<2.3 | * |

*** The student can never be graduated with cumulative G.P.A < 2.0.**

**** For obtaining the rank of honor, the student should have not failed any course during his/her study.**

## 7. GRADUATION PROJECT

It is an engineering assignment that requires the student to demonstrate his/her ability to conduct a design or research and to demonstrate his/her presentation skills. The student will select a project title at the beginning of the ninth semester. Nevertheless, students themselves can propose their own project title. A faculty member will provide supervision. A project report and/or a complete project is required at the end of the tenth semester.

## 8. CHANGE OF SPECIALIZATION

Students may change their field of study or be required to change it by a university action based on:

1. The recommendations of the academic advisor.
2. The approval of the faculty council.

## 9. SCIENTIFIC VISITS

The Faculty may arrange scientific visits for the students to industrial, construction and service centers under supervision of the faculty members. These visits are subsidized by the University.

## 10. PRACTICAL TRAINING

Each student is required to spend a minimum of 240 hours in practical training split over three modules each having 80 hours. This training can be carried out during the summer or mid-year vacations in Egypt or abroad after level two. One training module can be carried out on-campus through enrolling in the internal training organized by the Faculty. After completing the practical training, a complete account of the student experience shall be reported, presented and evaluated by the academic department as unaccredited activity, mandatory for graduation.

# STUDY PROGRAMS

# A - UNIVERSITY REQUIREMENTS
# (12 credit hours)

## 1. Compulsory Courses List
## (8 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CSC 101 | Introduction to Computers | 2 |
| PSC 110 | Human Rights | 2 |
| ENG KET | English KET | 2 |
| ENG PET | English PET | 2 |

## 2. Elective Courses List
## (4 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| BSA H01 | Administration of Small Projects | 2 |
| ENG H02 | English Technical Writing | 2 |
| ENV 101 | Environmental Science | 2 |
| HUM H05 | History of Science | 2 |
| PSY 101 | Psychology | 2 |
| SOC 101 | Sociology | 2 |
| SCT 101 | Scientific Thinking | 2 |
| HUM H09 | Specific Computer Applications | 2 |

# B - FACULTY REQUIREMENTS
# (32 credit hours)

## 1. Compulsory Courses List
## (30 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CHM 151 | Chemistry 1 | 2 |
| CMP 132 | Computer Programming | 2 |
| GEN 313 | Report Writing and Presentation Skills | 2 |
| GRA 141 | Graphics 1 | 2 |
| GRA 142 | Graphics 2 | 2 |
| MAN 121 | Production Technology | 2 |
| MEC 121 | Mechanics 1 | 2 |
| MEC 122 | Mechanics 2 | 2 |
| MTH 111 | Differentiation with Applications and Algebra (Math. 1) | 3 |
| MTH 112 | Integration with Applications and Analytical Geometry (Math. 2) | 3 |
| PHY 131 | Properties of Matter and Thermodynamics (Physics 1) | 4 |
| PHY 132 | Electricity and Magnetism (Physics 2) | 4 |

## 2. Electives Courses List
## (2 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| GEN 441 | Law for Professional Engineers | 2 |
| ARC 582 | Professional Practice & Legislations (for Architects only) | 2 |

# C - DEPARTMENTAL REQUIREMENTS

## 1. Architectural Engineering Department (131 credit hours)

### a. Compulsory Courses List (119 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| ARC 211 | Architectural Design 1 | 3 |
| ARC 212 | Architectural Design 2 | 3 |
| ARC 221 | History & Theories of Architecture 1 | 2 |
| ARC 222 | History & Theories of Architecture 2 | 2 |
| ARC 231 | Graphics & Visual Skills 1 | 3 |
| ARC 232 | Graphics & Visual Skills 2 | 3 |
| ARC 241 | Building Construction & Materials 1 | 3 |
| ARC 242 | Building Construction & Materials 2 | 3 |
| ARC 311 | Architectural Design 3 | 4 |
| ARC 312 | Architectural Design 4 | 4 |
| ARC 321 | History & Theories of Architecture 3 | 2 |
| ARC 322 | History & Theories of Architecture 4 | 2 |
| ARC 323 | Human Studies in Architecture | 2 |
| ARC 341 | Building Construction & Materials 3 | 4 |
| ARC 342 | Building Construction & Materials 4 | 4 |
| ARC 451 | Urban Planning 1 | 3 |
| ARC 452 | Urban Design & Housing 1 | 3 |
| ARC 453 | Landscape Architecture | 3 |
| ARC 361 | Environmental Control & Technical Installations 1 | 2 |
| ARC 362 | Environmental Control & Technical Installations 2 | 2 |
| ARC 411 | Architectural Design 5 | 4 |
| ARC 412 | Architectural Design 6 | 4 |
| ARC 421 | History & Theories of Architecture 5 | 3 |
| ARC 422 | History & Theories of Architecture 6 | 3 |
| ARC 551 | Urban Planning 2 | 3 |
| ARC 552 | Urban Design & Housing 2 | 3 |

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|---|---|---|
| ARC 471 | Execution Designs 1 | 4 |
| ARC 472 | Execution Designs 2 | 4 |
| ARC 501 | Graduation Project Studies | 2 |
| ARC 502 | Graduation Project | 5 |
| ARC 511 | Architectural Design 7 | 4 |
| ARC 571 | Execution Designs 3 | 4 |
| ARC 581 | Project Management & Feasibility Studies | 2 |
| MTH 213 | Mathematics, Statistics & Computers | 3 |
| SCM 214 | Theory of Structures | 3 |
| SCM 215 | Properties & Strength of Materials | 2 |
| SCM 223 | Surveying | 2 |
| SCM 317 | Reinforced Concrete for Architects | 2 |
| SCM 418 | Steel Structures for Architects | 2 |
| SCM 442 | Foundations for Architects | 3 |

## b. Elective Courses List
## (12 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| ARC E01 | Computer Applications for Architects 1<br>(Computer Aided Drawing: Computer Drawing in 2D & 3D) | 3 |
| ARC E02 | Computer Applications for Architects 2<br>(Computer Aided Design: Modeling, Visualization, Generation, Simulation and Optimization) | 3 |
| ARC E03 | Interior Design<br>(Colors - Textures - Materials - Design) | 3 |
| ARC E04 | Community Development / Participatory Design<br>(Techniques of data gathering – User participation – Case studies) | 3 |
| ARC E05 | Architectural Heritage:<br>(Conservation – Preservation – Charters – Case studies) | 3 |
| ARC E06 | Urban Upgrading and Management<br>(Upgrading techniques – Management procedures) | 3 |
| ARC E07 | Architectural Aesthetics & Criticism<br>(Theories of aesthetics – Definitions – Critiquing – Case studies) | 3 |
| ARC E08 | Appropriate Architecture & Technologies | 3 |

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|---|---|---|
| | (Appropriate Materials – Systems – Technologies - Case studies) | |
| ARC E09 | Innovative Architecture & Technologies (New materials – systems – Technologies – Case studies) | 3 |
| ARC E10 | Computer Applications for Architects 3 (Responsive Architecture, Physical Computing, Digital Fabrication) | 3 |
| ARC E11 | Computer-Aided Information (GIS) (Data Analysis – Case studies) | 3 |

# 2. Electrical Engineering (132 cedit hours)

## i. Electrical Engineering Core List (62 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CMP 334 | Digital Systems and Computer Organization | 3 |
| CMP 351 | Microprocessors and Applications | 3 |
| CMP 371 | Control Systems 1 | 3 |
| COM 213 | Electromagnetic Waves 1 | 3 |
| COM 362 | Signal Analysis | 3 |
| ELE 213 | Electronics | 4 |
| ELE 215 | Logic Design and Digital Circuits | 3 |
| ELE 364 | Electronic Circuits | 4 |
| EPR 261 | Electrical Circuits 1 | 4 |
| EPR 263 | Electrical Circuits 2 | 4 |
| EPR 341 | Energy Systems | 3 |
| EPR 364 | Electrical and Electronic Measurements | 3 |
| MAN 381 | Engineering Economics | 2 |
| MPR 243 | Thermodynamics and Fluid Mechanics | 3 |
| MTH 211 | Functions of Several Variables and Ordinary Differential Equations (Math. 3) | 3 |

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|---|---|---|
| MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 |
| MTH 311 | Complex Variable and Special Functions (Math. 5) | 3 |
| MTH 312 | Probability and Statistics (Math. 6) | 3 |
| PHY 232 | Solid State Physics (Phys. 4) | 3 |
| SCM 217 | Civil Engineering | 2 |

# ii. Electrical Power Engineering Specialization Requirements (70 credit hours)

## a. Compulsory Courses List (58 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CMP 472 | Control Systems 2 | 3 |
| COM 414 | Communication Systems | 3 |
| EPR 411 | Power System Analysis 1 | 3 |
| EPR 412 | Economics of Generation & Operation | 3 |
| EPR 413 | Renewable Energy | 3 |
| EPR 421 | Transmission and Distribution of Electrical Energy | 3 |
| EPR 431 | High Voltage Engineering | 3 |
| EPR 444 | DC Machines & Transformers | 4 |
| EPR 445 | Induction Machines | 3 |
| EPR 451 | Power Electronics 1 | 3 |
| EPR 452 | Power Electronics 2 | 3 |
| EPR 473 | PLC and Applications | 3 |
| EPR 500 | Graduation Project | 0 |
| EPR 501 | Graduation Project | 4 |
| EPR 511 | Computer Applications in Electric Power Engineering | 3 |
| EPR 512 | Power System Analysis 2 | 3 |
| EPR 541 | Synchronous Machines | 3 |
| EPR 551 | Electric Drives | 3 |
| EPR 581 | Protection and Switchgear in Electrical Power Systems | 3 |
| GEN 541 | Environmental Impact of Projects | 2 |

## b. Elective Courses List
## (12credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| EPR 513 | Utilization of Electrical Energy | 3 |
| EPR 514 | Planning of Electrical Networks | 3 |
| EPR 531 | Over-Voltages in Power Systems | 3 |
| EPR 533 | Power Quality | 3 |
| EPR 542 | Special Electrical Machines | 3 |
| EPR 571 | Advanced Control of Power | 3 |
| EPR 582 | Applications in Protection & Switchgear Systems | 3 |

# iii. Electronics and Communication Engineering
## Specialization Requirements
## (70 credit hours)

## a. Compulsory Courses List
## (61 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CMP 472 | Control Systems 2 | 3 |
| COM 411 | Communications 1 | 3 |
| COM 412 | Communications 2 | 3 |
| COM 413 | Electromagnetic Waves 2 | 3 |
| COM 415 | Microwave Engineering | 3 |
| COM 500 | Graduation Project | 0 |
| COM 501 | Graduation Project | 4 |
| COM 520 | Telecommunication Networks | 3 |
| COM 521 | Antennas and Propagation | 3 |
| COM 523 | Mobile Communication Systems | 3 |
| COM 524 | Satellite Communication Systems | 3 |
| COM 526 | Data Communication Systems | 3 |
| COM 527 | Optical Fiber Communication Systems | 3 |
| COM 561 | Digital Signal Processing | 3 |
| ELE 412 | Optical Electronics | 3 |
| ELE 514 | Microwave Electronic Devices | 3 |

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|---|---|---|
| ELE 415 | Analog Signal Processing | 3 |
| ELE 420 | Electronic Devices | 3 |
| ELE 521 | Electronic Systems Design | 3 |
| ELE 570 | Microelectronics Systems | 3 |
| EPR 441 | Electrical Machines | 3 |

## b. Elective Courses List
## (9 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| COM 522 | Optical Networks | 3 |
| COM 525 | Computer Communication Networks | 3 |
| COM 530 | Digital Television Systems | 3 |
| COM 531 | Acoustics and Ultrasonic Engineering | 3 |
| COM 581 | Special Topics in Electronics and Communication Engineering | 3 |
| COM 582 | Introduction to Information Theory | 3 |
| COM 583 | Wireless Communication Networks | 3 |
| COM 584 | Interfacing Circuits and Networks | 3 |
| ELE 511 | Radio Frequency Microelectronics | 3 |
| ELE 522 | Semiconductor Devices | 3 |
| ELE 524 | Microsystems Technology | 3 |
| ELE 525 | Integrated Circuits Technology | 3 |
| ELE 526 | Analog Integrated Circuit Design | 3 |
| ELE 561 | Integrated Circuits | 3 |
| ELE 562 | VLSI Design | 3 |
| ELE 563 | Integrated VLSI Systems | 3 |
| ELE 564 | Integrated Circuits Applications | 3 |
| EPR 442 | Actuators and Power Electronics | 3 |

# 3. Mechatronics Engineering
## (132 Credit Hours)

## i. Mechanical Engineering Core List
## (73 credit hours)

| No. | Code | Course Title | Cr. H |
|---|---|---|---|
| 1 | CMP 470 | Control Systems | 3 |
| 2 | CMP 475 | Digital Control Systems | 3 |
| 3 | ELE 216 | Basic Electronic Circuits | 3 |
| 4 | EPR 266 | Electrical Circuits | 4 |
| 5 | EPR 340 | Electrical Machines | 3 |
| 6 | MAN 221 | Production Engineering 1 | 2 |
| 7 | MAN 231 | Properties of Materials | 3 |
| 8 | MAN 232 | Stress Analysis | 3 |
| 9 | MAN 241 | Mechanical Engineering Drawing | 2 |
| 10 | MAN 311 | Mechanical Mechanisms | 3 |
| 11 | MAN 321 | Fundamentals of Manufacturing Processes | 2 |
| 12 | MAN 331 | Structural Mechanics | 3 |
| 13 | MAN 341 | Mechanical Design 1 | 3 |
| 14 | MAN 380 | Modeling and Simulation | 2 |
| 15 | MAN 381 | Engineering Economics | 2 |
| 16 | MAN 441 | Mechanical Design 2 | 3 |
| 17 | MAN 481 | Quality Control | 2 |
| 18 | MAN 592 | Project Management | 2 |
| 19 | MEC 221 | Dynamics of Rigid Bodies (Mech. 3) | 3 |
| 20 | MPR 251 | Engineering Thermodynamics | 4 |
| 21 | MPR 252 | Fluid Mechanics | 4 |
| 22 | MPR 321 | Measurements and Measuring Instruments | 2 |
| 23 | MTH 211 | Functions of Several Variables and Ordinary Differential Equations (Math. 3) | 3 |
| 24 | MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 |
| 25 | MTH 311 | Complex Variables and Special Functions (Math. 5) | 3 |
| 26 | MTH 312 | Probability and Statistics (Math. 6) | 3 |

# ii - Specialization Requirements (58 credit hours)

## a. Compulsory Courses List (48 credit hours)

| No. | Code | Course Title | Cr. H |
|---|---|---|---|
| 1 | CMP 456 | Design of Real-Time Embedded Systems | 2 |
| 2 | ELE 366 | Digital Systems | 3 |
| 3 | ELE 410 | Introduction to Microprocessors | 3 |
| 4 | EPR 442 | Actuators and Power Electronics | 3 |
| 5 | MAN 350 | Industrial Automation (CAD/CAM) | 2 |
| 6 | MAN 515 | Electromechanical Design | 3 |
| 7 | MKT 411 | Mechatronics | 3 |
| 8 | MKT 412 | Mechatronics System Design | 3 |
| 9 | MKT 440 | Programmable Logic Controllers | 2 |
| 10 | MKT 471 | Robot Mechanics | 3 |
| 11 | MKT 472 | Robot Control | 3 |
| 12 | MKT 500 | Graduation Project I | 2 |
| 13 | MKT 501 | Graduation Project II | 4 |
| 14 | MPR 355 | Thermal Power Systems | 3 |
| 15 | MPR 456 | Heat Transfer | 3 |
| 16 | MPR 459 | Fluid Systems Control | 3 |
| 17 | MPR 555 | Energy Conversion systems | 3 |

## b. Elective Courses List (10 credit hours)

| No. | Code | Course Title | Cr. H |
|---|---|---|---|
| 1 | MAN 547 | Reverse Engineering in Mechanical Design | 2 |
| 2 | MAN 570 | Mechanisms Computer Aided Design | 2 |
| 3 | MKT 505 | Sensors and Signal Conditioning | 2 |
| 4 | MKT 506 | Micro Processor- Based Instrumentation | 2 |
| 5 | MKT 507 | Introduction to Micro- Electro Mechanical Systems (MEMS) | 2 |
| 6 | MKT 510 | Vibration Principles and Monitoring | 2 |
| 7 | MKT 590 | Smart Systems | 2 |
| 8 | MKT 599 | Special Topics in Mechatronics | 2 |
| 9 | MPR 466 | Heating, Ventilation and Air Conditioning | 2 |
| 10 | MPR 561 | Plant Engineering and Maintenance | 2 |

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|---|---|---|---|
| 11 | MPR 563 | Pollution Control | 2 |
| 12 | MAN 334 | Mechanics of Deformable Solids | 3 |
| 10 | EPR 341 | Energy Systems | 3 |
| 11 | EPR 443 | Sensors and Instrumentation | 2 |
| 12 | PHY 232 | Solid State Physics (Phys. 4) | 3 |
| 13 | SCM 217 | Civil Engineering | 2 |

# 4. Petroleum Engineering

## (132 credit hours)

## 1. Core Courses List

## (119 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| CHM 301 | Organic Chemistry | 2 |
| EPR 261 | Electrical Circuits 1 | 3 |
| GEN 401 | Principles of Economics | 2 |
| GEO 201 | General Geology | 2 |
| GEO 301 | Structural Geology | 2 |
| GEO 302 | Depositional Systems | 3 |
| GEO 401 | Petroleum Geology | 3 |
| HUM H02 | History of Petroleum Industry | 2 |
| MAN 221 | Production Engineering 1 | 2 |
| MAN 232 | Stress Analysis | 3 |
| MAN 241 | Mechanical Engineering Drawing | 2 |
| MAN 301 | Rock Mechanics | 2 |
| MEC 221 | Dynamics of rigid Bodies | 3 |
| MPR 251 | Engineering Thermodynamics | 4 |
| MPR 252 | Fluid Mechanics | 3 |
| MTH 211 | Functions of Several Variables and Ordinary Differential Equations (Math. 3) | 3 |
| MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 |
| MTH 311 | Complex Variable and Special Functions | 3 |
| PE 201 | Introduction to Petroleum Engineering | 2 |

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|---|---|---|
| PE 202 | Introduction to Oil Well Drilling | 2 |
| PE 301 | Properties of Petroleum Fluids | 3 |
| PE 302 | Reservoir Rock Properties | 3 |
| PE 303 | Petroleum Reservoir Engineering | 3 |
| PE 304 | Petroleum Reservoir Laboratory | 1 |
| PE 305 | Drilling Engineering I | 3 |
| PE 306 | Petroleum Refining Engineering | 1 |
| PE 401 | Natural Gas Engineering | 3 |
| PE 402 | Drilling Engineering II | 3 |
| PE 403 | Advanced Petroleum Reservoir Engineering | 3 |
| PE 404 | Well Testing Analysis | 3 |
| PE 405 | Well Performance and Production Systems | 3 |
| PE 406 | Well logging | 3 |
| PE 407 | Finite Element Analysis with Applications in Petroleum Engineering | 4 |
| PE 408 | Subsurface Production Engineering | 3 |
| PE 501 | Petroleum Engineering Design Project | 3 |
| PE 502 | Mechanical Earth Modeling | 3 |
| PE 503 | Secondary Recovery of Petroleum | 3 |
| PE 504 | Artificial Lift | 2 |
| PE 505 | Petroleum Economics and Asset Valuation | 2 |
| PE 506 | Offshore Petroleum Technology | 3 |
| PE507 | Graduation Project | 3 |
| PHY 231 | Theory of Relativity and Nuclear Physics (Phys. 3) | 3 |
| PHY 401 | Thermal Analysis (Phys. 5) | 3 |
| SCM 221 | Planimetric Surveying 1 | 2 |

# 2. Elective Courses List
# (9 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| PE 508 | Fundamental Digital Applications in Petroleum Engineering | 3 |
| PE 509 | Advanced Drilling Technology | 3 |
| PE 510 | Fundamentals of Petroleum Reservoir Simulation | 3 |
| PE 511 | Applied Reservoir Simulation | 3 |
| PE 512 | Reservoir Characterization | 3 |

### 3. Humanities/ Social Science Elective Courses List
### (4 Credit Hours)

| Code | Course Title | Cr. H |
|---|---|---|
| HUM H08 | Scientific Thinking | 2 |
| HUM HX | Humanities/ Social Science Elective | 2 |
| HUM HY | Humanities/ Social Science Elective | 2 |

## 5. Structural Engineering and Construction Management
## (132 credit hours)

### a. Compulsory Courses List
### (123 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| EPR 344 | Electrical Installations and Construction Equipment | 2 |
| MEC 221 | Dynamics of Rigid Bodies (Mech. 3) | 3 |
| MPR 252 | Fluid Mechanics | 4 |
| MTH 211 | Functions of Several Variables and Ordinary Differential Equations (Math. 3) | 3 |
| MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 |
| MTH 214 | Applied Statistics | 2 |
| PHY 231 | Theory of Relativity and Nuclear Physics (Phys. 3) | 3 |
| SCM 211 | Structural Analysis 1 | 3 |
| SCM 212 | Structural Analysis 2 | 3 |
| SCM 213 | Strength and Technology of Materials 1 | 3 |
| SCM 221 | Planimetric Surveying 1 | 2 |
| SCM 222 | Planimetric Surveying 2 | 2 |
| SCM 231 | Civil Engineering Drawing 1 | 2 |
| SCM 232 | Civil Engineering Drawing 2 | 2 |
| SCM 233 | Engineers and the Environment | 2 |
| SCM 311 | Structural Mechanics 1 | 3 |
| SCM 312 | Strength and Technology of Materials 2 | 3 |

| | | |
|---|---|---|
| SCM 313 | Engineering Geology | 2 |
| SCM 314 | Structural Mechanics 2 | 3 |
| SCM 315 | Reinforced Concrete 1 | 3 |
| SCM 316 | Building Construction and City Planning | 2 |
| SCM 321 | Geo-informatics 1 | 2 |
| SCM 322 | Geo-informatics 2 | 2 |
| SCM 351 | Construction Project Management | 3 |
| SCM 352 | Engineering Economics and Finance | 2 |
| SCM 411 | Structural Mechanics 3 | 3 |
| SCM 412 | Reinforced Concrete 2 | 3 |
| SCM 413 | Metallic Structures 1 | 3 |
| SCM 414 | Advanced Technology of Construction Materials | 3 |
| SCM 415 | Structural Mechanics 4 | 3 |
| SCM 416 | Reinforced Concrete 3 | 3 |
| SCM 417 | Metallic Structures 2 | 3 |
| SCM 441 | Soil Mechanics | 4 |
| SCM 451 | Project Planning and Control | 3 |
| SCM 461 | Hydraulic Engineering | 4 |
| SCM 462 | Irrigation and Drainage Engineering. | 3 |
| SCM 500 | Graduation Project | 0 |
| SCM 501 | Graduation Project | 4 |
| SCM 511 | Reinforced Concrete 4 | 2 |
| SCM 551 | Applied Topics in Construction Engineering | 3 |
| SCM 553 | Construction Technology | 2 |
| SCM 581 | Resource Management | 2 |
| SCM 513 | Advanced Structural Analysis | 3 |
| SCM 521 | Environmental and Sanitary Engineering | 3 |
| SCM 541 | Foundations | 3 |
| SCM 552 | Quantity Surveying and Cost Control | 2 |

## b. Elective Courses List
## (9 credit hours)

| Code | Course Title | Cr. H |
|---|---|---|
| SCM 512 | Metallic Structures 3 | 3 |
| SCM 514 | Reinforced Concrete 5 | 3 |
| SCM 515 | Metallic Bridges | 3 |
| SCM 516 | Applied Topics in Structural Analysis and Mechanics | 3 |

| | | |
|---|---|---|
| SCM 517 | Computer Aided Structural Analysis | 3 |
| SCM 518 | Dynamics of Structures | 3 |
| SCM 519 | Metallic Structures | 3 |
| SCM 523 | Engineering Applications of Surveying | 3 |
| SCM 524 | Highway and Airport Engineering | 3 |
| SCM 525 | Introduction to Earthquake Engineering | 3 |
| SCM 526 | Metallic Bridges 2 | 3 |
| SCM 527 | Transport Planning and Traffic Engineering | 3 |
| SCM 531 | Analysis and Design of Masonry Buildings | 3 |
| SCM 532 | Design of Coastal Protection Works | 3 |
| SCM 533 | Design of Massive Irrigation Structures | 3 |
| SCM 534 | Design of Modern Irrigation Systems | 3 |
| SCM 535 | Mechanics and Technology of Engineering Materials | 3 |
| SCM 536 | Mechanics of Solids | 3 |
| SCM 591 | Inspection and Maintenance of Structures | 3 |
| SCM 592 | Special Reinforced Concrete Structures 1 | 3 |
| SCM 593 | Special Reinforced Concrete Structures 2 | 3 |

# SUGGESTED SCHEDULES

# Suggested Schedules

## Level 1

### Common to All Engineering Students

#### First Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 111 | Differentiation with Applications and Algebra (Math .1) | 3 | 2 | 5 | 3 | - |
| 2 | MEC 121 | Mechanics 1 | 2 | 2 | 4 | 2 | - |
| 3 | PHY 131 | Properties of Matter and Thermodynamics (Physics 1) | 3 | 3 | 6 | 4 | - |
| 4 | GRA 141 | Graphics 1 | 1 | 3 | 4 | 2 | - |
| 5 | CHM 151 | Chemistry 1 | 2 | 2 | 4 | 2 | - |
| 6 | CSC 101 | Introduction to Computers | 2 | 1 | 3 | 2 | - |
| 7 | ENG KET | English KET | 2 | 0 | 2 | 2 | - |
| Total | | | 15 | 13 | 28 | 17 | |

#### Second Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 112 | Integration with Applications and Analytical Geometry (Math.2) | 3 | 2 | 5 | 3 | MTH 111 |
| 2 | MEC 122 | Mechanics 2 | 2 | 2 | 4 | 2 | MEC 121 |
| 3 | PHY 132 | Electricity and Magnetism (Physics 2) | 3 | 3 | 6 | 4 | - |
| 4 | GRA 142 | Graphics 2 | 1 | 3 | 4 | 2 | GRA 141 |
| 5 | CMP 132 | Computer Programming | 2 | 2 | 4 | 2 | CMP 101 |
| 6 | MAN 121 | Production Technology | 2 | 2 | 4 | 2 | - |
| 7 | ENG PET | English PET | 2 | 0 | 2 | 2 | ENG KET |
| Total | | | 15 | 14 | 29 | 17 | |

# 1. ARCHITECTURAL ENGINEERING

# Architectural Engineering

## Level 2

### Third Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 213 | Mathematics, Statistics & Computers | 2 | 2 | 4 | 3 | - |
| 2 | ARC 211 | Architectural Design 1 | 2 | 4 | 6 | 3 | GRA 141 or 142 |
| 3 | ARC 221 | History &Theories of Architecture 1 | 2 | 0 | 2 | 2 | - |
| 4 | ARC 231 | Graphics & Visual Skills 1 | 2 | 2 | 4 | 3 | - |
| 5 | ARC 241 | Building Construction & Materials 1 | 2 | 2 | 4 | 3 | GRA 141 or 142 |
| 6 | SCM 214 | Theory of Structures | 2 | 2 | 4 | 3 | MEC 121 |
| **Total** | | | **12** | **12** | **24** | **17** | |

### Fourth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 212 | Architectural Design 2 | 2 | 4 | 6 | 3 | ARC 211 |
| 2 | ARC 222 | History & Theories of Architecture 2 | 2 | 0 | 2 | 2 | - |
| 3 | ARC 232 | Graphics & Visual Skills 2 | 2 | 2 | 4 | 3 | ARC 231 |
| 4 | ARC 242 | Building Construction & Materials 2 | 2 | 2 | 4 | 3 | ARC 241 |
| 5 | SCM 215 | Properties & Strength of Materials | 2 | 2 | 4 | 2 | - |
| 6 | SCM 223 | Surveying | 2 | 2 | 4 | 2 | - |
| 7 | PSC 110 | Human Rights | 2 | 0 | 2 | 2 | - |
| **Total** | | | **14** | **12** | **26** | **17** | |

# Architectural Engineering

# Level 3

## Fifth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 311 | Architectural Design 3 | 2 | 6 | 8 | 4 | ARC 212 |
| 2 | ARC 321 | History & Theories of Architecture 3 | 2 | 0 | 2 | 2 | ARC 221 |
| 3 | ARC 323 | Human Studies in Architecture | 2 | 0 | 2 | 2 | - |
| 4 | ARC 341 | Building Construction & Materials 3 | 2 | 4 | 6 | 4 | ARC 242 |
| 5 | ARC XX1 | Departmental Elective 1 | 2 | 2 | 4 | 3 | See List |
| 6 | ARC 361 | Environmental Control & Technical Installations 1 | 2 | 1 | 3 | 2 | - |
| 7 | GEN 313 | Report Writing and Presentation Skills | 2 | 1 | 3 | 2 | - |
| **Total** | | | **14** | **14** | **28** | **19** | |

## Sixth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 312 | Architectural Design 4 | 2 | 6 | 8 | 4 | ARC 311 |
| 2 | ARC 322 | History & Theories of Architecture 4 | 2 | 0 | 2 | 2 | ARC 222 |
| 3 | ARC 342 | Building Construction & Materials 4 | 2 | 4 | 6 | 4 | ARC 341 |
| 4 | ARC XX2 | Departmental Elective 2 | 2 | 2 | 4 | 3 | See List |
| 5 | ARC 362 | Environmental Control & Technical Installations 2 | 2 | 1 | 3 | 2 | - |
| 6 | SCM 317 | Reinforced Concrete for Architects | 2 | 2 | 4 | 2 | SCM 214 |
| 7 | UNV E01 | University Elective 1 | 2 | 0 | 2 | 2 | See List |
| **Total** | | | **14** | **15** | **29** | **19** | |

# Architectural Engineering

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 411 | Architectural Design 5 | 2 | 6 | 8 | 4 | ARC 312 |
| 2 | ARC 421 | History & Theories of Architecture 5 | 3 | 0 | 3 | 3 | - |
| 3 | ARC 451 | Urban Planning 1 | 2 | 2 | 4 | 3 | - |
| 4 | ARC 471 | Execution Designs 1 | 2 | 4 | 6 | 4 | ARC 342 |
| 5 | UNV E02 | University Elective 2 | 2 | 0 | 2 | 2 | See List |
| 6 | SCM 442 | Foundations for Architects | 2 | 2 | 4 | 3 | - |
| **Total** | | | **13** | **14** | **27** | **19** | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 412 | Architectural Design 6 | 2 | 6 | 8 | 4 | ARC 411 |
| 2 | ARC 422 | History & Theories of Architecture 6 | 3 | 0 | 3 | 3 | ARC 421 |
| 3 | ARC 452 | Urban Design & Housing 1 | 2 | 2 | 4 | 3 | - |
| 4 | ARC 472 | Execution Designs 2 | 2 | 4 | 6 | 4 | ARC 471 |
| 5 | ARC 453 | Landscape Architecture | 2 | 2 | 4 | 3 | - |
| 6 | SCM 418 | Steel Structures for Architects | 2 | 2 | 4 | 2 | SCM 214 |
| **Total** | | | **13** | **16** | **29** | **19** | |

# Architectural Engineering

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC 511 | Architectural Design 7 | 2 | 6 | 8 | 4 | ARC 412 |
| 2 | ARC 551 | Urban Planning 2 | 2 | 2 | 4 | 3 | ARC 451 |
| 3 | ARC 552 | Urban Design & Housing 2 | 2 | 2 | 4 | 3 | ARC 452 |
| 4 | ARC 571 | Execution Designs 3 | 2 | 4 | 6 | 4 | ARC 472 |
| 5 | ARC XX3 | Departmental Elective 3 | 2 | 2 | 4 | 3 | See List |
| 6 | ARC 501 | Graduation Project Studies | 2 | 1 | 3 | 2 | ARC 412 |
| **Total** | | | **12** | **17** | **29** | **19** | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ARC XX4 | Departmental Elective 4 | 2 | 2 | 4 | 3 | See List |
| 2 | ARC 581 | Project Management & Feasibility Studies | 2 | 1 | 3 | 2 | As Advised |
| 3 | ARC 582 | Professional Practice & Legislations | 2 | 1 | 3 | 2 | As Advised |
| 4 | ARC 502 | Graduation Project | 0 | 10 | 10 | 5 | ARC 501 |
| Total | | | **6** | **14** | **20** | **12** | |

# 2. ELECTRICAL POWER ENGINEERING

# Electrical Power Engineering

## Level 2

## Common to All Electrical Engineering Students

### Third Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 211 | Functions of Several Variables and Ordinary Differential Equations(Math.3) | 3 | 2 | 5 | 3 | MTH 112 |
| 2 | PHY 232 | Solid State Physics (Phys. 4) | 3 | 2 | 5 | 3 | PHY 132 |
| 3 | MPR 243 | Thermodynamics and Fluid Mechanics | 3 | 2 | 5 | 3 | PHY 131 |
| 4 | EPR 261 | Electrical Circuits 1 | 3 | 3 | 6 | 4 | PHY 132 |
| 5 | UNV E01 | University Elective Course 1 | 2 | 0 | 2 | 2 | |
| 6 | PSC 110 | Human Rights | 2 | 0 | 2 | 2 | - |
| **Total** | | | **16** | **9** | **25** | **17** | |

### Fourth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 | 2 | 5 | 3 | MTH 211 |
| 2 | SCM 217 | Civil Engineering | 2 | 0 | 2 | 2 | |
| 3 | ELE 213 | Electronics | 3 | 3 | 6 | 4 | PHY 232 Co-requisite EPR 261 |
| 4 | ELE 215 | Logic Design and Digital Circuits | 3 | 2 | 5 | 3 | Co-requisite ELE 213 |
| 5 | EPR 263 | Electrical Circuits 2 | 3 | 3 | 6 | 4 | EPR 261 |
| 6 | MAN 381 | Engineering Economics | 2 | 1 | 3 | 2 | - |
| **Total** | | | **16** | **11** | **27** | **18** | |

# Electrical Power Engineering

## Level 3

## Common to All Electrical Engineering Students

### Fifth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 311 | Complex Variable and Special Functions (Math. 5) | 3 | 2 | 5 | 3 | MTH 211 |
| 2 | CMP 334 | Digital Systems and Computer Organization | 3 | 2 | 5 | 3 | ELE 215 |
| 3 | ELE 364 | Electronic Circuits | 3 | 3 | 6 | 4 | ELE 213 |
| 4 | EPR 341 | Energy Systems | 3 | 2 | 5 | 3 | EPR 263 |
| 5 | COM 362 | Signal Analysis | 3 | 1 | 4 | 3 | EPR 261, MTH 211 |
| 6 | UNV E02 | University Elective Course 2 | 2 | 0 | 2 | 2 | - |
| **Total** | | | **17** | **10** | **27** | **18** | |

### Sixth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 312 | Probability and Statistics (Math. 6) | 3 | 2 | 5 | 3 | MTH 211 |
| 2 | COM 213 | Electromagnetic Waves 1 | 3 | 2 | 5 | 3 | MTH 212 |
| 3 | CMP 351 | Microprocessors and Applications | 3 | 2 | 5 | 3 | CMP 334 |
| 4 | EPR 364 | Electrical and Electronic Measurements | 3 | 2 | 5 | 3 | EPR 261, ELE 213 |
| 5 | CMP 371 | Control Systems 1 | 3 | 2 | 5 | 3 | MTH 212 |
| 6 | GEN 313 | Report Writing and Presentation Skills | 2 | 1 | 3 | 2 | - |
| **Total** | | | **17** | **11** | **28** | **17** | |

# Electrical Power Engineering

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | COM 414 | Communication Systems | 3 | 1 | 4 | 3 | COM 362, MTH 312 |
| 2 | EPR 473 | PLC and Applications | 3 | 2 | 5 | 3 | CMP 334 |
| 3 | EPR 421 | Transmission and Distribution of Electrical Energy | 3 | 1 | 4 | 3 | EPR 263, MTH 212 |
| 4 | EPR 431 | High Voltage Engineering | 3 | 1 | 4 | 3 | EPR 341 |
| 5 | EPR 451 | Power Electronics 1 | 3 | 1 | 4 | 3 | ELE 213 |
| 6 | EPR 444 | DC Machines and Transformers | 3 | 3 | 6 | 4 | EPR 341 |
| Total | | | 18 | 9 | 27 | 19 | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | CMP 472 | Control Systems 2 | 3 | 1 | 4 | 3 | CMP 371 |
| 2 | EPR 411 | Power System Analysis 1 | 3 | 2 | 5 | 3 | EPR 421 |
| 3 | EPR 445 | Induction Machines | 3 | 2 | 5 | 3 | EPR 444 |
| 4 | EPR 452 | Power Electronics 2 | 3 | 2 | 5 | 3 | EPR 451 |
| 5 | EPR 412 | Economics of Generation and Operation | 3 | 1 | 4 | 3 | EPR 421 |
| 6 | EPR 413 | Renewable Energy | 3 | 1 | 4 | 3 | EPR 341 |
| Total | | | 18 | 9 | 27 | 18 | |

# Electrical Power Engineering

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | EPR 551 | Electric Drives | 3 | 1 | 4 | 3 | EPR 452, EPR 445 |
| 2 | EPR 541 | Synchronous Machines | 3 | 2 | 5 | 3 | EPR 444 |
| 3 | EPR 511 | Computer Applications in Electric Power Engineering | 3 | 2 | 5 | 3 | EPR 411 |
| 4 | EPR E01 | Elective 1 | 3 | 1 | 4 | 3 | See List |
| 5 | EPR E02 | Elective 2 | 3 | 1 | 4 | 3 | See List |
| 6 | GEN 441 | Law for Professional Engineers | 2 | 1 | 3 | 2 | - |
| 7 | EPR 500 | Graduation Project | 0 | 4 | 4 | 0 | As Advised |
| Total | | | 17 | 12 | 29 | 17 | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | EPR 512 | Power System Analysis 2 | 3 | 2 | 5 | 3 | EPR 411 |
| 2 | EPR 581 | Protection and Switchgear in Electrical Power Systems | 3 | 2 | 5 | 3 | EPR 431 |
| 3 | EPR E03 | Elective 3 | 3 | 1 | 4 | 3 | See List |
| 4 | EPR E04 | Elective 4 | 3 | 1 | 4 | 3 | See List |
| 5 | GEN 541 | Environmental Impact of Projects | 2 | 1 | 3 | 2 | - |
| 6 | EPR 501 | Graduation Project | 0 | 4 | 4 | 4 | EPR 500 |
| Total | | | 14 | 11 | 25 | 18 | |

# 3. ELECTRONICS AND COMMUNICATION ENGINEERING

# Electronics & Communication Engineering

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ELE 415 | Analog Signal Processing | 3 | 2 | 5 | 3 | ELE 364 |
| 2 | CMP 472 | Control Systems 2 | 3 | 2 | 5 | 3 | CMP 371 |
| 3 | COM 411 | Communications 1 | 3 | 2 | 5 | 3 | COM 362 |
| 4 | COM 413 | Electromagnetic Waves 2 | 3 | 2 | 5 | 3 | COM 213 |
| 5 | ELE 420 | Electronic Devices | 3 | 2 | 5 | 3 | ELE 364 |
| 6 | EPR 441 | Electrical Machines | 3 | 2 | 5 | 3 | EPR 341 |
| **Total** | | | **18** | **12** | **30** | **18** | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | COM 415 | Microwave Engineering | 3 | 2 | 5 | 3 | COM 413 |
| 2 | COM 412 | Communications 2 | 3 | 2 | 5 | 3 | COM 411 |
| 3 | ELE 412 | Optical Electronics | 3 | 2 | 5 | 3 | PHY 232 |
| 4 | ELE 570 | Microelectronics Systems | 3 | 2 | 5 | 3 | ELE 420 |
| 5 | COM E01 | Elective 1 | 3 | 2 | 4 | 3 | See List |
| 6 | COM 561 | Digital Signal Processing | 3 | 2 | 5 | 3 | COM 362 |
| **Total** | | | **18** | **12** | **30** | **18** | |

# Electronics & Communication Engineering

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ELE 514 | Microwave Electronic Devices | 3 | 2 | 5 | 3 | COM 415 |
| 2 | COM 527 | Optical Fiber Communication Systems | 3 | 2 | 5 | 3 | ELE 412 , COM 412 |
| 3 | COM 526 | Data Communication Systems | 3 | 2 | 5 | 3 | COM 412 |
| 4 | GEN 441 | Law for Professional Engineers | 2 | 1 | 3 | 2 | |
| 5 | COM 520 | Telecommunication Networks | 3 | 2 | 5 | 3 | COM 412 |
| 6 | COM E02 | Elective 2 | 3 | 2 | 5 | 3 | See List |
| 7 | COM 500 | Graduation Project | 0 | 2 | 2 | 0 | COM 412 |
| **Total** | | | **17** | **13** | **30** | **17** | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | COM 524 | Satellite Communication Systems | 3 | 2 | 5 | 3 | COM 412 |
| 2 | COM 523 | Mobile Communication Systems | 3 | 1 | 4 | 3 | COM 412 |
| 3 | ELE 521 | Electronic Systems Design | 3 | 2 | 5 | 3 | ELE 420 |
| 4 | COM 521 | Antenna and Propagation | 3 | 2 | 5 | 3 | COM 415 |
| 5 | COM E03 | Elective 3 | 3 | 2 | 5 | 3 | See List |
| 6 | COM 501 | Graduation Project | 0 | 4 | 4 | 4 | COM 500 |
| **Total** | | | **15** | **13** | **28** | **19** | |

# 4. MECHATRONICS ENGINEERING

# Mechatronics Engineering

# Level 2

## Common to All Mechanical Engineering Students

### Third Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | EPR 266 | Electric Circuits | 3 | 3 | 6 | 4 | PHY 132 |
| 2 | MAN 221 | Production Engineering 1 | 2 | 1 | 3 | 2 | MAN 121 |
| 3 | MAN 231 | Properties of Materials | 2 | 2 | 4 | 3 | PHY 131 |
| 4 | MAN 241 | Mechanical Engineering Drawing | 0 | 4 | 4 | 2 | GRA 142 |
| 5 | MPR 251 | Engineering Thermodynamics | 3 | 3 | 6 | 4 | PHY 131 |
| 6 | MTH 211 | Functions of Several Variables and Ordinary Differential Equations(Math. 3) | 2 | 2 | 4 | 3 | MTH 112 |
| **Total** | | | **12** | **14** | **26** | **18** | |

### Fourth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ELE 216 | Basic Electronic Circuits | 2 | 2 | 4 | 3 | PHY 132 |
| 2 | GEN 313 | Report Writing and Presentation Skills | 2 | 1 | 3 | 2 | None |
| 3 | MAN 232 | Stress Analysis | 2 | 2 | 4 | 3 | PHY 131 |
| 4 | MEC 221 | Dynamics of Rigid Bodies(Mech3) | 2 | 2 | 4 | 3 | MEC 122 |
| 5 | MPR 252 | Fluid Mechanics | 3 | 3 | 6 | 4 | MEC 122, PHY 131 |
| 6 | MTH 212 | Transformation and Numerical Analysis (Math. 4) | 2 | 2 | 4 | 3 | MTH 211 |
| **Total** | | | **13** | **12** | **25** | **18** | |

# Mechatronics Engineering

# Level 3

## Common to All Mechanical Engineering Students

### Fifth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MAN 311 | Mechanical Mechanisms | 2 | 2 | 4 | 3 | MEC 221 |
| 2 | MAN 321 | Fundamentals of Manufacturing Processes | 2 | 1 | 3 | 2 | MAN 221 |
| 3 | MAN 331 | Structural Mechanics | 2 | 2 | 4 | 3 | MAN 232 |
| 4 | MPR 355 | Thermal Power Systems | 2 | 2 | 4 | 3 | MPR 251 |
| 5 | MTH 311 | Complex Variables and Special Functions (Math. 5) | 2 | 2 | 4 | 3 | MTH 212 |
| 6 | PSC 110 | Human Rights | 2 | 0 | 2 | 2 | None |
| 7 | UNV E01 | University Elective 1 | 2 | 1 | 3 | 2 | None |
| **Total** | | | **14** | **10** | **24** | **18** | |

### Sixth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | ELE 366 | Digital Systems | 2 | 2 | 4 | 3 | PHY 132 |
| 2 | EPR 340 | Electrical Machines | 2 | 2 | 4 | 3 | EPR 200 |
| 3 | MAN 341 | Mechanical Design 1 | 2 | 2 | 4 | 3 | MAN 232<br>MAN 241<br>MAN 311 |
| 4 | MAN 350 | Industrial Automation (CAD/ CAM) | 2 | 1 | 3 | 2 | MAN 221<br>CMP 132 |
| 5 | MAN 380 | Modeling and Simulation | 2 | 1 | 3 | 2 | CMP 132<br>MTH 311 |
| 6 | MPR 321 | Measurements and Measuring Instruments | 2 | 1 | 3 | 2 | MPR 251<br>MPR 252 |
| 7 | MTH 312 | Probability and Statistics (Math. 6) | 2 | 2 | 4 | 3 | MTH 311 |
| **Total** | | | 14 | 11 | 25 | 18 | |

# Mechatronics Engineering

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | CMP 470 | Control Systems | 2 | 2 | 4 | 3 | MTH 212 |
| 2 | ELE 410 | Introduction to Microprocessors | 2 | 2 | 4 | 3 | ELE 366 |
| 3 | MAN 441 | Mechanical Design 2 | 2 | 2 | 4 | 3 | MAN 341 |
| 4 | MKT 411 | Mechatronics | 2 | 2 | 4 | 3 | EPR 266<br>ELE 216 |
| 5 | MKT 471 | Robot Mechanics | 2 | 2 | 4 | 3 | MAN 311 |
| 6 | MPR 459 | Fluid Systems Control | 2 | 2 | 4 | 3 | MPR 252 |
| **Total** | | | **12** | **12** | **24** | **18** | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | CMP 456 | Design of Real – Time Embedded Systems | 2 | 2 | 4 | 2 | ELE 410 |
| 2 | CMP 475 | Digital Control Systems | 2 | 2 | 4 | 3 | CMP 470 |
| 3 | MAN 481 | Quality Control | 2 | 1 | 3 | 2 | MTH 312 |
| 4 | MKT 412 | Mechatronics System Design | 2 | 2 | 4 | 3 | MKT 411 |
| 5 | MKT 440 | Programmable Logic Controllers (PLCs) | 2 | 1 | 3 | 2 | ELE 216 |
| 6 | MKT 472 | Robot Control | 2 | 2 | 4 | 3 | MKT 471 |
| 7 | MPR 456 | Heat Transfer | 2 | 2 | 4 | 3 | MPR 251 |
| **Total** | | | 14 | 12 | 26 | 18 | |

# Mechatronics Engineering

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | EPR 442 | Actuators and Power Electronics | 2 | 2 | 4 | 3 | EPR 340 |
| 2 | MAN 515 | Electromechanical Design | 2 | 1 | 3 | 3 | MAN 441 EPR 340 |
| 3 | MAN 592 | Project Management | 2 | 1 | 3 | 2 | None |
| 4 | MKT 500 | Graduation Project I | 0 | 4 | 4 | 2 | As Advised |
| 5 | MKT E01 | Elective 1 | 2 | 1 | 3 | 2 | See List |
| 6 | MKT E02 | Elective 2 | 2 | 1 | 3 | 2 | See List |
| 7 | UNV E02 | University Elective 2 | 2 | 0 | 2 | 2 | None |
| **Total** | | | 12 | 10 | 22 | 16 | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | GEN 441 | Law for Professional Engineers | 2 | 0 | 2 | 2 | None |
| 2 | MAN 381 | Engineering Economics | 2 | 1 | 3 | 2 | None |
| 3 | MKT 501 | Graduation Project II | 0 | 4 | 4 | 4 | MKT 500 |
| 4 | MKT E03 | Elective 3 | 2 | 1 | 3 | 2 | See List |
| 5 | MKT E04 | Elective 4 | 2 | 1 | 3 | 2 | See List |
| 6 | MKT E05 | Elective 5 | 2 | 1 | 3 | 2 | See List |
| 7 | MPR 555 | Energy Conversion Systems | 2 | 2 | 4 | 3 | MPR 355 |
| Total | | | **12** | **10** | **22** | **17** | |

# 5. PETROLEUM ENGINEERING

# Petroleum Engineering

## Level 2

### Third Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 211 | Functions of Several Variables and Ordinary Differential Equations(Math.3) | 3 | 2 | 5 | 3 | MTH 112 |
| 2 | PHY 231 | Theory of Relativity and Nuclear Physics (Phys. 3) | 3 | 2 | 5 | 3 | PHY 132 |
| 3 | ENG H02 | English Technical Writing | 2 | 0 | 2 | 2 | - |
| 4 | MPR 251 | Engineering Thermodynamics | 3 | 3 | 6 | 4 | PHY 132 |
| 5 | PSC 110 | Human Rights | 2 | 0 | 2 | 2 | - |
| 6 | GEO 201 | General Geology | 2 | 1 | 3 | 2 | - |
| 7 | PE 201 | Introduction to Petroleum Engineering | 2 | 0 | 2 | 2 | - |
| **Total** | | | **17** | **8** | **25** | **18** | |

### Fourth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 212 | Transformation and Numerical Analysis (Math. 4) | 3 | 2 | 5 | 3 | MTH 211 |
| 2 | MAN 221 | Production Engineering 1 | 2 | 2 | 4 | 2 | MAN 121 |
| 3 | MAN 232 | Stress Analysis | 3 | 2 | 5 | 3 | - |
| 4 | MAN 241 | Mechanical Engineering Drawing | 0 | 4 | 4 | 2 | GRA 142 |
| 5 | MPR 252 | Fluid Mechanics | 2 | 3 | 5 | 3 | PHY 231 |
| 6 | HUM H02 | History of Petroleum Industry | 2 | - | 2 | 2 | - |
| 7 | PE 202 | Introduction to oil well drilling | 2 | 1 | 3 | 2 | P201 |
| **Total** | | | **14** | **14** | **28** | **17** | |

# Petroleum Engineering

## Level 3

### Fifth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | GEO 301 | Structural Geology | 2 | 1 | 3 | 2 | GEO 201& MAN 232 |
| 2 | PE 301 | Properties of Petroleum Fluids | 3 | 2 | 5 | 3 | CHM 151 |
| 3 | MTH 311 | Complex Variable and Special Functions | 3 | 2 | 5 | 3 | MTH 212 |
| 4 | PE 302 | Reservoir Rock Properties | 2 | 3 | 5 | 3 | PE 201& PE 202 |
| 5 | HUM H08 | Scientific Thinking | 2 | 0 | 2 | 2 | - |
| 6 | EPR 261 | Electric Circuits 1 | 3 | 2 | 5 | 3 | PHY 132 |
| 7 | MAN 301 | Rock Mechanics | 2 | 2 | 4 | 2 | MAN 232 |
| **Total** | | | **17** | **12** | **29** | **18** | |

### Sixth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MEC 221 | Mechanics 3 | 3 | 1 | 4 | 3 | MEC 122 |
| 2 | PE 303 | Petroleum Reservoir Engineering | 3 | 2 | 5 | 3 | PE 301& PE302 |
| 3 | PE 304 | Petroleum Reservoir Lab. | - | 2 | 2 | 1 | PE 301 |
| 4 | SCM 221 | Planemetric Surveying 1 | 2 | 1 | 3 | 2 | MTH 112 |
| 5 | PE 305 | Drilling Engineering I | 2 | 3 | 5 | 3 | PE 202 |
| 6 | GEO 302 | Depositional Systems | 3 | 1 | 4 | 3 | GEO 301 |
| 7 | CHM 301 | Organic Chemistry | 2 | 2 | 4 | 2 | CHM 151 |
| 8 | PE 306 | Petroleum Refining Engineering | 1 | 1 | 2 | 1 | - |
| **Total** | | | **16** | **13** | **29** | **18** | |

# Petroleum Engineering

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | GEO 401 | Petroleum Geology | 3 | 2 | 5 | 3 | GEO 301 |
| 2 | PE 401 | Natural Gas Engineering | 3 | 2 | 5 | 3 | PE 303 |
| 3 | PE 402 | Drilling Engineering II | 3 | 2 | 5 | 3 | PE 305 |
| 4 | PE 403 | Advanced Petroleum Reservoir Engineering | 3 | 2 | 5 | 3 | PE 202& PE 303 |
| 5 | GEN 401 | Principles of Economics | 3 | 1 | 4 | 2 | - |
| 6 | PE 404 | Well Testing Analysis | 3 | 2 | 5 | 3 | PE 303 |
| **Total** | | | **18** | **11** | **29** | **17** | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | PHY 401 | Thermal analysis (Phys. 5) | 3 | 2 | 5 | 3 | PHY 132&PHY 231 |
| 2 | PE 405 | Well Performance and Production Systems | 3 | 2 | 5 | 3 | PE 303 |
| 3 | PE 406 | Well logging | 3 | 2 | 5 | 3 | PHY 231 |
| 4 | PE 407 | Finite Element Analysis with Applications in Petrol. Engineering | 4 | 2 | 6 | 4 | PE 303 & GEO 401 |
| 5 | PE 408 | Subsurface Production Engineering | 3 | 2 | 5 | 3 | PE 402 |
| 6 | HUM | Humanities/ Social Science Elective | 2 | 1 | 3 | 2 | - |
| **Total** | | | **18** | **11** | **29** | **18** | |

# Petroleum Engineering

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | GEN 441 | Law for Professional Engineers | 2 | 1 | 3 | 2 | - |
| 2 | PE 501 | Petroleum Engineering Design Project | 3 | 2 | 5 | 3 | PE 303 & PE405 |
| 3 | PE | Elective | 3 | 2 | 5 | 3 | |
| 4 | PE 502 | Mechanical Earth Modeling | 3 | 2 | 5 | 3 | PE 406 |
| 5 | PE 503 | Secondary Recovery of Petroleum | 3 | 2 | 5 | 3 | PE 303 & PE 304 |
| 6 | PE 504 | Artificial Lift | 2 | 1 | 3 | 2 | PE 405 |
| 7 | HUM | Humanities/ Social Science Elective | 2 | 2 | 4 | 2 | |
| **Total** | | | **18** | **12** | **30** | **18** | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | PE 505 | Petroleum Econ and Asset Valuation | 2 | 2 | 4 | 2 | PE 303 |
| 2 | PE 506 | Offshore Petroleum technology | 3 | 2 | 5 | 3 | PE 305 & PE 305 |
| 3 | GEN 313 | Report Writing and Presentation Skills | 2 | 1 | 3 | 2 | - |
| 4 | PE 507 | Graduation Project | 0 | 9 | 9 | 3 | - |
| 5 | PE | Elective | 3 | 2 | 5 | 3 | - |
| 6 | PE | Elective | 3 | 2 | 5 | 3 | - |
| 7 | HUM | Humanities/ Social Science Elective | 2 | 2 | 4 | 2 | - |
| **Total** | | | **15** | **20** | **35** | **18** | |

# 6. STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

# Structural Engineering and Construction Management

## Level 2

### Third Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 211 | Functions of Several Variables and Ordinary Differential Equations (Math .3) | 3 | 2 | 5 | 3 | MTH 112 |
| 2 | PHY 231 | Theory of Relativity and Nuclear Physics (Phys. 3) | 3 | 2 | 5 | 3 | PHY 132 |
| 3 | MEC 221 | Dynamics of Rigid Bodies (Mech. 3) | 2 | 2 | 5 | 3 | MEC 122 |
| 4 | SCM 211 | Structural Analysis 1 | 3 | 1 | 4 | 3 | MEC 121 |
| 5 | SCM 221 | Planimetric Surveying 1 | 2 | 1 | 3 | 2 | MTH 112 |
| 6 | SCM 231 | Civil Engineering Drawing 1 | 0 | 4 | 4 | 2 | GRA 142 |
| 7 | PSC 110 | Human Rights | 2 | 0 | 2 | 2 | - |
| **Total** | | | **15** | **12** | **27** | **18** | |

### Fourth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | MTH 212 | Transformations and Numerical Analysis (Math. 4) | 3 | 2 | 5 | 3 | MTH 211 |
| 2 | MTH 214 | Applied Statistics | 2 | 2 | 4 | 2 | MTH 112 |
| 3 | SCM 212 | Structural Analysis 2 | 3 | 1 | 4 | 3 | SCM 211 |
| 4 | SCM 213 | Strength and Technology ofMaterials 1 | 3 | 2 | 5 | 3 | - |
| 5 | SCM 222 | Planimetric Surveying 2 | 2 | 1 | 3 | 2 | SCM 221 |
| 6 | SCM 232 | Civil Engineering Drawing 2 | 0 | 4 | 4 | 2 | SCM 231 |
| 7 | SCM 233 | Engineers and the Environment | 2 | 0 | 2 | 2 | - |
| **Total** | | | **15** | **12** | **27** | **17** | |

# Structural Engineering and Construction Management

## Level 3

### Fifth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | EPR 344 | Electrical Installations and Construction Equipment | 2 | 2 | 4 | 2 | PHY 132 |
| 2 | MPR 252 | Fluid Mechanics | 3 | 3 | 6 | 4 | MEC 122 |
| 3 | SCM 311 | Structural Mechanics 1 | 3 | 1 | 4 | 3 | SCM 212 |
| 4 | SCM 312 | Strength and Technology of Materials 2 | 3 | 2 | 5 | 3 | SCM 213 |
| 5 | SCM 313 | Engineering Geology | 2 | 1 | 3 | 2 | - |
| 6 | SCM 321 | Geo-informatics 1 | 2 | 2 | 4 | 2 | SCM 222 |
| 7 | GEN 313 | Report Writing and Presentation Skills | 2 | 1 | 3 | 2 | - |
| **Total** | | | **17** | **12** | **29** | **18** | |

### Sixth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | SCM 314 | Structural Mechanics 2 | 3 | 1 | 4 | 3 | SCM 311 |
| 2 | SCM 315 | Reinforced Concrete 1 | 3 | 2 | 5 | 3 | SCM 311 |
| 3 | SCM 316 | Building Construction and City Planning | 2 | 2 | 4 | 2 | - |
| 4 | SCM 322 | Geo-informatics 2 | 2 | 2 | 4 | 2 | SCM 222 |
| 5 | SCM 351 | Construction Project Management | 3 | 1 | 4 | 3 | - |
| 6 | SCM 352 | Engineering Economics and Finance | 2 | 1 | 3 | 2 | - |
| 7 | UNV E01 | University Elective Course 1 | 2 | 0 | 2 | 2 | - |
| **Total** | | | **17** | **9** | **26** | **17** | |

# Structural Engineering and Construction Management

## Level 4

### Seventh Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | SCM 411 | Structural Mechanics 3 | 3 | 1 | 4 | 3 | SCM 314 |
| 2 | SCM 412 | Reinforced Concrete 2 | 3 | 2 | 5 | 3 | SCM 315 |
| 3 | SCM 413 | Metallic Structures 1 | 3 | 1 | 4 | 3 | SCM 314 |
| 4 | SCM 461 | Hydraulic Engineering | 3 | 3 | 6 | 4 | MPR 252 |
| 5 | SCM 462 | Irrigation and Drainage Engineering. | 3 | 2 | 5 | 3 | MPR 252 |
| 6 | UNV E02 | University Elective Course 2 | 2 | 0 | 2 | 2 | - |
| **Total** | | | **17** | **9** | **26** | **18** | |

### Eighth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | SCM 414 | Advanced Technology of Construction Materials | 3 | 2 | 5 | 3 | SCM 312 |
| 2 | SCM 415 | Structural Mechanics 4 | 3 | 1 | 4 | 3 | SCM 411 |
| 3 | SCM 416 | Reinforced Concrete 3 | 3 | 2 | 5 | 3 | SCM 412 |
| 4 | SCM 417 | Metallic Structures 2 | 3 | 1 | 4 | 3 | SCM 413 |
| 5 | SCM 441 | Soil Mechanics | 3 | 2 | 5 | 4 | SCM 313 |
| 6 | SCM 451 | Project Planning and Control | 3 | 1 | 4 | 3 | SCM 351 |
| **Total** | | | **18** | **9** | **27** | **19** | |

# Structural Engineering and Construction Management

## Level 5

### Ninth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | SCM 511 | Reinforced Concrete 4 | 2 | 2 | 4 | 2 | SCM 416 |
| 2 | SCM 513 | Advanced Structural Analysis | 3 | 1 | 4 | 3 | SCM 411 |
| 3 | SCM 521 | Environmental and Sanitary Engineering | 3 | 2 | 5 | 3 | SCM 461 |
| 4 | SCM 541 | Foundations | 3 | 2 | 5 | 3 | SCM 441 |
| 5 | SCM 551 | Applied Topics In Construction Engineering | 3 | 1 | 4 | 3 | SCM 351 |
| 6 | SCM E01 | Elective 1 | 3 | 1 | 4 | 3 | See List |
| 7 | SCM 500 | Graduation Project | 0 | 4 | 4 | 0 | As Advised |
| **Total** | | | **17** | **13** | **30** | **17** | |

### Tenth Semester

| No | Course | | Weekly Hours | | | | Prerequisite Courses |
|---|---|---|---|---|---|---|---|
| | Code | Title | Lec | Ex/ Lab | Total | CrH | |
| 1 | SCM 552 | Quantity Surveying And Cost Control | 2 | 2 | 4 | 2 | SCM 351 |
| 2 | SCM 553 | Construction Technology | **2** | **2** | **3** | **2** | --- |
| 3 | SCM 581 | Resource Management | **2** | **2** | **3** | **2** | SCM 351 |
| 4 | SCM E02 | Elective 2 | 3 | 1 | 4 | 3 | See List |
| 5 | SCM E03 | Elective 3 | 3 | 1 | 4 | 3 | See List |
| 6 | SCM 501 | Graduation Project | 0 | 4 | 4 | 4 | SCM 500 |
| 7 | GEN 441 | Law for Professional Engineers | 2 | 1 | 3 | 2 | - |
| **Total** | | | **14** | **13** | **27** | **18** | |

# Course Contents

**ARC 211 Architectural Design 1**
**Credit Hours: 3**
The main concern and focus of this course will be about the "Creative Thinking" design process. The design process will focus mainly on methods of generating creative ideas considering simple functional needs, simple structures for small scale buildings, simple design problem solving. The course projects may be such as: a pavilion in a public garden, a bus station, a sightseeing kiosk, a small or medium span exhibition hall, and similar ones.
Prerequisites: GRA 141 or GRA 142
Lecture Hours: 2 Exercise/Lab/studio: 4

**ARC 212 Architectural Design 2**
**Credit Hours: 3**
The main concern and focus of this course will be about the "Problem Solving" design process. The design process will be approached as a method of finding solutions for functional, environmental, and structural needs and problems. This will be as important as the need for generating creative and innovative ideas as the creative thinking methods should be well rooted in the prerequisite "Architectural Design (1)" course. The student will address various issues such as functional relations, circulation patterns, qualitative and quantitative study of architectural spaces, relationships between spaces and required openings, the effect of openings upon facades, human / environmental / functional relations, simple structures for small scale buildings, and similar issues. The course projects may be such as: a Celebrity Residence, Chalet, Youth Hostel, an Exploration Center, a Kindergarten, Kids' Arts Center, Children's' Library/Museum and similar projects.
Prerequisites: ARC 211
Lecture Hours: 2 Exercise/Lab/Studio 4

**ARC 221 History & Theories of Architecture 1**
**Credit Hours: 2**
Ancient Egyptian, Mesopotamian, Classic Architecture (Greek, Roman), Early Christian, Byzantine, Baroque-Rococo
Prerequisites: -
Lecture Hours: 2 Exercise/Lab: 0

**ARC 222 History & Theories of Architecture 2**
**Credit Hours: 2**
The course focuses on the methods of creative thinking. In addition, Student will learn about the relation between form and space and how to define space. Also, student will learn about circulation spaces and their characteristics.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab: 0

**ARC 231 Graphics & Visual Skills 1**
**Credit Hours: 3**
The course introduces various drawing principles and artistic techniques: Pencil techniques, Pen and ink, Colors and Materials, Scale and composition, Foreground, Middle and background, Sketching architectural elements and landscapes.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 232 Graphics & Visual Skills 2**
**Credit Hours: 3**
The course examines the language of architectural form and deals with the techniques of analyzing and representing it by different means of rendering. The course includes lectures, problem solving and exercises. Topics include: 1.Shade and Shadow: Fundamentals; shade of points, lines, planes, and volumes. Exercises on shade and shadow of different architectural elements; arches, stairs, curves, etc.2. Perspective: Fundamentals of perspective; plane of image, position of the observer, cone of vision, angles of vision, vanishing points (one point, two points), Architectural perspective. Shade and shadow in perspective.
Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 241 Building Construction & Materials 1**
**Credit Hours: 3**
General introduction, Drawing techniques, Abbreviation symbols, Dimensioning, Technical presentation, Understanding types of structures, Wall bearing & skeleton types, Traditional construction Method; Load bearing walls. Using brick to build load bearing elements: foundation design, walls, jack arch floors, vaults and domes. Introduction to RC skeleton system.
Prerequisites: GRA 141 or GRA 142
Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 242 Building Construction & Materials 2**
**Credit Hours: 3**
Introduction to Conventional Construction Method; Skeleton system. Using Reinforced Concrete to construct structural elements. Staircases rules and design. Retaining walls; concrete and masonry. Arches & Lintels, Doors and Windows.
Prerequisites: GRA 241
Lecture Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 311 Architectural Design 3**
**Credit Hours: 4**
The main concern and focus of this course will be about the "Environmental/Site Considerations" affecting the design decisions. The course will address urban projects to introduce urban spaces and landscape design. The course will also emphasize the importance

of the setting: environmental and physical factors in the design process, introduction and experimentation with current trends and concepts through studio and design assignments. Course projects may be such as: Hostel, Youth Camp, Touristic Village, Gated Residential Communities, and other similar ones
Prerequisites: ARC 212
Lecture Hours: 2 Exercise/Lab/Studio 6

**ARC 312 Architectural Design 4**
**Credit Hours: 4**
The main concern and focus of this course will be about the different methods of "Form Generation". The priority will be for using advanced structure systems as the main tool to generate advanced and sophisticated forms. The course concerns the development of the students' sense of structure to generate architectural concepts and forms. The course projects may be such as: Design Center, Club House, Religious Complex, Rest House, Bus/railway Station, Indoor Sports Hall, and other similar ones.
Prerequisites: ARC 311
Lecture Hours: 2 Exercise/Lab/Studio: 6

**ARC 321 History & Theories of Architecture 3**
**Credit Hours: 2**
The course deals with different topics like history of each period, geology & climate, materials, construction systems, architectural character, Islamic decorations and analysis for examples. The periods are: Romanesque - Gothic - Fustat - Al Askar - Al Qatta'i - Fatimid Cairo - Ayyubid - Mamluk - Ottoman.
Prerequisites: ARC 221
Lecture Hours: 2 Exercise/Lab: 0

**ARC 322 History & Theories of Architecture 4**
**Credit Hours: 2**
Building Types; Designing community facilities, Educational, Cultural, Health, Recreational, Commercial, Administrative and Tourist buildings.
Prerequisites: ARC 222
Lecture Hours: 2 Exercise/Lab: 0

**ARC 323 Human Studies in Architecture**
**Credit Hours: 2**
The course looks at architecture within the framework of human sciences. The history of human sciences in architecture, Human theories and society formation, Environment relationship, Perception, behavior and culture, Behavior and the built environment, Human needs in relation to social concepts, Humanities in contemporary architecture, Sampling, data gathering and social research tools, Applied behavioral research.
Prerequisites: N/A
Lecture Hours: 2 Exercise/Lab: 0

**ARC 341 Building Construction & Materials 3**
**Credit Hours: 4**
The main concern and focus of this course will be about the advanced construction systems and execution methods. The course will cover the basics of designing and executing buildings with large span and high rise buildings; mainly the steel and wood trusses and frames. Also the course will comprise the design and execution details of space trusses, geodesic domes, tents, tension and shell structures.
Prerequisites: ARC 242 Exercise/Lab/Studio: 4

**ARC 342 Building Construction & Materials 4**
**Credit Hours: 4**
Contemporary finishing techniques, methods, Architectural/building works (partitions, curtain walls, panels), Finishing materials (bricks, timber, metals, plastics, and synthetics), Finishes (plaster, cladding, suspended ceilings, etc.) expansion and settlement joints, Admixtures, Thermal and damp proofing.
Prerequisites: ARC 341
Lecture Hours: 2 Exercise/Lab/Studio: 4

**ARC 361 Environmental Control & Technical Installations 1**
**Credit Hours: 2**
This course starts with the definition of the environment (natural and man-made) and its components. Then, it focuses on the "Room Acoustics". Many related topics will be introduced such as: nature of acoustics, weighted pressure levels, sound analysis, comfort and noise indices, acoustic design and noise control In addition, the course addresses the main mechanical systems that are used in buildings to achieve vertical and horizontal circulation. Also, this course includes the hydraulic services that serve the user needs such as: water supply, sewerage, sewer and rainwater drainage, sanitary installations, firefighting, solid waste disposal.
Prerequisites: N/A
Lecture Hours: 2 Exercise/Lab: 1

**ARC 362 Environmental Control & Technical Installations 2**
**Credit Hours: 2**
The course focuses on the building energy consumption and thermal performance. It addresses thermal comfort and how to achieve it using architectural and mechanical manipulations. Many related topics are investigated: Heat transfer, Storage and insulation, Air conditioning and ventilation, Heating and cooling loads, Central distribution and package units, Mechanical ventilation, Heating appliances and systems. In addition, the course also addresses topics of architectural spaces lighting either naturally or artificially. Other related topics are also investigated: Daylight quality, Artificial lighting mechanism, Light sources and luminance design.
Prerequisites: N/A
Lecture Hours: 2 Exercise/Lab: 1

**ARC 411 Architectural Design 5**
**Credit Hours: 4**
The course aims to give focus at "Environmental Design" principles. Students will experience how these principles guide and control the design process. The emphasis will be on the different manipulations of architectural and urban design that help to reduce energy consumption of both internal and urban spaces. The course projects may be such as: Research Center, Technical School, Museum, Echo Tourism, and other similar ones.
Prerequisites: ARC 312
Lecture Hours: 2 Exercise/Lab/Studio: 6

**ARC 412 Architectural Design 6**
**Credit Hours: 4**
The main concern and focus of this course will be about the "Future of Architecture". Students will be asked to think and imagine how the architecture works will be at the future. Concepts of "Hyper Architecture", Designing in severe Environments", "Vertical Cities", "Biomimicry in Architecture", "Responsive Architecture", and "Virtual Architecture" may be experienced. The course projects may be such as: Virtual Museum, Floating City, Intelligent Responsive House, and other similar ones.
Prerequisites: ARC 411
Lecture Hours: 2 Exercise/Lab/Studio: 6

**ARC 421 History & Theories of Architecture 5**
**Credit Hours: 3**
An introduction to the concept of space in architecture, demonstrate organizations and relationships of space in an abstract way, regardless to their functions. Case studies (examples) are selected from different eras to exercise the methodologies of obtaining and extracting theories and philosophies from these examples. Basic principles of architectural design are studied in relation to other dimensions of design in visual arts and music, discovering the embedded scientific values and the philosophical background in iconic buildings such as Hagia Sofia an The Alhambra.
Lecture Hours: 3 Exercise/Lab: 0

**ARC 422 History & Theories of Architecture 6**
**Credit Hours: 3**
The course traces the development of architectural thought in the 2nd half of the 20th Century and its effect on Architecture, Post-modernism, Deconstructionism, Future trends in architecture. The course also discusses concepts and considerations of educational buildings, Transportation buildings and tourist facilities.
Prerequisites: ARC 421
Lecture Hours: 3 Exercise/Lab: 0

**ARC 451 Urban Planning 1**
**Credit Hours: 3**
This course provides the basic understanding knowledge for the urban planning discipline. It illustrates the core methodology of urban planning that is used in the different levels of planning. The students are given a real time project focusing mainly on the district level. The course illustrates how to analyze the present urban situation, formulates a proper development and upgrading vision, and finally formulates a strategic plan for the upgrading of the city.
Pre-requisite: N/A
Lecture Hours: 2 Exercise/Lab: 2

**ARC 452 Urban Design & Housing 1**
**Credit Hours: 3**
This course introduces the students to the approaches, techniques and tools of urban design necessary to structure the spatial and dimensional relationships of the built environment. The morphology of the city and the relationship of built form to circulation networks and open space configurations will be the primary subject of the class. This course concentrates on the design of urban spaces, housing clusters and residential neighborhoods, informed by (but independent of) the demands of quantitative analysis, decision-making frameworks, economic forecasting or the specifics of plan implementation.
Pre-requisite: N/A
Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 453 Landscape Architecture**
**Credit Hours: 3**
This course introduces the approaches, techniques and tools of Landscape Architecture. This is to understand the different five elements of the landscape; landform, water, vegetation, site furniture and paths. The students will be able to apply the design process of the landscape architecture in projects of different scales.
Prerequisite: Architectural Design 4
Lecture Hours: 2 Exercise/Lab/Studio: 2

**ARC 471 Execution Designs 1**
**Credit Hours: 4**
The students will know about the basics of drafting working drawings. They will learn how to follow dimensioning and coding systems. In addition, they will learn how to use the different coding systems. They will also practice coordinating between architectural, structural, and electromechanical needs. Their practice will be on a small to moderate scale project.
Prerequisites: ARC 342
Lecture Hours: 2 Exercise/Lab/Studio: 4

**ARC 472 Execution Designs 2**
**Credit Hours: 4**
The main concern of this course will be on detailing the execution and construction issues. Sketches and diagrams needed to clarify in all main stages of design and execution, the way in which building industry is becoming a main tool in building construction. The research and understanding of the function of material in design, the ability to design with material, and the techniques of manipulating representations of material structures through digital tectonics that has become a burgeoning part of the architectural knowledge. In addition, the student will know how to follow rules while writing the technical specifications of building/construction items. Their practice will be on a moderate scale project.
Prerequisites: ARC 471
Lecture Hours: 2 Exercise/Lab/Studio: 4

**ARC 501 Graduation Project Studies**
**Credit Hours: 2**
The course aims at preparing the preliminary studies to the final design studio (the Graduation Project) that includes the basic criteria of design, the formulation and development of the program, site evaluation, collecting necessary data and analytical studies of program and site. This is an integrated study that combines the collective outputs of previous architectural, technical, environmental, urban design and planning studies and knowledge acquired through the years of study that finally leads to the required architectural and urban program.
Prerequisites: ARC 412 + 125 Cr.Hrs
Lecture Hours: 2 Exercise/Lab/Studio: 1`

**ARC 502 Graduation Project**
**Credit Hours: 5**
The final design studio deals with a complex design problem to reflect the student's understanding and skills in handling and integrating all knowledge gained through the years of study. The goal is to achieve project's objectives on both architectural and urban levels as well as details.
Prerequisites: ARC 501
Lecture Hours: 0 Exercise/Lab/Studio: 10

**ARC 511 Architectural Design 7**
**Credit Hours: 4**
Visual relations of the group of buildings and their conformity with the general layout and context. The design should comprise major elements having wide structural spans. Provision for natural lighting and ventilation. Application of new technologies to enhance design concepts.
Prerequisites: ARC 412
Lecture Hours: 2 Exercise/Lab/Studio: 6

**ARC 551 Urban Planning 2**
**Credit Hours: 3**
The course introduces the concepts of regional development and planning as the largest scale of planning practice. The students also get to know the principles of urban transformation and the causes for such transformations. The students are invited to apply the gained knowledge through actual project(s) within the Egyptian context, with the aim of formulating a strategic regional plan for a selected region in Egypt. This is to be followed by learning how to make a structural plan for a medium sized city within the scope of the regional plan.
Prerequisites: ARC 451
Lecture Hours: 2 Exercise/Lab: 2

**ARC 552 Urban Design & Housing 2**
**Credit Hours: 3**
This course introduces the students to working with complex and large scale urban design projects, while taking into consideration the socio-economic contextual factors. In connection to this the course also introduces the students to different types of housing types (public housing, incremental housing, sites and services, etc..) and the how they can be de developed through a given methodology that starts with site analysis, site planning to the development of the housing cluster and housing typologies.
Prerequisites: ARC 452.
Lecture Hours: 2 Exercise/Lab: 2

**ARC 571 Execution Designs 3**
**Credit Hours: 4**
The main concern of this course will be the integration of complex multi-disciplinary issues. In addition, students will practice how to survey different quantities of construction/building items. The practice will be on a moderate scale complex project. In addition, these topics will be discussed; Analysis of bids, Cost analysis, Shop and as built drawings.
Prerequisites: ARC 472
Lecture Hours: 2 Exercise/Lab/Studio: 4

**ARC 581 Project Management & Feasibility Studies**
**Credit Hours: 2**
Introduction to project management and feasibility studies. Principles of project life cycle, role and activity of a manager, project breakdown structure, economic analysis of projects, interest and time value of money, discounted cash flow, evaluation of projects, Project time programming and control.
Prerequisites: As Advised.
Lecture Hours: 2 Exercise/Lab: 1

**ARC 582 Professional Practice and Legislations**
**Credit Hours: 2**
The course explains the roles and the relationship between the different participants in the construction process; the Architect, the contractor and the owner. It is a study of the professional practice, codes and legislations in terms of bylaws, regulations, rights, commitments, ethics and scope of services. Types of contracts, fees and bidding are the main issues of this course. Case studies of real sites are examined, discussed and analyzed in classes.
Prerequisites: As Advised.
Lecture Hours: 2 Exercise/Lab: 1

**ARC E01 Elective 1: Computer Applications for Architects 1**
**Credit Hours: 3**
Computer as a tool designed for change: Computer aided drafting, Creation and editing of primitives – Accuracy – Organization – 2D and 3D drawing.
Computer aided Design: Modeling, and Visualization. Architectural rendering: Scenes, Materials and mapping. Using Photo editing applications in Architectural rendering.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E02 Elective 2: Computer Applications for Architects 2**
**Credit Hours: 3**
3D Computer modeling using Sketchup, Assigning Sketchup materials to masses, Assigning Sketchup lighting properties, adding components, Assigning shots and saving them, surface rendering in variable "styles", Animations & settings. Using Vray for materials and lighting, Using Vray renderer. Rendering, Animations, and Presentations using LUMION 5 Software.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E03 Elective 3: Interior Design**
**Credit Hours: 3**
The course presents creative and practical skills and covers both domestic and commercial interior design. Colors and materials, lighting, finishes details, furnishings and texture in spaces.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E04 Elective 4: Community Development / Participatory Design**
Credit Hours: 3
The course looks at the existence of privacy and territoriality in traditional Arab cities regarding the morphological analysis of the urban spatial pattern. Land utilization, population density, site and services projects for the low-income groups. The districts closely integrated physical and social fabric and the way in which social, economic, and cultural factors could

all together affect the development of that community.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E05 Elective 5: Architectural Heritage: Conservation – Preservation**
**Credit Hours: 3**
Criteria for the selection of heritage buildings - The concept of the common heritage and its common sections - International charters and norms to preserve heritage buildings - Problems facing the preservation of architectural heritage - The Authorities concerned with the preservation of heritage - Actions by the Egyptian state to preserve heritage - The use of nanotechnology in the field of restoration of heritage buildings - Prepare a draft restoration report of heritage building - Treatment of architectural and decorative elements of the heritage buildings - Method of preparing report of (the historical study of the building's heritage, photographic documentation, damage and cracks, architectural drawings, philosophy of preserving, restoration project and a plan of restoration).
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E06 Elective 6: Urban Upgrading and Management**
**Credit Hours: 3**
This course identifies the different challenges that might face cities and cause different symptoms of deterioration within. The course identifies diverse concepts that lead to deterioration and urban decay, as well as shrinkage of cities. The means of upgrading and revitalization of these cities are discussed explaining how the upgrading process is done in real life. An overview concerning how the city management is done in the administrative authorities in the cities of Egypt and how it should be done, is discussed as well.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E07 Elective 7: Architectural Aesthetics & Criticism**
**Credit Hours: 3**
The course emphasizes the multiplicity of architectural thinking.
Principles of architectural criticism – and techniques of evaluating projects are discussed. Aesthetics in the arts, Fine arts and concept of beauty and the sensual and spiritual - Elements of aesthetic composition, case studies.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E08 Elective 8: Appropriate Architecture & Technologies**
**Credit Hours: 3**
The course focuses on Appropriate Architecture and Technologies, Introduction, Properties, Elements and Language of Appropriate Architecture, Natural materials in site, Construction

Practices, Architecture form, Materials, Interior Design, Traditional and Contemporary Technologies, Local and Global Architectural projects.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E09 Elective 9: Innovative | Architecture & Technologies**
**Credit Hours: 3**
Energy efficiency in buildings, New & renewable energy, Air / water / solar energy in architecture, Sustainable Architecture, Green Architecture, New materials and technologies. Case studies.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E10 Elective 10: Computer Applications for Architects 3**
**Credit Hours: 3**
Responsive Architecture, Interactive Environments, Physical Computing, Parametric Design, Digital Fabrication and CNC, using Arduino, Rhino and Grasshopper Applications with models.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**ARC E11 Elective 11: Geographical Information systems (GIS)**
**Credit Hours: 3**
This course introduces the fundamental concepts underlying computerized geographic information systems (GIS). It combines an overview of the general principles of GIS with a theoretical treatment of the nature and analytical use of spatial information (raster and vector). The course has a laboratory component, which introduces students to the ArcGIS software package.
Prerequisites: As advised
Lecture Hours: 2 Tutorial: 2

**BSA H01 Administration of Small Projects**
**Credit Hours: 2**
Entrepreneurship & Entrepreneurs; Small Entrepreneurs' Challenges & Opportunities; Importance and Challenges of Owning & Managing a Small Business; Planning, Organizing & Operating a Small Business; Marketing, Promotion & Distribution of Small Businesses' Goods & Services; Computer Technology in a Small Business; Risk Management, Insurance & Crime Prevention in a Small Business
Prerequisites: -
Lecture Hours: 2 Exercise/Lab: 0

**CHM 151 Chemistry 1**
**Credit Hours: 2**
Gases, Mass balance and heat balance in combustion processes of fuels, Solutions, Dynamic equilibrium in physical and chemical processes, Electrochemistry and corrosion, Water treatment, Building materials, Environmental engineering. Selected chemical industries: fertilizers, dyes, polymers, sugar, petrochemicals, semi-conductors, Oil and fats, Industrial systems.
Prerequisites:
Lecture Hours: 2 Exercise/Lab: 2

**CHM 301 Organic Chemistry**
**Credit Hours: 2**
Molecular composition and structure of organic compounds: determination and calculation of empirical and molecular formulae, pictorial treatment of hybridization. Organic Reactions: Bond formation and fission, classification of reagents and reactions, reaction intermediates: Carbonations, free radicals, carbanions. Hydrocarbons: (aliphatic, alicyclic and aromatic), structure and nomenclature. Homologous series, and gradation of properties, preparation, reactions.
Prerequisites: CHM 151
Lecture Hours: 2 Exercise/Lab: 2

**CMP 132 Computer Programming**
**Credit Hours:2**
Overview of basic programming constructs. Functions, parameter passing and files. Data modeling with arrays, structures and classes. Pointers and linked lists. Recursion. Basic program design and analysis, testing and debugging techniques. Programming in C++. Program development using modern APIs.
Prerequisites:CMP 101
Lecture Hours: 2 Exercise/Lab: 2

**CMP 334 Digital System and Computer organization**
**Credit Hours: 3**
Sequential logic: state table and transition diagram, design of digital systems, incompletely specified states, counters, shift registers, Miscellaneous topics: adders, subtractors, decoders, coders, multiplexer/demultiplexer, memories (ROM, EPROM, EEPROM, FLASH, RAM). Description of a hypothetical computer system, The CPU main memory, I/O subsystem and all related components. the architecture of the Intel 80x86 based microprocessors, Linkers, library managers and debugging tool. Macro assembler programming techniques involving building, Incorporating and maintaining libraries, and using assembler pseudo-ops and directives. Debugging and testing techniques, Interfacing a high level language with an assembly language, Chip level programming of microprocessor type systems, Topics covered include I/O ports, I/O devices and controllers, DMA channels, priority.

Prerequisites: ELE 215
Lecture Hours: 3 Exercise/Lab: 2

**CMP 351 Microprocessors and Applications**
**Credit Hours: 3**
Introduction to microprocessors, Architecture, Microprocessor hardware, Assembly language fundamentals, Programming, Microprocessor system connections, Timing in microprocessors, Interrupts and interrupt service procedures, Microprocessor timing specifications, Interfacing, Programmable chips , Data acquisition systems, Applications of closed loop control, I/O hardware alternatives, Developments tools, Troubleshooting case studies.
Prerequisites: CMP 334
Lecture Hours: 3 Exercise/Lab: 2

**CMP 371 Control Systems 1**
**Credit Hours: 3**
Introduction to control systems, Advantages of closed-loop feedback systems, The role of the system mathematical model, Block diagrams and signal flow graphs, The basic control system design problem, stability in control systems, Frequency response analysis techniques, Root-locus analysis, Examples on continuous control systems, Transient response, Static error analysis, Frequency response: Bode plots, Relative stability, Introduction to concept of state space representation.

Prerequisites: MTH 212
Lecture Hours: 3 Exercise/Lab: 2

**CMP 456 Design of Real-Time Embedded Systems**
**Credit Hours: 2**
Introduction to bus architectures and programming; Device and system firmware; Microprocessor and I/O architectures; Memory architectures; Interrupt service routines; Real-time clocks/timers; Real-time debugging techniques and tools; Development and testing techniques. Students will be introduced to the full embedded system design process including: analysis, design (using extended finite state machine specification), interfacing, programming, hardware assembly, integration and system testing.
Prerequisites: ELE 410
Lecture Hours: 2 Exercise/Lab: 1

**CMP 470 Control Systems**
**Credit Hours: 3**
Introduction to feedback control systems; Block diagram reduction and signal flow graphs; System time response and stability; Feedback systems performance specifications; Time; Root-Locus; Frequency response analysis techniques; State space analysis of multivariable systems; Controllability, observability, and sensitivity; Basic controller design in frequency

domain and state space; PID, lead-lag and lag-lead compensation; Analysis and design of feedback control systems using Matlab.
Prerequisites: MTH 212
Lecture Hours: 2 Exercise/Lab: 2

**CMP 472 Control Systems 2**
**Credit Hours: 3**
Optimal control of continuous systems, Stability of closed loop systems, Discrete control systems, Z-Transform, Modified Z-Transform, Impulse T.F( Transfer Function)., Static error, Jury stability analysis, Frequency response, Classical design of D.T.C.( Discrete Time Control) system, Design of D.T.C. with dead zone. Digital controller versus continuous controller, Discrete Root-Locus, State-Space, Conversion using c2dm (Continuous to Digital Method), Zero-order hold equivalence, Example in motor speed control.
Prerequisites: CMP 371
Lecture Hours: 3 Exercise/Lab: 1

**CMP 475 Digital Control Systems**
**Credit Hours: 3**
Discrete-time signals and systems; z-Transform analysis; Pulse transfer function and discrete-time feedback system; Static error, Jury stability test, and system sensitivity; Frequency-domain and state space analysis and design of discrete-time systems using Matlab; Digital controller implementation issues.
Prerequisites: CMP 470
Lecture Hours: 2 Exercise/Lab: 2

**COM 213 Electromagnetic Waves 1**
**Credit Hours: 3**
Different coordinate systems used in solving vector field problems. Coulomb's law- relation of electric field intensity with different charges. The electric flux density- Gauss's law and the divergence theorem. relation between the electric field and the force exerted on charges, and energy expended in this motion- the potential gradient and dipole moment. the application of the previous laws to some materials; conductors- semiconductors- and dielectrics. Boundary conditions. Definition of susceptibility and permittivity. Laplace and Poisson equations in the three coordinate systems, examples of their solutions. relations of steady magnetic field, its curl, and Stoke's theorem. time-varying fields and Maxwell's equations
Prerequisites: MTH 212
Lecture Hours: 3 Exercise/Lab: 2

**COM 362 Signal Analysis**
**Credit Hours: 3**
Continuous and discrete time signals and systems, Continuous time convolution, Discrete time convolution, Fourier series representation of periodic signals: Fourier representation of

continuous time periodic signals, Fourier series representation of discrete time periodic signals, The continuous-time Fourier transform: the Fourier transform for periodic signals, the properties of continuous-time Fourier transform, The discrete-time Fourier transform: representation of a periodic signals, the discrete Fourier transform for periodic signals, properties of the discrete-time Fourier transform,.
Prerequisites: EPR 261, MTH 211
Lecture Hours: 3 Exercise/Lab: 2

**COM 411 Communications 1**
**Credit Hours: 3**
History of communication, Communication systems: block diagram, transmission media, frequency bands, fundamental limits, Shannon, s equation, linear and nonlinear distortion, noise (internal and external noise sources), energy and power spectral densities.
Amplitude modulation (conventional AM, SSB, DSB and VSB) and demodulation, Angle modulation and demodulation (PM and FM), Automatic gain control, Automatic frequency control, FDM Systems, Broadcast transmitters and receivers (AM SSB and FM) and circuits (Detectors, Mixers, Automatic gain control, Automatic frequency control, Phase-locked-loop, Applications of class C RF power amplifiers: limiters, harmonic generators and amplitude modulators ,FM stereo broadcast transmitters and receivers.
Prerequisites: COM 362
Lecture Hours: 3 Exercise/Lab: 2

**COM 412 Communications 2**
**Credit Hours: 3**
Overview of Analog communication systems. Introduction to Digital communication. Analog to Digital Convertors. Sampling Theorem. Practical Aspects Aliasing error. Information Rate and Bandwidth. Pulse modulation PAM, PWM, and PPM. Features, generation and detection. Pulse Code Modulation {PCM}. Sampling, Quantization and Encoding. SNRo. Companding Process, TDM: principles, framing bits, total bit rate Rb. T1 carrier system. Synchronization and signaling. Plesichronous Digital Hierarchy. Differential Pulse Code Modulation {DPCM. ADPCM, and DM. Line Codes: Properties, types, PSDs, and comparison, Pulse Shaping; ISI, Nyquist's First Criterion. Digital Receivers, and Regenerative repeaters. Equalizers, Time Extraction Detection Error. Error probability for different signals. Eye Diagram Digital Carrier Systems. M-ary Digital Modulation. Comparison of digital modulation schemes.
Prerequisites: COM 411
Lecture Hours: 3 Exercise/Lab: 2

**COM 413 Electromagnetic Waves 2**
**Credit Hours: 3**
Boundary conditions for different media, Retarded potentials, Time harmonic fields, Plane waves in free space, Plane waves in lossy media, Wave polarization, Wave type, Pointing vector, Phase and group velocities, Reflection and transmission of waves, TEM transmission

lines, Ideal two conductor transmission line, Transmission lines equivalent circuits, Transmission line circuit theory, Smith chart,
Prerequisites: COM 213
Lecture Hours: 3 Exercise/Lab: 2

**COM 414 Communication Systems**
**Credit Hours: 3**
Communication Systems objective, block diagram, transmission media, signal impairments. SNR, and channel bandwidth, Shannon's equation. Analog and digital messages. Amplitude modulation (conventional AM, SSB, DSB and VSB) and demodulation, Angle modulation and demodulation (PM and FM), Broadcast transmitters and receivers (AM and FM). Principles of digital data transmission: Digital communication system: Sampling Theorem, PCM ,and DM techniques Regenerative repeaters. Optical fiber communication system (Main features, OPGW Cable System). Hybrid networks (Power and data networks).
Prerequisite: COM 362, MTH 312
Lecture Hours: 3 Exercise/Lab: 2

**COM 415 Microwave Engineering**
**Credit Hours: 3**
Equivalent circuit of waveguides: N-port circuit, circuit description, scattering parameters, excitation of wave guides, waveguides coupling by aperture, Passive devices: terminations, attenuators, phase shifters, directional couplers, Hybrid junctions, Circuit theory of resonators, Fabry Perot and optical resonators, Microwave measurements, detection and measurement of microwave power, measurement of wavelength, measurement of impedance. Ferrites
Prerequisites: COM 413
Lecture Hours: 3 Exercise/Lab: 2

**COM 500 Graduation Project**
**Credit Hours: 0**
An engineering assignment requiring the student to demonstrate initiative and assume responsibility, the student will select a project at the end of the ninth semester, Students can propose their own project, A faculty member will provide supervision, A project report is required at the end of the tenth semester.
Prerequisites: As Advised
Lecture Hours: 2 Exercise/Lab: 2

**COM 501 Graduation Project**
**Credit Hours: 4**
Continuation to the bachelor project started in COM 500
Prerequisites: COM 500
Lecture Hours 0 Exercise/Lab 4

**COM 520 Telecommunication Networks**
**Credit Hours: 3**
Introduction to telecommunications, Telegraph and telephone, Switching: telegraph, telephone, telex, data, signaling, ISDN, broad band, private switching. Network multiplexing: analog, digital, wavelength division, Data transmission interface equipment: modems, digital data interface equipment, Codecs: audio, video, Copper lines: open wire, twisted pair cable, coaxial cable, Optical fibber technology: types of optical fibbers, cables, applications, Radio relay systems, Mobile radio: service mode technology, Satellites: services, technology, digital subscriber lines.
Prerequisites: COM 412
Lecture Hours: 3 Exercise/Lab: 2

**COM 521 Antennas and Propagation**
**Credit Hours: 3**
Antenna types and antenna parameters, Wire antennas: small wire antenna, dipoles, monopole, folded – loop antenna, helical antennas (normal, and axial)- travelling wave antenna (including rhombic antennas). Arrays: broadside- binomial- Chybeshev, end fire array, and phased arrays. Aperture antennas: open end waveguides (rectangular, and circular apertures). Horns: sectoral, pyramidal, and conical horns. Reflectors: single, double and corner reflectors. Lens antennas: dielectric and parallel plates. Wide band antennas (spiral-LPDA). Microstrip antennas.
Prerequisites: COM 415
Lecture Hours 3 Exercise/Lab 2

**COM 522 Optical Networks**
**Credit Hours: 3**
Introduction to optical networks, Propagation of signals in optical fiber, Components (couplers, multiplexers and filters, optical amplifiers, transmitters, detectors, switches, wavelength converters), Modulation and demodulation, Transmission system engineering, Client layers of optical layer, WDM network elements and design, Control and management, Photonic packet switching, Design example.
Prerequisites: COM 412, COM 527
Lecture Hours: 3 Exercise/Lab: 2

**COM 523 Mobile Communication Systems**
**Credit Hours: 3**
Conventional telephone systems, Traffic theory, Conventional mobile system, Frequency spectral efficiency, Methods of increasing system capacity, System, Architecture, Access schemes, Interference in cellular system, Hand off, propagation models, Fading and Doppler in cellular system, GSM system architecture, GSM channel coding, Ciphering and modulation, System management, CDMA spread spectrum systems, Direct sequence SSS, The performance of DS-SSS, CDMA air links: the forward pilot channel, sync channel,

paging channel, traffic channel, Access channel, Types of codes used in CDMA, Power and Hand-off.

Prerequisites: COM 412

Lecture Hours 3 Exercise/Lab 2

**COM 524 Satellite Communication Systems**

**Credit Hours: 3**

Satellite Orbits. Orbital Parameters and terms. General satellite orbit. LEOs, MEOs, GEO Satellite orbits. Keplerian set of orbital parameters.

Orbit perturbations. Sun synchronous orbits. Geostationary orbit. Characteristics of Satellite communication. Uplinks, Downlinks and onboard system. Power Budget calculations. Satellite EIRP, G/T ratio. Carrier To Noise ratio (C/N), Carrier To Noise Spectral Density ratio $C/N_0$, Useful bitrate. Satellite Construction. Satellite subsystems: Payload (P/L), Electrical Power (EPS), Telemetry and Telecommand (TCR), Attitude Determination and Control (ADCS) subsystems.

Construction of the P/L subsystem. Input Demultiplexer (IMUX), Transponder, Travelling Wave Tube (TWT) as HPA, Channel Amplifiers (CAMPS), Output Multiplexer (OMUX). (P/L) receiving and transmitting antennas. Gregorian, Cassegrain and Parabolic Reflector antennas. Multiple access techniques. Methods of transmissions. MCPC and SCPC transmissions. Tradeoff between Bandwidth and Bitrate. Satellite Control Ground stations. Functions of the control stations. Frequency and Time, Baseband, and RF subsystems. Satellite Station Keeping Maneuvers.

Prerequisites: COM 412

Lecture Hours 3 Exercise/Lab 2

**COM 525 Computer Communication Networks**

**Credit Hours: 3**

Classification of computer communication networks, LAN topologies, Transmission media, Error control, Fundamentals of queuing theory, Performance of local area networks, LAN standards, Practical examples for LAN operating systems, LAN security.

Prerequisites: COM 526

Lecture Hours 3 Exercise/Lab 2

**COM 526 Data Communication Systems**

**Credit Hours: 3**

Basic concepts of data transmission, data networks and the internet. Computer models (ISO/OSI and TCP/IP) modems and xDSL, error control, flow control, data link control protocols, sliding window and ARQ, HDLC, statistical multiplexing, line codes, circuit and packet switching, timing diagrams, frame relay, ATM, routers. Multiple-Access techniques. Local Area Networks. Giga Ethernet. Wireless LAN (IEEE 802.11x).

Prerequisites: COM 412

Lecture Hours 3 Exercise/Lab 2

**COM 527 Optical Fiber Communication Systems**

**Credit Hours: 3**

Overview of optical fiber communications: Historical review, the general system, and the main features. Optical Fiber waveguides: Ray theory transmission, Electromagnetic mode theory for optical propagation.

Optical Fiber waveguides (Continued). Cylindrical fiber: modes, mode coupling, Step index fiber, Graded index fiber. Optical Fiber waveguides (Continued).

Single mode fiber: cutoff wavelength, Mode field diameter [MFD], Effective, refractive index, and Gaussian approximation. Transmission Characteristics of optical fibers: Attenuation {material absorption, linear scattering losses, nonlinear scattering losses, and fiber bend loss, Transmission Characteristics of optical fibers (continued): Dispersion inter-modal dispersion, chromatic dispersion, overall dispersion. Dispersion (continued) modified single mode dispersion: DSFs, DFFs, and NZ DFs. Optical fibers: Multi-mode Step-index fiber, Multi-mode Graded-index fiber, Single mode fiber, Plastic-clad fiber, Plastic optical fibers. Direct detection receiver performance: Noise, Receiver noise, Receiver structure. Optical fiber systems {Direct detection}: introduction, Transmitter circuits, Receiver circuits, Digital system design considerations, optical power budget, and rise time budget.

Check the system design parameters of an optical fiber link using power budget and rise time budget. Wavelength division multiplexing techniques. Optical fiber Measurements: Fiber attenuation measurements, fiber dispersion measurements, Fiber cutoff wavelength, and Fiber NA measurements.

Prerequisites: COM 412, ELE 412

Lecture Hours: 3 Exercise/Lab: 2

**COM 530 Digital Television Systems**

**Credit Hours: 3**

Composite analog TV signal. Digital Component signals. Required Bitrate for a digital TV channel broadcasting. Video Compression techniques: MPEG 2, MPEG 4 (Moving Picture Expert Group). Digital Video Broadcasting (DVB). Levels and Profiles in video broadcasting. Parameters for the standard Digital Video Broadcasting (DVBS). Advanced Digital Video Broadcasting (DVBS2). The High Definition TV (HDTV). Broadcasting of HDTV channels. Application of DVBS2 and MPEG 4 in the HDTV Broadcasting. The Ultra HDTV. 4K HDTV, 9K HDTV.

Effects of FEC ratio, QPSK, 8PSK on the number of broadcasted TV channels on a given satellite transponder bandwidth.

Prerequisites: COM 412

Lecture Hours: 3 Exercise/Lab: 2

**COM 531 Acoustics and Ultrasonic Engineering**

**Credit Hours: 3**

Plane and spherical waves, Simple and compound sound sources, Dynamically analogous mechanical and acoustical circuits, Acoustic transducers, Loudspeakers: types and systems,

Microphone: types and systems, Measurements of sound, Acoustics and Hearing, Acoustic environment outdoors, Acoustic environment indoors, Ultrasonic applications.
Prerequisites: EPR 364
Lecture Hours: 3 Exercise/Lab: 2

**COM 561 Digital Signal Processing**
**Credit Hours: 3**
Digital filter design: finite impulse response, Infinite impulse response, Adaptive digital filters: concepts, algorithms, applications, Speech coders: speech signal analysis, waveform coders, vocoders, hybrid coders, Image processing: image coding, image enhancement, image compression.
Prerequisites: COM 362
Lecture Hours: 3 Exercise/Lab: 2

**COM 581 Special Topics in Electronics and Communication**
**Credit Hours: 3**
Independent study in various problem areas of communication engineering may be assigned to individual students or to groups, Readings assigned, and frequent consultations held.
Prerequisites: As Advised
Lecture Hours: 3 Exercise/Lab: 2

**COM 582 Introduction to Information Theory**
**Credit Hours: 3**
Introduction: uncertainty, information, entropy and its properties, Source coding: Shannon coding, prefix coding, Kraft-Mcmillan inequality, First Shannon theorem, Huffman coding, Lempel Ziv coding, Discrete memoryless channels: transition probability, binary symmetric channel, Mutual information and its properties, Channel capacity, Definition, Binary symmetric channel. Channel coding theorem: second Shannon theorem differential entropy and mutual information for continuous ensemples, Differential entropy, Mutual information, Channel capacity theorem: implications on different communication systems, Constant rate encoding, Linear encoding, Kraft rule for inequalities, Variable rate data compression Hofmann coding.
Prerequisites: COM 412, MTH 312
Lecture Hours: 3 Exercise/Lab: 2

**COM 583 Wireless Communication Networks**
**Credit Hours: 3**
Introduction to wireless systems and standards: cellular and wireless systems, multiple access techniques, cellular system design considerations. Brief review of fundamentals of radio propagation and channel models; error probability and outage probability in fading channels. Signal modulation: modulation schemes used in mobile systems, spectral characteristics, and error performance. Introduction to diversity combining: antenna diversity,

multipath diversity, interleaving. Selected topics on modern wireless systems, including ultra wideband (UWB) Wi-Fi and WiMax
Prerequisites: COM 412
Lecture Hours: 3 Exercise/Lab: 2

**COM 584 Interfacing Circuits and Networks**
**Credit Hours: 3**
Physical Layer:Properties of the Physical Layer, Movement of bits, Transmission Media Open Wire; Twisted Pair; Coaxial Cable; Optical Fiber. Link Layer, Role of the data link layer. Local Area Networks Definition of a Local Area Network, Ethernet , Network Interface Card , Medium Access Control Layer , Access to the Shared Medium (Cable), TransceiverPreamble, Carrier Sense Checking for other users; Possible contention. , Collision Detection (CD)Cabling (media):10B5 Thick Ethernet (low loss co-axial cable), 10B2 Thin Ethernet (low cost co-axial cable) , 10BT Unshielded Twisted Pair (unshielded twisted pair cable, UTP CAT-5) , 10BF Fiber Optic Links (point to point fiber link), Higher bandwidth twisted pair cable (CAT-5e, CAT-6, CAT-7, STP), Higher Speed Communication interfaces: Fast Ethernet100 Mbps, Gigabit Ethernet 1 Gbps, 10 Gbps, and higher.
Prerequisites: COM 526
Lecture Hours: 3 Exercise/Lab: 2

**CSC 101 Introduction to Computers**
**Credit Hours: 2**
Computer Systems: Introduction, Computer devices: Input, Output, CPU, Auxiliary units, Programs, Processing programs, Applied programs. Manipulating problems and their solution (Algorithms), Applied programs.
Prerequisites: --

**ELE 213 Electronics**
**Credit Hours: 4**
Semiconductor diode (theory of the P-N junction, I-V characteristics, junction potential, forward and reverse biased P-N junction, diffusion capacitance), Diode models. Diode circuit applications (rectifier circuits, voltage doublers, clipping circuits), Special diodes: Zener diode, Schottky barrier diodes, Light emitting diodes(LED) .and photodiodes.
Bipolar Junction Transistor (BJT), Static and dynamics characteristics, Field Effect Transistor (FET), linear, nonlinear and pinch off regions, Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET): physical structure, basic configurations, the I-V characteristics, FETs applications: MOSFET as a resistance, JFET as a constant current source, Single stage amplifiers (biasing, small signal models). Other semiconductor devices.
Prerequisites: PHY 232
Co-requisites: EPR 261
Lecture Hours: 3 Exercise/Lab: 3

**ELE 215 Logic Design & Digital Circuits**
**Credit Hours: 3**
Review on number systems: positional notation, binary number systems, number base conversion, octal and hexadecimal, negative numbers, coded number systems, Switching functions: main operators, postulates and theorems, Analysis and synthesis of switching functions, incompletely specified functions, Design using NAND and NOR gates, standard combinational Logic, PLA & PAL implementation of combinational logic, Storage devices: 1-bit storage, set-reset FF, clocked SR-FF, positive and negative-edge triggered SR-FF, JK-FF, Race-around condition, Master-slave JK-FF, D-FF, T-FF, Excitation table. Introduction to sequential circuits and FSM.
Co-requisites: ELE 213
Lecture Hours: 3 Exercise/Lab: 2

**ELE 216 Basic Electronic Circuits**
**Credit Hours: 3**
This course is designed to provide students with introductory topics in semiconductor physics. It includes theory of operation and analysis of the P-N junction diode, Bipolar Junction Transistor (BJT`s) and Field Effect Transistors (FET`s) and their applications. The course provides the understanding of the principle of operation, characteristics and applications of the operational Amplifiers (Op-Amp) in addition with understanding of the filter characteristics, types, implementation and applications. It also provides considerable understanding and confidence in Engineering Electronics and develops the intellectual and practical skills necessary for Electronics Engineering area.
Prerequisites: PHY 132
Lecture Hours 2 Exercise/Lab 2

**ELE 364 Electronic Circuits**
**Credit Hours: 4**
Transistor small signal models: □- model , Analysis of audio frequency (AF) amplifiers: RC-coupled, high frequency model and frequency response, AF power amplifiers: Class-A, Push-pull operation (Class-A, Class-B, Class AB), Feedback amplifiers (FB): FB concept, stability, general characteristics of negative FB amplifiers, input and output impedances with FB, difference amplifier Operational amplifiers (OPAMPs):, OPAMP specifications and frequency characteristics, OPAMP applications: inverting, non-inverting, adder, subtracter, integrator, differentiator, Oscillators: concept of stability and oscillations, OPAMP oscillators (rectangular, sinusoidal, Wien bridge, phase shift, and tuned circuits). Multivibrators (MVs): bistable MVs, triggering, schmitt trigger, monostabfe and astable MVs, wave shaping circuits and the 555 timer
Prerequisites: ELE 213
Lecture Hours 3 Exercise/Lab 3

**ELE 412 Optical Electronics**

**Credit Hours: 3**

Introduction, Photons & Electrons.Maxwell's equations, Wave nature of light, Fundamentals of Optics.Interaction of radiation and atomic systems, particle/wave property, De-Broglie wave length, Uncertainty principle, Optical Coherence and Correlation. Radiation and Solids: Light and matter (light propagation in uniform dielectric medium, Rayleigh scattering, susceptibility, optical dispersion), rate equations and gain medium for two level system. Theory of laser oscillation: Fabry-Perot laser, Three-level System. Four-level System. Optical Sources- Gas Laser, Nd-YAG Laser, Semiconductor sources [LEDs & LDs]. Optical Modulators.Photo detectors [PINs & APDs].

Prerequisites: PHY 232

Lecture Hours: 3 Exercise/Lab: 2

**ELE 415 Analog Signal Processing**

**Credit Hours: 3**

Op-Amp analog signal processing: Active Filters, voltage multiplier/ divider, logarithmic and exponential amplifiers\, inductance simulation, comparators & window comparators, switched capacitor filters, voltage multiplier (Gilbert Cell), voltage regulators, phase detectors, VCO, F/V & V/F converters, PLL and synthesizers. FM &PM detection using PLL.

Prerequisites: ELE 364

Lecture Hours: 3 Exercise/Lab: 2

**ELE 420 Electronic Devices**

**Credit Hours: 3**

Crystal Structure and Reciprocal Lattice, Energy Bands, Carrier Concentration at Thermal Equilibrium, Generation, Recombination, and Carrier Lifetimes, Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, DiffusionBasic Equations and Examples PN Junction and Depletion region I-V characteristics, and Non-ideal Effects ,Pspice Models for PN Junctions Silicon MOS Capacitor , MOSFET Characteristics and Behavior, MOSFET Pspice model , BJT Pspice model .

Prerequisites: ELE 364

Lecture Hours: 3 Exercise/Lab: 2

**ELE 511 Radio Frequency Microelectronics**

**Credit Hours: 3**

The theory and practice of Radio Frequency (RF) engineering, Transmission lines, and scattering parameters, Design of RF components (low noise amplifiers, power amplifiers, oscillators, RF power detectors, active/passive mixers, power amplifiers), Properties and representation of noise, Passive device design (micro strip lines, diodes, IC resistors, IC capacitors, and IC inductors), Active device design (bipolar and FET's).

Prerequisites: ELE 420, COM 411

Lecture Hours: 3 Exercise/Lab: 1

**ELE 514 Microwave Electronic Devices**
**Credit Hours: 3**
Microwave linear beam tubes (O-type): two cavity klystron, reflex klystron, multi cavity klystron amplifiers, travelling wave tube amplifiers, backward wave oscillator, extended interaction oscillator, Microwave crossed field tubes (M-type): magnetron oscillators, forward wave crossed field amplifier, backward wave crossed field amplifier (Amplitron), backward wave crossed field oscillator (Carcinotron), Gyratron, Microwave solid state devices: Schottky barrier mixer diodes, tunnel diodes, transferred electron devices, IMPATT, TRAPATT, BARITT, Varactors, Parametric devices: Manley-Rowe relations, parametric up converters, negative resistance parametric. Gunn diodes
Prerequisites: COM 415
Lecture Hours: 3 Exercise/Lab: 2

**ELE 521 Electronic Systems Design**
**Credit Hours: 3**
Introduction to MOS technology, Geometrical design rules and layout, Circuit characterization, Regular structure (PLA), Clocked systems (FSM), Memory, Scaling,
Analog circuits layout, CMOS design project, Introduction to PLDs, CPLDs and FPGAs, commercial available FPGAS, Design development systems, Design characterization, Design examples.
Prerequisites: ELE 420
Lecture Hours: 3 Exercise/Lab: 2

**ELE 522 Semiconductor Devices**
**Credit Hours: 3**
Metal-Semiconductor junctions (Schottky barriers), Heterojunctions, Solar cells, Light emitting diodes, Photodetector diodes, JFET's, MESFET's, MOSFET's, VLSI bipolar and MOS devices, CCD's power devices (PIN and rectifier diodes, SCR's, power switching transistors).
Prerequisites: ELE 420
Lecture Hours: 3 Exercise/Lab: 2

**ELE 524 Microsystems Technology**
**Credit Hours: 3**
Physical principles, Design, and micro fabrication technologies pertinent to input (sensor) and output (actuator) devices for multimedia applications such as document and video imaging devices, Micro mirror projection displays and micro-electro-mechanical systems.
Prerequisites: ELE 420
Lecture Hours 3 Exercise/Lab 2

**ELE 525 Integrated Circuits Technology**
**Credit Hours: 3**

Defining terms, Technology roadmap, Basic silicon processes, Fabrication of passive and active components, Process integration and standard technologies, Process simulation, Layout design rules, Layout parasitics, Typical examples, Layout techniques, Interconnect modelling, Substrate coupling issues, ESD protection.

Prerequisites: ELE 213

Lecture Hours 3 Exercise/Lab 2

**ELE 526 Analog Integrated Circuit Design**

**Credit Hours: 3**

Introduction to analog VLSI, Device modelling, Basic analog building blocks (current mirrors, common source, common drain, common gate, cascode), Noise, Voltage and current references differential pair, Frequency response, Stability and frequency compensation, Operational amplifiers (basic, two-stage, Miller, symmetrical, telescopic, folded, cascode), Noise, Voltage and current references.

Prerequisites: ELE 364

Lecture Hours 3 Exercise/Lab 2

**ELE 561 Integrated Circuits**

**Credit Hours: 3**

Switching characteristics of transistors, Digital integrated circuits including ECL, T2L, CMOS, BiCMOS, Low voltage-low power and high performance design issues, Lab project, Design of analog circuits such as: current sources and mirrors, differential, low-noise and feedback amplifiers, mixers and oscillators, Applications of these circuits in areas such as A/D and D/A conversion and receiver front-end.

Prerequisites: ELE 420

Lecture Hours 3 Exercise/Lab 2

**ELE 562 VLSI_Design**

**Credit Hours: 3**

Introduction to VLSI systems□, Review of digital systems, CMOS logic and fabrication, MOS transistor theory, Layout design rules, Circuit characterization and performance estimation, Circuit simulation, Combinational and sequential circuit design, Static and dynamic CMOS gates, Memory system design, Design methodology and tools

Prerequisites: ELE 420

Lecture Hours 3 Exercise/Lab 2

**ELE 563 Integrated VLSI Systems**

**Credit Hours: 3**

Integrated system design, Memory cells and systems, Logic arrays, VLSI design methodologies, Applications in digital signal and data processing systems, Low-power, low-voltage design issues.

Prerequisites: ELE 420

Lecture Hours 3 Exercise/Lab 2

**ELE 564 Integrated Circuits Applications**
**Credit Hours: 3**
Amplifiers: RF IF and video, Oscillators: tuned and untuned oscillators stability, VCO, phase locked loop, Modulators: AM, SSB balanced FM, PM, pulse modulators, digital modulators, Demodulators: AM, FM and PM detectors, Transmitter and receiver circuits, Circuit simulators, Digital, Analog and mixed mode.
Prerequisites: ELE 420, COM 411
Lecture Hours 3 Exercise/Lab 2

**ELE 570 Microelectronic Systems**
**Credit Hours: 3**
MOS LOGIC gates; NMOS, CMOS pseudo NMOS; dynamic logic; dynamic cascaded logic; domino logic; 2 and 4 phase logic; pass transistor logic. Control and timing; synchronous and asynchronous; self-timed systems; multi-phase clocks; register to register transfer; Effects of scaling circuit dimensions; physical limits to device fabrication. Static & dynamic memories.
Prerequisites: ELE 420
Lecture Hours: 3 Exercise/Lab: 2

**ENG KET English KET**
**Credit Hours: 2**
Study of the basics of communicative goals through the use of frequency words, collocations and expressions, while at the same time emphasizing productive and receptive skills through extensive practice. Grammar and lexis are introduced through reading and listening and further practiced through writing and speaking. Reinforcing language learning. Drawing Lexis from the reading and listening and recycling it for consolidation within grammar, writing and speaking. More emphasis is given to fluency thus achieving higher levels of communicative complexity.
Prerequisites: --
Lecture Hours 2 Exercise/Lab: 0

**ENG PET English PET**
Credit Hours: 2
Encompassing the lexical approach which focuses on communication by emphasizing fluency and accuracy through developing sub-skill strategies for interaction via speaking and writing. Understanding topical and functional lexis which provide the reference by which language is introduced and recycled within clear natural contexts. Exploring writing through a range of texts, Understanding genre-specific conventions, Developing confidence through planning and discussions and by applying both process and product approaches.
Prerequisites: ENG KET
Lecture Hours: 2 Exercise/Lab: 0

**ENG H02 English Technical Writing**
**Credit Hours: 2**
Review of the basics of Grammar, Relative clauses and articles, Requirements of technical language skills, Technical Report importance, types and requirements, Report writing methodology, Techniques of report organization, Standard specifications of parts and components to insure production and performance security, The use of computer in report presentation,
Prerequisites: -
Lecture Hours 2 Exercise/Lab: 0

**ENV 101 Environmental Science**
**Credit Hours: 2**
Introduction to environmental science, Survey of environmental issues related to health and disease, Natural resources management, nuclear waste disposal, water resources, Hydrology, energy use and conservation, Land reclamation, Global climate change, and industrial pollution, Environmental legislations.
Prerequisites: -
Lecture Hours 2 Exercise/Lab: 0

**EPR 261 Electrical Circuits 1**
**Credit Hours: 4**
Basic electrical quantities, Ohm's Law and Kirchhoff's Laws, resistance and source combinations, voltage and current division. Techniques of solving DC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thévenin's theorem. AC sinusoidal sources, time domain and frequency domain, voltages and currents phasor diagrams, inductance and capacitance: voltage and current relationships, impedance and admittance. Techniques of solving AC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thévenin's theorem.

Prerequisites: PHY 132
Lecture Hours: 3 Exercise/Lab: 3

**EPR 263 Electrical Circuits 2**
**Credit Hours: 4**
Transient analysis in R-L, R-C, and RLC circuits. Steady state power analysis for circuits with sinusoidal sources. Maximum power transfer theorem. Three phase circuits; connections, transformations, and power measurements. Magnetically coupled circuits: linear transformer equivalent circuits, ideal transformer. Frequency response, Series and parallel resonance circuits, Quality factor, 3 dB bandwidth, Resonance in mutually coupled circuits.

Prerequisites: EPR 261
Lecture Hours: 3 Exercise/Lab: 3

**EPR 266 Electrical Circuits**
**Credit Hours : 4**
Basic electrical quantities, Ohm's Law and Kirchhoff's Laws, resistance and source combinations, voltage and current division. Techniques of solving DC electric circuits: nodal analysis and mesh analysis. Theorems: superposition, Thévenin's theorem, and maximum power transfer. AC sinusoidal sources, time domain and frequency (phasor) domain, voltages and currents phasor diagrams, inductance and capacitance: voltage and current relationships, impedance and admittance, Techniques of solving AC electric circuits: nodal and mesh analysis. Theorems: superposition, and Thévenin's theorem. Steady state power analysis: Real Power, complex power, and power measurement. Three phase circuits; connections: Y-Y, Y-Δ, Δ-Y, Δ-Δ, and power measurements.

Prerequisites: PHY 132
Lecture Hours: 3 Exercise/Lab: 2

**EPR 340 Electrical Machines**
**Credit Hours: 3**
Magnetic circuits. Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics, performance: efficiency and voltage regulation or speed regulation, and testing (experiments) and of each of the following machines: DC Machines, 1-ph Transformers, 3-ph Induction Motors, and 3-ph Synchronous Machines.
Prerequisites: EPR 266
Lecture Hours: 2 Exercise/Lab: 2

**EPR 341 Energy Systems**
**Credit Hours: 3**
Electrical energy resources, Magnetically coupled circuits, The per-unit system, Two-port networks, Three phase loads: advanced concepts, Power system structure: generation, transmission and distribution, Power system components: generators, transformers, transmission lines and circuit breakers.
Prerequisites: EPR 263
Lecture Hours: 3 Exercise/Lab: 2

**EPR 344 Electrical Installations and Construction Equipment**
Credit Hours: 2
Electrical installations: introduction to electric circuits, electrical installations in residential and industrial buildings (lighting, power, telephone, TV, air conditioning, lifts), Acoustic precautions, Alarm systems (Fire, Security, Gas), Electrical design for signaling systems in roads and railways, Electrical print reading.
Construction equipments: assessment and selection of construction equipment, earth moving equipment, equipment of concrete production and handling, Steel installations equipment.
Prerequisites: PHY 132
Lecture Hours: 2 Exercise/Lab: 2

**EPR 364 Electrical and Electronic Measurements**
**Credit Hours: 3**
Introduction to Units, Standards, and Measurements Errors. Electromechanical Instruments and DC meters. Resistance, Inductance and Capacitance measurements, DC/AC bridges. Digital Basic Instruments, Digital counters, A/D & D/A converters. Digital measuring instruments: digital multimeters and frequency meters. Cathode Ray Oscilloscopes and its applications in phase and frequency measurements, Digital Storage Oscilloscopes, Spectrum Analyzer.
Electromechanical Transducers: Variable resistance, capacitance and inductance transducers, Strain Gauge, Linear Variable Differential Transformer.
Temperature Transducers: The Thermocouple and the Thermistor.
Light Transducers: The photoconductive cell and photodiode.
Prerequisites: ELE 213, EPR 261
Lecture Hours: 3 Exercise/Lab: 2

**EPR 411 Power System Analysis 1**
**Credit Hours: 3**
Symmetrical components: Synthesis of unsymmetrical phasor diagrams from their symmetrical components, Symmetrical components of unsymmetrical systems, Power in terms of symmetrical components, Positive, negative and zero phase sequence networks, Unsymmetrical faults: Shunt faults, Series faults, Network matrices: Network topology, System admittance and system impedance matrices, Load flow solutions and control: Load flow equations, The Gauss-Seidel method, Newton-Raphson method and approximations, De-coupled methods, Regulating transformers.
Prerequisites: EPR 421
Lecture Hours: 3 Exercise/Lab: 1

**EPR 412 Economics of Generation and Operation**
**Credit Hours: 3**
Load curves, Variation in demand, Load diversity. Power plant layout: thermal power plants, Hydroelectric plants, Diesel and gas turbine plants, Main equipment, Auxiliaries, Bus-bar arrangements. Power plant economics: Capital cost, Operating cost, Fixed charge rate, Selection of plant and size and unit size, Operation and economics of spinning reserve. Tariffs, Effect of low power factor, Power factor improvement, Most economic power factor. Optimal operation of power systems: Modeling of fuel cost for thermal generation, Optimal operation of thermal system, Accounting for system losses, Optimal operation of hydro-thermal system.
Prerequisites: EPR 421
Lecture Hours: 3 Exercise/Lab: 1

**EPR 413 Renewable Energy**
**Credit Hours: 3**

Wind Energy Systems: Power in the wind - Rotor aerodynamics and efficiency - Power curve of wind turbines - Electric generators used with wind turbines – environmental impacts of wind turbines. Photovoltaic Systems: The solar resource - Types and characteristics of PV cells – Connection of PV cells, modules and arrays – Balance of system - Design of PV systems. Other Renewable Energy Resources: (e.g., Fuel cells - Wave energy – Hydro power – Tidal power – Concentrated Solar thermal systems) .

Prerequisites: EPR 341

Lecture Hours: 3 Exercise/Lab: 1

**EPR 421 Transmission & Distribution of Electrical Energy**

**Credit Hours: 3**

Representation of power systems, Types of transmission systems, Parameters of transmission lines: resistance, inductance and capacitance, Modeling of transmission lines: approximate and exact models, Performance of transmission lines: powers at sending and receiving ends, efficiency, voltage regulation, Distribution systems: layouts of distribution systems - voltage drop and power.

Prerequisites: EPR 263, MTH 212

Lecture Hours: 3 Exercise/Lab: 2

**EPR 431 High Voltage Engineering**

**Credit Hours: 3**

Advantages and limitations of using high voltages for transmission, Generation and measurement of high voltage for testing, Generation of impulse waves, The impulse generators, Specifications of high voltage laboratories, Insulators for transmission lines and substations, Insulator materials: Shapes and types, Factors affecting performance of insulators, Testing of insulators: Destructive and non-destructive insulation test5- electrical breakdown in gases, Ionization and attachment coefficients, Electro-negative gases, Electrical breakdown in liquids and solids. Corona discharge, Single and three-core cables, Electrical stresses in cables, High voltage equivalent circuits, High voltage cables, Thermal properties of cables, Earthing systems.

Prerequisites: EPR 341

Lecture Hours: 3 Exercise/Lab 2

**EPR 441 Electrical Machines**

**Credit Hours: 3**

Magnetic circuits. Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics, performance: efficiency and voltage regulation or speed regulation, speed control (for motors) and testing (experiments) and of each of the following machines: DC Machines, 1-ph Transformers, 3-ph Induction Motors, and 3-ph Synchronous Machines.

Prerequisites: EPR 341

Lecture Hours: 3 Exercise/Lab 2

**EPR 442 Actuators and Power Electronics**

**Credit Hours: 3**

Single phase induction motors, Two phase machines and applications in control systems, Special AC machines.

Power diodes, Power bipolar junction transistors, Thyristors, Rectifiers, Principles of power conditioning, Switching characteristics of power semiconductor devices, Computer simulation of power electronic circuits, Analysis, design, and applications of power converters.

Prerequisites: EPR 441

Lecture Hours: 3 Exercise/Lab: 2

**EPR 443 Sensors and Instrumentation**

**Credit Hours: 2**

Review of circuit theory: input-output relationships, transfer functions and frequency response of linear system, Operational amplifiers, Operational amplifier circuits using negative or positive feedback, Diodes operational amplifier circuits using diodes, Analog signal detection, Conditioning and conversion systems, Transducers and sensors, Difference and instrumentation amplifiers, Active filters.

Prerequisites: EPR 261

Lecture Hours: 2 Exercise/Lab: 2

**EPR 444 DC Machines & Transformers**

**Credit Hours: 4**

DC machines: Theory and design: Construction of DC machines, Armature windings, The generation of e.m.f., The magnetic circuit of the DC machine, Armature reaction, Commutation, Methods of excitation, Load characteristics of DC generators, Efficiency, Testing of DC generators. Force and torque, Load characteristics of DC motors, Efficiency, Testing of DC motors. Transformers: Theory and design: Fundamental concepts, Electric and magnetic circuits, Power transformers, Magnetizing current and core loss, Equivalent circuits, Transformers at load, Phasor diagrams, Efficiency, Voltage regulation, Transformers testing. Three phase transformers, Three phase transformer connections, Auto transformer.

Prerequisites: EPR 341

Lecture Hours: 3 Exercise/Lab: 3

**EPR 445 Induction machines**

**Credit Hours: 3**

3-ph Induction Motors: Construction, theory of operation, equivalent circuit, voltage, current, power and torque equations, Load (Torque/Slip) characteristics, Circle diagram, Starting methods, Speed control, Testing and experiments, and Double cage IM. 1-ph Induction Motors: Construction, theory of operation, equivalent circuit, voltage, current, power and torque equations, Load (Torque/Slip) characteristics, Starting methods, Testing and experiments.

Prerequisites: EPR 444
Lecture Hours: 3 Exercise/Lab 2

**EPR 451 Power Electronics 1**
**Credit Hours: 3**
Introduction to power electronics. Characteristics of Power electronics devices: Diodes, Thyristors, BJTs, MOSFETs, IGBTs. Power computation in power electronics circuits. Rectifier circuits: Single-phase rectifier circuits (uncontrolled and fully controlled), Single-phase rectifier circuits with free-wheeling diodes, Three-phase rectifier circuits (uncontrolled, and fully controlled).
Prerequisites: ELE 213
Lecture Hours: 3 Exercise/Lab: 1

**EPR 452 Power Electronics 2**
**Credit Hours: 3**
AC voltage controllers: Single phase AC voltage controllers (integral cycle control, phase angle control), Three phase AC voltage controllers with resistive loads. single-phase cycloconverter, DC-DC converters: Buck, Boost, Buck-Boost, Ćuk. Inverters: Square-wave single phase inverters (half bridge, full bridge), Pulse width modulation techniques, Three phase inverters.
Prerequisites: EPR 451
Lecture Hours: 3 Exercise/Lab 1

**EPR 473 PLC and Applications**
**Credit Hours: 3**
Introduction to classic control. Components of classic control systems and their applications. Examples of classic control circuits. Introduction to PLCs and their types. PLC hardware configuration. Input and output devices. Processing input and output modules, signal conditioning. Basics of PLC programming using ladder (LD), function block diagram (FBD), programming languages. Timers: types and programming. Counters: types and programming. Industrial Applications using PLCs, Introduction to networking systems and SCADA.
Prerequisites: CMP 334
Lecture Hours: 3 Exercise/Lab 1

**EPR 500 Graduation Project**
**Credit Hours: 0**
An engineering assignment requiring the student to demonstrate initiative and assume responsibility, the student will select a project at the end of the ninth semester, Students can propose their own project, A faculty member will provide supervision, A project report is required at the end of the tenth semester.
Prerequisites: As Advised
Lecture Hours: 0 Exercise/Lab: 4

**EPR 501 Graduation Project**
**Credit Hours: 4**
An engineering assignment requiring the student to demonstrate initiative and assume responsibility, the student will select a project at the end of the ninth semester, Students can propose their own project, A faculty member will provide supervision, A project report is required at the end of the tenth semester.
Prerequisites: As Advised
Lecture Hours: : 0 Exercise/Lab: 4

**EPR 511 Computer Applications in Electric Power Engineering**
**Credit Hours: 3**
Introduction to Computer applications in EPS, Load Frequency Control (LFC) and AGC of a single-area System: Modeling, Steady state response, Dynamic response and root-locus. AGC of a 2-area system: steady state equations, application of Simulink to simulate LFC problems. Under-frequency Load Shedding. Power System Bus Matrices: Branch& node admittances. Modifications of Ybus, Network Incidence matrix. Modification of an existing Zbus, Direct determination of Zbus, Fault analysis using Zbus, MATLAB application to solve fault problems. SCADA and Energy Management Systems.
Prerequisites: EPR 411
Lecture Hours: 3 Exercise/Lab: 1

**EPR 512 Power System Analysis 2**
**Credit Hours: 3**
Transients in electrical systems: Types of transients, Equivalent circuits of power system elements, Multi-machine linear systems, Maximum power and loading limit, Modeling of basic elements of electrical systems: Vector diagram representation, Simplified systems, Excitation and speed control systems, Block diagram representation, Simplified criteria of transient stability: Concept of transient stability, Equal area criterion, Numerical solutions of rotor electromechanical equation, Dynamic stability: Analysis of uncontrolled systems, Controlled systems, Power system stabilizers, Voltage stability of loads and power systems: Criteria of voltage stability, Voltage collapse in electrical power
Prerequisites: EPR 411
Lecture Hours: 3 Exercise/Lab: 1

**EPR 513 Utilization of Electrical Energy**
**Credit Hours: 3**
Electrical traction systems, Mechanical and electrical characteristics, Speed curves, Operations during electrical traction, Electrical traction motors, Modern control of traction motors. Illumination: Artificial illumination requirements and characteristics, Standard specifications, Types of lamps and luminaries, Illumination curves, Installation of lamps, Luminaries and connections, gas filled lamp ignition. Electric heating: Resistance wires, Electric furnaces, Induction heating. Electric welding of metals: Welding transformers and

generators, Arc welding, Spot welding. Electrolytic processes: Metal coating. Electric transportation: Cranes and hoists, Elevators and conveyor belts, Paper and

Prerequisites: EPR 444

Lecture Hours : 3 Exercise/Lab: 1

**EPR 514 Planning of Electrical Networks**

**Credit Hours: 3**

Load curves and load characteristics. Load forecasting: Linear and Quadratic Regression, Moving average and Exponential smoothing methods. Cost Analysis of Generation Systems and levelized cost of electrical energy. Distribution network reliability: Reliability Indices; SAIFI, CAIDI, SAIDI, ASAI. Reliability Analysis of Generation Systems: Capacity Outage Probability Table, Binomial Expansion, Recursive Algorithm, Loss of Load Expectation. Course Project.

Prerequisites: EPR 412

Lecture Hours : 3 Exercise/Lab Hours: 1

**EPR 531 Over-Voltages in Power Systems**

**Credit Hours: 3**

Introduction to types of over-voltages in power systems, EHV testing, HV measurements and laboratory equipment. Phenomenon of over-voltages in power systems.Over-voltages in EHV systems caused by switching operations & switching, Over-voltage protection. Lightning over-voltages: Lightning and lightning protection. Capacitance switching. Traveling waves: Wave equation, Reflection and refraction of the wave, wave propagation over lines and equipment, Theory of traveling waves and standing waves.Power-frequency and over-voltages frequency control.Electrostatic field of extra-high-voltage (EHV) lines. Factors contributing to line design. Design of EHV lines.

Prerequisites: EPR 431

Lecture Hours : 3 Exercise/Lab Hours: 1

**EPR 533 Power Quality**

**Credit Hours: 3**

Power Quality Fundamentals: Definition, Terminology, Criteria, Standards. Voltage Sags: Characteristics, Mitigation, Voltage Fluctuations and Lamp Flicker. Power Frequency Disturbance: Disturbances, Low Frequency Disturbances, Voltage Tolerance Criteria - ITIC Graph. Electrical Transients: Modeling, Types and Causes. Harmonics: Voltage and Current Harmonics, Individual and Total Harmonic Distortion. Power Factor: Power Factor Improvement, Advantages of Power Factor Correction. Measuring and Solving Power Quality Problems: Measurement Devices.

Prerequisites: EPR 431

Lecture Hours : 3 Exercise/Lab Hours: 1

**EPR 541 Synchronous machines**

**Credit Hours: 3**

Synchronous machines: Theory and design: Introduction, Cylindrical-rotor and salient-pole synchronous machines, Types of windings in ac machines, Winding coefficients, Generator performance, Motor performance, Phasor diagrams, steady state operation, Voltage regulation, Parallel operation, Synchronous machine to an infinite bus, Synchronization process, V curves, Power angle characteristics, Open circuit characteristics, Short circuit characteristics, Potier reactance, Zero-power-factor characteristic, Testing of synchronous machines.

Prerequisites: EPR 444

Lecture Hours: 3 Exercise/Lab 2

**EPR 542 Special Electrical Machines**

**Credit Hours: 3**

Theory of single-phase rotating machines; Doubly revolving field theory; Single- and two-phase induction motors, windings and connections. Methods of starting of single-phase induction motors: Split phase motors; Capacitor-start motors; Two-value capacitor motors. Shaded pole motors: Construction and operation. Universal motors. Control motors. Synchronous motors, variable speed drive system. Reluctance motors; Permanent magnet motors. Stepper motors. Brushless dc motors. Hysteresis motors. Linear motors. Selecting motors for required operations.

Prerequisites: EPR 541

Lecture Hours : 3 Exercise/Lab Hours: 1

**EPR 551 Electric Drives**

**Credit Hours: 3**

Characteristics of Motors & Loads, Equation of Motion, Four quadrants for drives systems, Speed control of DC motors: armature voltage control - armature resistance control - flux control, Braking of DC motors: plugging – regenerative braking – dynamic braking, Speed control of DC motors using rectifiers and DC choppers, Speed control of induction motors: voltage control - frequency control - V/f control - rotor resistance - slip power recovery, Braking of induction motors, Speed control of special motors.

Prerequisites: EPR 452, EPR 445

Lecture Hours: 3 Exercise/Lab 2

**EPR 571 Advanced Control of Power**

**Credit Hours: 3**

Central operations: Operation of power systems, Organization and operator activities, Control center experience, Supervisory and control functions: Data acquisition, Monitoring and event processing, Control functions, Reports and calculations, Man-machine communications: Operators duties, Mimic diagram functions, System structures: Subsystems, System classes, System interactions, Performance and reliability considerations: Performance criteria,

Software considerations, Hardware considerations, Databases, Technical realization: Central system, Communication system, Maintenance, Real time network modeling, Security, Training, Control system examples.
Prerequisites: EPR 512
Lecture Hours : 3 Exercise/Lab Hours: 1

**EPR 581 Protection & Switchgear in Electrical Power Systems**
**Credit Hours: 3**
Protection relaying philosophy and fundamental considerations, Transmission line protection, Short lines, Medium length lines, Long distance power transmission, Compensating distance relaying. Rotating machinery protection: Relay protection for ac generators, Loss of field relay operation, Power transformer protection, Relay input sources, Switchgear engineering: Circuit breakers, Types, Construction, Performance and ratings, Interruption of fault currents and arcs in circuit breakers, Circuit breaker test oscillograms, Circuit breakers synthetic and direct tests. Switching over-voltages, Resistance.
Prerequisites: EPR 431
Lecture Hours: 3 Exercise/Lab 2

**EPR 582 Applications in Protection & Switchgear Systems**
**Credit Hours: 3**
Fundamentals of Power System Protection. Instrument Transformers. Overcurrent Relays. Radial System Protection. Reclosers and Fuses. Distance Protection of Lines. Differential Relay. Differential Protection of Transformers. Fundamentals of Switching Operations. Transient Recovery Voltage. Circuit Breakers & Arc Extinction. Rated Characteristics of Circuit Breakers.
Prerequisites: EPR 581
Lecture Hours : 3 Exercise/Lab Hours: 1

**GEN 313 Report Writing and Presentation Skills**
**Credit Hours: 2**
Report importance, Types and requirements of technical reports, Report writing methodology, Requirements of technical language skills, Techniques of report organization, The use of computer in report presentation, Standard specifications of parts and components to insure production and performance security.
Prerequisites: -
Lecture Hours 2 Exercise/Lab 1

**GEN 401 Principles of Economics**
**Credit Hours: 2**
Fundamental economic concepts, applying the tools (graphs, statistics, equations).
Understanding of operations and institutions of economic systems.Basic economic principles

of micro and macroeconomics, international economics, comparative economics systems, measurement and method.
Prerequisites: -
Lecture Hours: 3 Exercise/Lab 1

**GEN 441 Law for Professional Engineers**
**Credit Hours: 2**
The legal system, Forms of business organizations, Tort law, The role of the professional, Contract law, The elements of a contract, Statute of frauds, Misrepresentation, Duress and undue influence, Mistake, Contract interpretation, Discharge of contract: Breach of contract and fundamental breach, Agreements between the client and engineer, General law, the Mechanics' Lien Act, Comparative discussion of the professional engineers act as it relates to the earlier statute, Intellectual property and industrial property.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab 1

**GEN 541 Environmental Impact of Projects**
**Credit Hours: 2**
Definition of the Environment and the different influencing factors. Human Influences of projects: Upgrading, development, economic factors, social factors, cultural factors, aesthetic factors, hygienic and psychological factors, Types of projects: Urban planning projects (residential projects, tourism projects, commercial projects, public buildings…etc.), Infrastructure projects (electricity plants, water supply and sewage networks, road networks, railroad networks, reservoirs, dams…etc.). different Industrial projects (textile factories, steel Industries, cement factories, carpet factories, ceramic factories, food factories, electrical appliances, car industries…etc.). Environmental impact of projects: Negative and positive impacts (direct and indirect). The assessment of projects both nationally and internationally in order to avoid the negative consequences of projects on the environment. The approved rates and criteria for the compatibility of projects with environmental topics.
Lecture Hours: 2 Exercise/Lab 1

**GEO 201 General Geology**
**Credit Hours: 2**
The course covers cosmology and Earth formation, mineralogy, different rock types, sedimentary processes, volcanoes, geologic time, plate tectonics and crustal deformation, earthquakes, surface processes of erosion, weathering in different geologic environments.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab 1

**GEO 301 Structural Geology**
**Credit Hours: 2**

The course gives a fundamental and thorough introduction to structures formed by brittle and ductile deformation. The structures will be discussed in terms of geometrical, kinematical, and mechanical analysis with emphasis on process understanding. Particular subjects that will be taught are: stereonet practice, stress and strain analysis, fractures and faults, folding, diapirism, shear zones, deformation mechanisms and rheology.
Prerequisites: MAN 233& Geo 201
Lecture Hours: 2 Exercise/Lab 1

**GEO 302 Depositional Systems**
**Credit Hours: 3**
Analysis and interpretation of seismic, Sea floor image, well logs (including borehole image logs), Core and outcrop characteristics of the component elements of deep water reservoirs and emphasizes internal architecture as related to reservoir performance. Geologic control on reservoir equality, new concepts in understanding transport and depositional processes, geologic modeling and deepwater petroleum systems.
Prerequisites: GEO 301
Lecture Hours: 3 Exercise/Lab 1

**GEO 401 Petroleum Geology**
**Credit Hours: 3**
Theory and practice of (mainly mining) geophysics. The basics of oil prospects, the acquisition, processing and interpretation of geophysical data, seismic stratigraphy,
Prerequisites: GEO 301
Lecture Hours: 3 Exercise/Lab 2

**GRA 141 Graphics 1**
**Credit Hours: 2**
Techniques and skills of engineering drawing, Normal and auxiliary projections. Solid geometry. Intersections between planes and solids.
Prerequisites: -
Lecture Hours: 1 Exercise/Lab 3

**GRA 142 Graphics 2**
**Credit Hours: 2**
Development, Sectioning, drawing and joining of steel Frames, Fasteners, Assembly drawing of some mechanical parts, Computer applications, Introduction to civil and architectural drawing.
Prerequisites: GRA 141
Lecture Hours: 1 Exercise/Lab 3

**HUM H02 History of Petroleum Industry**
Credit Hours: 2

An overview of the petroleum industry. The history of oil and gas in a variety of different petroleum technologies which includes the origins of oil and gas, petroleum exploration, reservoir performance, drilling, formation evaluation, production, transportation, marketing, and refining.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab Hours 0

**HUM H05 History of Science**
**Credit Hours: 2**
What is History? What is Science, Prehistoric Science and Technology, Human Origins and the Earliest Tools, Descent of Woman Quest for Fire, Prehistoric Science and Technology cont., Paleolithic Astronomy, Science in the Ancient Mediterranean World, ,Ancient Science and Medieval Science, Middle Eastern Science and the Islamic World, Eastern Science and Medicine, The Scientific Revolution, The Modern Cosmos

**HUM H09 Specific Computer Applications**
**Credit Hours: 2**
Computer systems, computer process, computer science, software engineer, professional and ethical responsibility, emergent system properties, measurements of system performance & productivity, organizations, people and computer systems, software models, CASE, computer project management, risk managements, concepts of IS, valuable information, classification of information systems, information technology, computer applications in engineering fields & industries.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab 0

**MAN 121 Production Technology**
**Credit Hours: 2**
Engineering materials: material structure and properties, metallic alloys and equilibrium diagrams, Metal forming: casting, forging, rolling, drawing, extrusion and spinning, Welding and riveting: soldering, brazing, electric arc welding, cold pressure and friction welding, electric resistance welding, spot, seam and projection welding, Metal cutting: hand tools and machining processes, centre lathe, shaper and drill, Measuring instruments, lengths and angles, specifications and standardization, Elements of production management systems and cost of production.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab 2

**MAN 221 Production Engineering 1**
**Credit Hours: 2**
Introduction to machining processes, Cutting elements, Cutting with single edge cutting tools, Cutting tool materials and its characteristics, Cutting velocity and feed, Machining

time, Power consumption in cutting, Practical machining operations: turning, shaping, drilling, Cutting with multi-edge, Cutting tools: milling, grinding, lapping, Simple dividing and dividing head, Basic elements of machine tools and specifications, Work fixation, Tool fixation, Process sheet, Machining time allowances, Cost elements, Break even point.
Prerequisites: MAN 121
Lecture Hours: 2 Exercise/Lab 2

**MAN 231 Properties of Materials**
**Credit Hours: 3**
Introduction to materials, Crystal structure of solids, Construction and use of phase diagrams in materials systems, Relationship of crystal structure to properties of metallic materials and their applications, Heat treatment of steels, Types of polymers: ceramics, glasses, and semi conducting materials and their applications, Internal reactions, load-stress relations and transformation of stresses for generally loaded rods, Generalized concepts of stress, strain and material relations, Energy methods, Elastic-plastic behavior of beams, Analysis of thin walled beams, Membrane theory of axisymmetric shells, Stress concentrations.
Prerequisites: PHY 131
Lecture Hours: 2 Exercise/Lab 2

**MAN 232 Stress Analysis**
**Credit Hours: 3**
Equilibrium, Continuity, Material mechanical behavior, Normal force, Shearing force, Bending and twisting moment diagrams, Stresses in simply loaded elastic bars: axial loading, bending and torsion, deformation, stiffness, strain Energy, Stresses in elastic and elasto-plastic bars, Residual stresses. Combined loading, Eccentric normal load, Oblique bending: combined bending and torsion, Two-dimensional stresses, Principal stresses, Maximum shear stress, Allowable stresses, Mohr's circle representation, Application to some simple frames, Thin-vessels, Springs, Load and displacement measurement.
Prerequisites: PHY 131
Lecture Hours: 2 Exercise/Lab 2

**MAN 241 Mechanical Engineering Drawing**
**Credit Hours: 2**
Computer aided drafting, Detailed working drawing, Dimensioning and geometrical tolerance symbols, Permanent joints details (riveting, welding, soldering ….), Fasteners, Threading, Drawing of standardized parts; bearings, gears, springs, Different assembly drawings (simple gear box, fixtures, vices, valves… etc).
Prerequisites: GRA 142
Lecture Hours: 0 Exercise/Lab 4

**MAN 301 Rock Mechanics**
**Credit Hours: 2**
Ability to bear stresses ,compressive strength, tensile strength, deformation response to stresses ,elastic moduli, Poisson’s ratio, principal stresses, in-situ stress regime, total-stress

and effective-stress, temperature effects, nature and origin of pore pressure, faulting and folding, tectonics, regional structural analysis, regional and localized stress, stresses around boreholes, overburden stress, horizontal stresses, mini-frac tests, formation testers, other pressure transient techniques, unconfined compression, triaxial compression, hydrostatic compression, poly-axial, multi-stage triaxial, direct tensile strength, indirect (Brazilian) tensile strength, direct shear, uniaxial strain (compaction), analastic strain recovery
Prerequisites: MAN 233
Lecture Hours: 2 Exercise/Lab 2

**MAN 311 Mechanical Mechanisms**
**Credit Hours: 3**
Kinematics Fundamentals: geometry of motion and mechanism topology, Linkage and mechanisms analysis of position, displacement, velocity, and acceleration (using graphical, analytical and computer-assisted methods), Cam-follower mechanisms: design and analysis, Standard cams and equivalent mechanisms, Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains, Kinetics fundamentals: force analysis of mechanisms, Applications to engine balancing machines, Applications and use of Computers (using Solid Works ) for Mechanism Simulation and Animation. Actuators and dynamic force specifications for embodiment design.
Prerequisites: MEC 221
Lecture Hours: 2 Exercise/Lab 2

**MAN 321 Fundamentals of Manufacturing Processes**
**Credit Hours: 2**
Fundamentals of metal casting, metal-casting processes and equipment, casting design, materials and economics. Powder-Metal processing and equipment. Metal Extrusion and drawing processes and equipment. Plastics and Composite Materials: Forming and shaping. Fusion-Welding Processes, brazing, soldering, adhesive-bonding, and mechanical-fastening processes, Finishing processes.
Prerequisites: MAN 221
Lecture Hours: 2 Exercise/Lab 1

**MAN 331 Structural Mechanics**
**Credit Hours: 3**
Displacement and deflections, Statically indeterminate structures, Energy methods applied to bar problems, Buckling of columns, Curved beams, Analysis of bars of thin walled sections in shear, Transverse shear, torsion, shear center, Analysis of axi-symmetric shells: thin walled cylinders, spheres, cones, discontinuity stresses, Introduction to structural analysis by matrix methods, Stresses in elastic structures with applications.
Prerequisites: MAN 232
Lecture Hours: 2 Exercise/Lab 2

**MAN 334 Mechanics of Deformable Solids**

**Credit Hours: 3**

Concept of equilibrium, Force analysis of structures and structural components, Equilibrium of deformable bodies, Stress and strain concepts, Stress-strain relationships, Stress analysis of prismatic members in axial, Shearing, Torsional and flexural deformations, Shear force and bending moment diagrams, A general treatment of the behavior of structural components from the study of stress and strain in solids, Topics include superposition, energy theorems, theories of failure, elastic and inelastic analysis of symmetrical bending.

Prerequisites: MAN 331

Lecture Hours: 3 Exercise/Lab 1

**MAN 341 Mechanical Design 1**

**Credit Hours: 3**

Introduction to Mechanical Engineering Design. Design Philosophy and Methodology: Phases of design process, design considerations, standards and codes. Engineering materials; classification, specification and selection.Factors affecting construction details, manufacturing and assembly processes, safety, aesthetics and economy. Design of Mechanical Elements: Shafts and shaft- components, Screws, fasteners, design of non-permanent joints, welding and design of permanent joints. Thin pipes and pressure vessels Application of CAD and Solid Works Group design project.

Prerequisites: MAN 232, MAN 241, MAN 311

Lecture Hours: 2 Exercise/Lab 2

**MAN 350 Industrial Automation (CAD/CAM)**

**Credit Hours: 2**

Computer assisted manufacturing systems NC, CNC, DNC, robotics, material handling, group technology, flexible manufacturing systems, process planning and control. Scope and utilization of CAM- data bases needed for manufacturing – languages- for CAM- integration between CAD and CAM- software and applications. How to implement the right industrial robot system for a plant.

Prerequisites: CMP 132, MAN 221

Lecture Hours: 2 Exercise/Lab 1

**MAN 380 Modeling and Simulation**

**Credit Hours: 2**

Mathematical models for mechanical, pneumatic, electrical, hydraulic, and mechatronic systems in the time domain for single and multivariable systems; Laplace and state space formulation Continuous, discrete, and combined system models; Hardware-in-the-loop simulation and rapid prototyping of real-time electromechanical systems; Mat Lab, SimMechanics, Simulink, etc. are used to build models and virtual prototypes.

Prerequisite: MTH 311

Lecture Hours: 2 Exercise/Lab 2

**MAN 381 Engineering Economics**
**Credit Hours: 2**
Introductory finance: time value of money, cash flow analysis, and Investment evaluation methods: present worth, annual worth and internal rate of return, Depreciation models and asset replacement analysis, the impact of inflation, Bonds and Breakeven analysis.
Prerequisites: -
Lecture Hours: 2 Exercise/Lab 1

**MAN 441 Mechanical Design 2**
**Credit Hours: 3**
Design of Mechanical Elements: Gears (spur, helical, bevel and worm gears). Clutches, Brakes, Couplings, Flywheels.Design of Flexible Mechanical Elements (Belts, Chains, Flexible shafts). Mechanical springs, Power transmission, Bearings (Rolling-contact bearing, journal Bearing). Case studies, Use of interactive computer programs for problem solving, Group design project.
Prerequisites: MAN 341
Lecture Hours: 2 Exercise/Lab 2

**MAN 481 Quality Control**
**Credit Hours: 2**
Fundamentals of Statistical Quality Control; Frequency Distributions; Measures of Central Tendency; Dispersion and Shapes; Probability Distributions: Binomial, Poisson and Normal. Control Charts: Introduction, Attribute Control Charts and Variable Control Charts. Process Capability Analysis; Acceptance Sampling: Introduction; Sampling Plans and Techniques: Single, Double, Multiple and Sequential Sampling Plans.
Prerequisites: MTH 312
Lecture Hours: 2 Exercise/Lab 1

**MAN 515 Electromechanical Design**
**Credit Hours: 3**
Design of mechanical motion transmission systems: gearing, couplings, belts and lead-screws, Sensing and measurement of mechanical motion, Sensor selection, Electromechanical actuator selection and specification, sequential controller design, Digital I/O, Case studies.
Prerequisites: MAN 441, EPR 340
Lecture Hours: 2 Exercise/Lab 2

**MAN 547 Reverse Engineering in Mechanical Design**
**Credit Hours: 2**
Effect of reversing engineering in mechanical design, Reversed engineering Process, Contact and non-contact 3-D scanning, Procedure for geometric modeling, Fitting of standard and free form surfaces, Identification of other design parameters, Transfer of geometric data to

CAD/CAM systems.
Prerequisites: MAN 341
Lecture Hours: 2 Exercise/Lab 1

**MAN 570 Mechanisms Computer Aided Design**
**Credit Hours: 2**
Synthesis of planar and spatial mechanisms. Computer based analysis of kinematics and dynamics of mechanisms. Mechanisms simulation tools and its merits and limitations. Mini-project on modeling and simulation of a practical case.Overview of rapid and virtual prototyping software tools.
Prerequisite: CMP 132, MAN 341
Lecture Hours: 2 Exercise/Lab 1

**MAN 592 Project Management**
**Credit Hours: 2**
Project Management definition, Modeling of projects, Tasks and sub tasks as activity networks, Principles and practices of critical path methodology under conditions of certainty (CPM) and uncertainty (PERT), Integration Management, Scope Management, Time Management, Cost Management, Communication Management, Quality Management, Procurement Management, Human Resource Management, Risk Management. Extensive use of computer programs in managing.
Prerequisites: -
Lecture Hours: 2 Exercise/Lavb 1

**MEC 121 Mechanics 1**
**Credit Hours: 2**
Applications on space vectors, Resultant of forces, Moment of a force, Equivalent couples, Equivalent systems, Equations of equilibrium of a rigid body, Types of supports, Equilibrium of plane systems (Trusses and frames), Equilibrium of space systems acting on rigid bodies, The mass center of a system of particles and laminas of different shapes, The mass moment of inertia of system of particles and laminas.
Prerequisites:
Lecture Hours: 2 Exercise/Lab 2

**MEC 122 Mechanics 2**
**Credit Hours: 2**
Displacement, Velocity and Acceleration of a particle, Use of Cartesian coordinates to describe particle motion, Projectiles, Particle motion on straight paths, Trajectory equations, Rectangular and polar axes, Relative motion of two particles. Newton's law of motion, Resistive media, Rocket motion as an application on variable mass particles, Simple harmonic motion of a particle, Motion on circular path, Principle of work and Kinetic energy, Conservative forces, Principle of conservation of mechanical energy, Principle of impulse

and momentum.
Prerequisites: MEC 121
Lecture Hours: 2 Exercise/Lab 2

**MEC 221 Dynamics of Rigid Bodies (Mech. 3)**
**Credit Hours: 3**
Types of planar motion of rigid body (R.B.), Angular velocity and velocity relation, Angular acceleration and acceleration relation, Equations of General planar motion of a R.B., Translational motion, Motion about a fixed axis, and General motion including friction, Principle of work and kinetic energy, Conservative forces and principle of conservation of mechanical energy, Linear and angular impulse, Principles of impulse and momentum, Impulsive forces, Inelastic and eccentric impact, Free undamped vibrations of R.B., Damped free vibrations, Forced damped and undamped vibrations of R.B.
Prerequisites: MEC 122
Lecture Hours: 2 Exercise/Lab 2

**MKT 411 Mechatronics**
**Credit Hours: 3**
Mechatronics system configuration; Modeling of mechanical translational and rotational systems; Mechanisms systems; Mechanical and electrical actuators; Pneumatic and hydraulic systems; Sensors and encoders; Data acquisition and signal conditioning; Computer-aided drawing (CAD) and interpretation of 3-D technical drawings; Mini project to design, model, implement, and test a mechatronics system.
Prerequisites: ELE 216, EPR 266
Lecture Hours: 2 Exercise/Lab 2

**MKT 412 Mechatronics System Design**
**Credit Hours: 3**
Introduction to Mechatronics system design; VDI design guideline for mechatronics system design; Basic control logic; Controller design for mechatronics systems using logic controllers, microcontrollers, PC-based controller, and PLCs; Embedded microprocessor system and control; Design of sensors and power transmission systems; Two projects to design a prototype mechatronic device.
Prerequisites: MKT 411
Lecture Hours: 2 Exercise/Lab 2

**MKT 440 Programmable Logic Controllers (PLCs)**
**Credit Hours: 2**
Basic Programmable logic controllers (PLCs) functions and programming; Relay and ladder logic; PLC programming and interfacing; PLC installation practices and troubleshooting techniques; Strategies to identify and localize PLC hardware generated problems; PLC Safety Procedures; PLCs in mechatronics systems; Mini design projects.

Prerequisite: ELE 216
Lecture Hours: 2 Exercise/Lab 1

**MKT 471 Robot Mechanics**
**Credit Hours: 3**
Robotics overview and applications; Robot sensors and actuators; Robotics technology and systems; Kinematics modeling: spatial representations and transformations; DH and homogeneous transformations. Forward and inverse kinematics; Jacobian for velocities and static analysis; Problem solving using up-to-date standard S/W robotics tools (MATLAB®); implementing the right industrial robotics system for a plant.
Prerequisites: MAN 311
Lecture Hours: 2 Exercise/Lab 2

**MKT 472 Robot Control**
**Credit Hours: 3**
Path and trajectory planning; Manipulator dynamics; Independent joint control; Force control; Geometric nonlinear control; Computer vision; Visual servo control; Fuzzy control; Robot control system design; Problem solving using up-to-date standard S/W robotics tools (MATLAB®).
Prerequisite: MKT 471
Credit Hours: 3 Lecture Hours: 2 Tutorial/Lab 2

**MKT 500 Graduation Project I**
**Credit Hours: 2**
Conceptual Design: Students follow systematic design approach, apply project planning and scheduling techniques, devise analytical, computational and/or experimental solutions, and design and build their own test-rig. Students attend technical seminars and learn to interact with speakers and at the end of the semester; they are required to present a seminar on the project status, progress and future work.
Prerequisites: Departmental Approval, Senior Standing
Lecture Hours: 0 Exercise/Lab 4

**MKT 501 Graduation Project II**
**Credit Hours: 4**
Lecture Hours 0 Exercise/Lab 4
Capstone Design: Participating students continue the work on the topic selected in MKT 500. Students are required to present their findings at the end of the project in the form of a seminar as well as a written formal report. Capstone Projects are intended to be intensive, active learning projects, requiring significant effort in the planning and implementation, as well as preparation of a substantial final written work product. Students should utilize faculty resources and seek consultations from faculty expertise to get a clear answers about what the project will entail and how it will be implemented.

Prerequisites: MKT 500
Lecture Hours 0 Exercise/Lab 4

**MKT 505 Sensors and Signal Conditioning**
**Credit Hours: 2**
Analog Signal Conditioning, Digital Signal Conditioning, Temperature Sensors. Mechanical Sensors, Optical Sensors, Ultrasonic Sensors, Fiber Optic Sensors
Prerequisites: EPR 266
Lecture Hours 2 Exercise/Lab 1

**MKT 507 Introduction to Micro- Electro Mechanical Systems (MEMS)**
**Credit Hours: 2**
Overview of micro-systems, common micro-systems and their working principles, mechanical modeling and simulation of MEMS, scaling laws in miniaturization, material for MEMS and micro-systems, mechanical design of micro devices, mechanical packaging of micro devices, overview on micro-systems fabrication processes.
Prerequisites: MAN441
Lecture Hours: 2 Exercise/Lab 1

**MKT 510 Vibration Principles and Monitoring**
**Credit Hours: 2**
Introduction to Vibration, Practical Application and major applications, Vibration Principles, Vibration Control, Vibration Isolation, Fault detection techniques, Vibration as a Fault detection and diagnosis technique, Vibration Measurements and analysis, use of Vibration as a machinery condition monitoring.
Prerequisites: MEC 221
Lecture Hours 2 Exercise/Lab 1

**MKT 590 Smart systems**
Credit Hours: 2
Macromechanical modeling of smart materials including Piezo-electric, Piezo-resistive, Piezo-restrictive, Magneto-strictive, Magneto-resistive, Shape Memory Alloys, Magnetically Activated Shape Memory Alloys, Active Fiber Composites, Electro and Magneto-Rheological Fluids, Smart Gels and Shape Memory Polymers. Design of smart dynamic systems such as Fast response valves, High-power-density hydraulic pumps, Active bearings for reduction of machinery noise, Footwear, Sports equipment, Precision machining, Vibration and acoustic sensors, Dampers, etc.
Prerequisites: As Specified by Department
Lecture Hours 2 Exercise/Lab 1

**MKT 599 Special Topics in Mechatronics**
**Credit Hours: 2**

Selected topics that meet student interests and reflects recent trends in one of the fields of mechatronics engineering.
Prerequisites: As Specified by Department
Lecture Hours 1 Exercise/Lab 3

**MPR 243 Thermodynamics and Fluid Mechanics**
**Credit Hours: 3**
Thermodynamics: macroscopic approach to energy analysis, energy transfer as work and heat, and the first law of thermodynamics, Properties and states of simple substances, Control-mass and control-volume analysis, The essence of entropy and the second law of thermodynamics, Fluid dynamic: fluid properties, similarity of fluid flows, conservation equations, conservation of mass-momentum, Newton second law, energy conservation of mechanical energy (Bernoulli Equation), Application: flow through pipes: laminar and turbulent flow, Pipes connected in series or in parallel, branching of pipes, Measuring devices, Mathematical models.
Prerequisites: PHY 131
Lecture Hours 3 Exercise/Lab 2

**MPR 251 Engineering Thermodynamics**
**Credit Hours : 4**
Introduction; Fields of application, Fundamental concepts and definitions, Thermo-dynamics Systems; System Classification, Properties and State Processes and Cycles, Properties of a Pure substance; Vapor - Liquid - Solid - Phases of Pure substance, Ide-al gas relations, Work and Heat; definitions; kinds of work, Heat transfer modes, The first law of thermodynamics; closed system analysis; Control - Volume analysis and applications, Transient Process analysis, The second law of Thermodynamics, Heat engines and Refrigerators, Carnot cycle, reversed cycles, irreversibility and availability, mixtures of gases.
Prerequisites : PHY 132
Lecture Hours 3 Exercise/Lab 3

**MPR 252 Fluid Mechanics**
**Credit Hours: 4**
Basic properties of fluids and fundamental concepts; Statics of fluids; Hydrostatic forces and buoyancy; Fluid kinematics; Characterization of fluid flow; Basic equations: conservation of mass; momentum and energy; Bernoulli's equation; Energy Equation Applications; Momentum equation. Laminar and Turbulent flow in ducts and pipes and their applications. External flow; Lift and Drag forces. Basics of dimensional analysis and dynamic similarity.
Prerequisites : MEC 122 , PHY 131
Lecture Hours 3 Exercise/Lab 3

**MPR 321 Measurements and Measuring Instruments**
**Credit Hours : 2**

Basic concepts and analysis of experimental data, Electrical measurements and sensing devices, Measurements of pressure and flow rates, Measurements of temperature and thermal transport properties, Measurements of force, torque, strain, displacement, length, and area.

Prerequisites : MPR 251, MPR 252

Lecture Hours 2 Exercise/Lab 1

**MPR 355 Thermal Power Systems**

**Credit Hours: 3**

Introduction to thermal power systems; properties of working fluids, governing laws and basic types. Air standard cycles theory and applications; petrol engine, diesel engine and gas turbine engine. Vapor power cycles; combined cycles and cogeneration. Jet propulsion. Non-conventional power systems. Construction of reciprocating engines. Classifications of internal combustion engines and their operating characteristics.

Prerequisites: MPR 251

Lecture Hours 2 Exercise/Lab 2

**MPR 451 Heat Transfer**

Credit Hours: 3

Mechanisms of heat transfer, steady heat conduction in plane walls, Thermal resistance concept, thermal resistance network. Thermal contact resistance. Heat conduction in cylinders and spheres. Critical radius of insulation. Heat transfer from fins. Optimum thickness of insulation. Transient heat conduction. Forced convection: on flat plate, cylinders, spheres and inside pipes. Basics of heat radiation. Heat exchangers: types, fouling and analysis.

Prerequisites: MPR 251

Lecture Hours 2 Exercise/Lab 2

**MPR 456 Heat Transfer**

**Credit Hours: 3**

Mechanisms of heat Transfer, Steady heat conduction in Plane wall, Thermal resistance concept, thermal resistance networks, Thermal contact resistance. Heat conduction in cylinders and spheres.Critical radius of Insulation. Heat transfer from fins. Optimum thickness of Insulation.Transient heat conduction.Forced convection: on flat plate, cylinders, spheres and inside pipes.Basics of heat radiation. Heat exchangers: types, fouling and analysis.

Prerequisites: MPR 251

Lecture Hours 2 Exercise/Lab 2

**MPR 459 Fluid Systems Control**

**Credit Hours: 3**

Basic characteristics, analysis and design of hydraulic and pneumatic Systems; Control devices; Directional, pressure and flow control valves; Motion control: pneumatic, hydraulic and electro-mechanical actuation systems; Pneumatic and hydraulic motors; Pneumatics and electro-pneumatics circuits; Fans and compressors; Power transmission and power amplification Sequence diagram; Applied circuits for direct and indirect control.
Prerequisites: MPR 252
Lecture Hours 2 Exercise/Lab 2

**MPR 466 Heating, Ventilation and Air Conditioning**
Credit Hours: 2
History and fundamentals of refrigeration, Refrigeration cycles and applications, Refrigerants and environment, Properties of air by Psychometric chart and equations, Air conditioning processes, Air conditioning load analysis and calculations, Air Conditioning Systems: DX systems, Chilled water Systems, Evaporative cooling systems. Heating Systems: Fired Equipment, Solar Heating. Ventilation: Air Handling Units, Coils, Fans, Ducts, Diffusers.
Prerequisites: MPR 252, MPR 451
Lecture Hours 2 Exercise/Lab 1

**MPR 555 Energy Conversion systems**
Credit Hours: 3
The world energy crises from engineering perspective; Energy resources, reserves and environmental impacts. Principles and technologies of conventional energy conversion systems; fossil fuels plants, nuclear power and hydro power systems. Potential and characteristics of renewable energy systems; solar thermal power, photovoltaics, wind energy, sea water and OTEC systems, geothermal plants, biomass and fuel cells. Development of energy storage technologies.
Prerequisites: MPR 355
Lecture Hours 2 Exercise/Lab 2

**MPR 561 Plant Engineering and Maintenance**
**Credit Hours: 2**
Introduction to Plant Engineering in industrial application; Definition of Modern maintenance and its objectives; Maintenance Types and Strategies used in Modern Industries; Economic considerations in Plant Engineering and Maintenance; Condition-Based Maintenance (CBM); Computer Maintenance Management Systems (CMMS).
Prerequisites: MAN 341
Lecture Hours 2 Exercise/Lab 1

**MPR 563 Pollution Control**
**Credit Hours: 2**
Classification of sources and effects of pollution especially those which are related to mechanical power engineering (air pollution, noise and work environment pollution, thermal pollution, pollution of water resources, pollution of solid wastes), Global environmental pollution problems, Methods for controlling different types of pollution, Standard specifications for clean environment.

Prerequisites: MPR 251
Lecture Hours 2 Exercise/Lab 1

**MTH 111 Differentiation with Applications and Algebra (Math. 1)**
**Credit Hours: 3**
**Calculus**: Derivatives with all rules, Trigonometric functions and their derivatives, Definitions, properties, derivatives of transcendental functions. Hyperbolic and inverse hyperbolic functions. Application of derivatives: Extreme of functions and Curve sketching, Differentials and linear Approximation, Chain Rule and Implicit differentiation, Indeterminate forms and L'Hopital's rule, Derivatives in parametric functions.
**Algebra**: Definitions and properties of determinant and matrices; System of Linear equations, Eigen values and Eigenvectors of a matrix with applications, Gauss elimination method. Theory of nonlinear equations Numerical methods: Iteration methods, Newton's and modified Newton's method, Secant method.
Prerequisites:
Lecture Hours : 3 Exercise/Lab Hours: 2

**MTH 112 Integration with Applications and Analytical Geometry (Math. 2)**
**Credit Hours: 3**
**Calculus:** Indefinite integrals and Change of variables. Definitions, properties and evaluation of definite integrals. Techniques of integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integral of rational functions, Quadratic expressions and substitutions, Integration by reduction. Applications of definite integral: Area, Volume, Arc length in parametric, Surface area of solid revolution, Integrals in parametric functions, Polar coordinates and their applications.
**Analytical Geometry**: Definitions and properties of conic sections, Translation and rotation of axes, Planes and lines in space, Cylindrical and spherical coordinates, Surface of second degree.
Prerequisites: MTH 111
Lecture Hours : 3 Exercise/Lab Hours: 2

**MTH 211 Functions of Several Variables and Ordinary Differential Equations (Math. 3)**
**Credit Hours: 3**
Functions of several variables: Limits, Continuity and partial derivatives, Tangent planes and normal lines, Chain rule, Extrema and Constrained Extrema, Taylor and Maclaurin expansion. Vector analysis: Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Multiple integrals: Double integral in Cartesian and Polar coordinates, Triple integrals, Jacobians, Line integral, Green's theorem, Gauss's theorems, Stokes's theorems. **Ordinary differential equations**: Equations of first order, Separable, Homogenous, Exact, Linear, Bernoulli. Equations reducible to first order, High order linear equations, System of linear differential equations,
Prerequisites: MTH 112
Lecture Hours : 3 Exercise/Lab Hours: 2

**MTH 212 Transformations and Numerical Analysis (Math. 4)**
**Credit Hours: 3**
Laplace transformation: Properties and theorems, Inverse transform, Solution of Ordinary differential equations and integral equations, Heaviside function and related theorems, Periodic functions and Dirac delta functions, Applications. Fourier series and transform: Usual and arbitrary period, Fourier series of odd and even functions, applications. **Numerical Analysis**: Systems of linear and nonlinear algebraic equations, Ordinary differential equations : Euler, Modified Euler and Runge- Kutta methods , Least square methods and Interpolation.
Prerequisites: MTH 211
Lecture Hours : 3 Exercise/Lab Hours: 2

**MTH 214 Applied Statistics**
**Credit Hours : 2**
Bearing in mind modern computing systems and concentrating on the different civil engineering applications, the course will address: Reviewing methods of data presentation and analysis and the important statistical measures, Probability distributions and their applications, Sampling methods, Sample and population measures (point estimate), Tests of hypothesis and confidence limits, Correlation and regression analysis.
Prerequisites : MTH 112
Lecture Hours 2 Exercise/Lab 2

**MTH 311 Complex Variable and Special Functions (Math. 5)**
**Credit Hours: 3**
Functions of a **complex variable**: Elementary functions, Analyticity, Cauchy Riemann equations, Complex integrals, Taylor and Laurent series, Evaluation of real integrals by residues. Conformal mappings.**Special functions**: Gamma and Beta functions, Bessel functions, Legendre polynomials, Bessel and Legendre series. Partial differential equations: D'fflambert solution of wave problem, Separation of variables for heat and wave, Laplace's equations in different systems of coordinates. Finite difference method for solutions of partial differential equations.
Prerequisites: MTH 211
Lecture Hours 3 Exercise/Lab 2

**MTH 312 Probability and Statistics (Math. 6)**
**Credit Hours: 3**
Probability: Definitions and concepts, Conditional probability, Statistical independence and Baye's theorem, Discrete and continuous random variables, Distribution functions, Probability distributions functions: Normal distribution, Binomial distribution, Poisson distribution. Joint distributions and moments. **Applied** Statistics: Reviewing methods of data presentation and analysis and the important statistical measures, Sampling methods, Sample and population measures (point estimate), Tests of hypothesis and confidence intervals,

Correlation analysis, Regression analysis.
Prerequisites: MTH 211
Lecture Hours 3 Exercise/Lab 2

**MTH 311 Complex Variable and Special Functions**
**Credit Hours : 3**
**Statistics :**Introduction to statistical experimentation and research methods. General concepts of estimation, and inferences. Systematic coverage of the more widely used statistical methods, including simple and multiple regression, single factor and multifactor analysis of variance, multiple comparisons, goodness of fit tests, contingency tables, nonparametric procedures, and power of tests.
**Probability:** Definitions and concepts, Conditional probability, Statistical independence and Baye's theorem, Discrete and continuous random variables, Distribution functions, Probability distributions: normal, binomial, Poisson,…, Joint distributions and moments. Finite difference method for solutions of partial differential equations.
Prerequisites : MTH 212
Lecture Hours 3 Exercise/Lab 2

**PE 201 Introduction to Petroleum Engineering**
**Credit Hours : 2**
The course's main goal is to provide the student with an overview of the petroleum industry: its history, its technical achievements, its role in the global-economy and its future prospects. A brief introduction to modern exploration, production and processing operations is included.
Prerequisites : -
Lecture Hours 2 Exercise/Lab 0

**PE 202 Introduction to Oil Well Drilling**
**Credit Hours : 2**
Introduction to the fundamentals of oil and gas well drilling. Fundamental physical principles and calculations used in drilling. Exposure to oil well drilling training software.
Prerequisite: PE 201
Lecture Hours 2 Exercise/Lab 1

**PE 301 Properties of Petroleum Fluids**
**Credit Hours : 3**
Physical properties of petroleum fluids; chemical components of petroleum fluids.Elementary phase behavior; calculations of the physical properties of gases, liquids, and gas-liquid mixtures in equilibrium.
Prerequisites : CHM 151
Lecture Hours 3 Exercise/Lab 2

**PE 302 Reservoir Rock Properties**
**Credit Hours : 3**
Basic petrophysical properties of reservoir rocks including porosity, permeability, fluid saturation, electrical conductivity, capillary pressure, and relative permeability. Laboratory measurement of the reservoir rock characteristics mentioned above.
Prerequisites : PE 201& PE 202
Lecture Hours 3 Exercise/Lab 2

**PE 303 Petroleum Reservoir Engineering**
**Credit Hours : 3**
Properties of reservoir formations and fluids; reservoir volumetrics, reservoir statics, reservoir dynamics. Darcy's law and the mechanics of single and multiphase fluid flow through reservoir rock, capillary phenomena, material balance, reservoir drive mechanisms.
Prerequisites : PE 301& PE 302
Lecture Hours 3 Exercise/Lab 2

**PE 304 Petroleum Reservoir Laboratory**
**Credit Hours : 1**
Core analysis determination of intensive properties of crude oil and its products; equipment and methods used to obtain petroleum reservoir information.
Prerequisites : PE 301
Lecture Hours 0 Exercise/Lab 2

**PE 305 Drilling Engineering I**
Credit Hours : 3
Systems of units, down hole pressure and temperature relations, drill string design, hosting, rotary drilling bits (cone bits, PDC bits, diamond bits), bit selection, mud engineering (functions, types, properties, calculations and conditioning), rig hydraulics.
Prerequisite PE 202
Lecture Hours 3 Exercise/Lab 2

**PE 306 Petroleum Refining Engineering**
**Credit Hours : 1**
Crude oil fractionation, Details of the design of Atmospheric and Vacuum distillation Columns, Basic petroleum fractions from AD/AV complex, Refinery Gases, Gasoline Specifications and use in Internal Combustion Engines, ignition quality of gasoline, Pre-ignition and Detonation, Mechanism of Detonation, Naphtha Specification and uses, Aviation Turbine Fuel, Kerosene specifications ( uses and production of Linear Alkyl Benzene LAB), Gas Oil and Diesel Fuel, Fuel oil and Asphalt specifications and uses, Wax distillates production, Manufacture of lubricating oils, Theory of friction and Lubrication, Manufacture of grease, Complex refinery schemes for processing of Natural Gas and crude oil, dehydration, desulphurization, Cracking and reforming Operations.

Prerequisite -
Lecture Hours 1 Exercise/Lab 1

**PE 401 Natural Gas Engineering**
**Credit Hours : 3**
Gas reserves estimation, deliverability, and future production performance prediction. Deliverability testing of gas wells including isochronal, flow after flow, drawdown and buildup. Gas field development and underground storage.Gas production metering gauging and transmission.
Prerequisites : PE 303
Lecture Hours: 3 Exercise/Lab: 2

**PE 402 Drilling Engineering II**
**Credit Hours : 3**
Pore pressure, fracture gradient, casing seat selection, casing design, cementing, well completion, factors affecting rate of penetration, hole problems, directional holes, fishing.
Prerequisites : PE 305
Lecture Hours: 3 Exercise/Lab: 2

**PE 403 Advanced Petroleum Reservoir Engineering**
**Credit Hours : 3**
Quantitative study of oil production by natural forces, gas cap, water influx, solution gas, etc.; material balance equations, study of gas, non-retrograde gas condensate, and black oil reservoirs.Predictive calculations of oil recovery from different reservoir types.
Prerequisites: PE 202& PE 303
Lecture Hours: 3 Exercise/Lab: 2

**PE 404 Well Testing Analysis**
**Credit Hours : 3**
Causes of low well productivity; analysis of pressure buildup tests, drawdown tests, multirate tests, injection well fall off tests, and open flow potential tests; design of well testing procedures.
Prerequisites : PE 303
Lecture Hours 3 Exercise/Lab 2

**PE 405 Well Performance and Production Systems**
**Credit Hours : 3**
Introduction to the producing wellbore system; inflow performance relationships, effect of formation damage on well flow, nodal systems analysis; perforating methods and their effect on inflow; stimulation treatments to enhance well performance. Introduction to well completions, diagnostics and well servicing.Overview of production systems.
Prerequisites : PE303
Lecture Hours 3 Exercise/Lab 2

**PE 406 Well logging**
**Credit Hours : 3**
An introduction to the electrical, nuclear, and acoustic properties of rocks: theory and interpretation of conventional well logs.
Prerequisites : PHY 231
Lecture Hours: 3 Exercise/Lab: 2

**PE 407 Finite Element Analysis with Applications in Petroleum Engineering**
**Credit Hours : 4**
This course introduces finite element analysis (FEA) methods and applications of subsurface engineering. The course is intended to provide a fundamental understanding of FEA software and experience in creating meshes for petroleum reservoirs or other subsurface features.
Prerequisites : PE 303 & GEO 401
Lecture Hours 4 Exercise/Lab 2

**PE 408 Subsurface Production Engineering**
**Credit Hours : 3**
Study of the fundamentals and applications of completion and workover operations including various completion designs, reservoir and mechanical considerations, basic tubing design, subsurface equipment, completion and workover fluids, perforating, stimulation, sand control and remedial cementing. Horizontal well completion technology. Laboratory sessions involve actual completion and workover problem solving, and demonstration of the design and operation of basic completion and control equipment.
Prerequisites : PE 402
Lecture Hours: 3 Exercise/Lab 2

**PE 501 Petroleum Engineering DesignProjects**
**Credit Hours : 3**
Senior capstone design project(s) based on industry data. Application of reservoir engineering: drilling and production engineering principles to evaluate and solve an industry problem such as a new field development, evaluation of an existing reservoir asset, or analysis of field re-development.
Prerequisites : PE 303& PE 405
Lecture Hours 3 Exercise/Lab 2

**PE 502 Mechanical Earth Modeling**
**Credit Hours : 3**
Development of the Mechanical Earth Model's principle components(MEM), formation in-situ stress and strength. 1-D modeling methods are reviewed and extended to 3-D; and the integration of MEM with well design is shown. An MEM model will be created and compared to actual field results.
Prerequisites : PE 406
Lecture Hours 3 Exercise/Lab 2

**PE 503 Secondary Recovery Of Petroleum**
**Credit Hours : 3**
Oil recovery by water injection.Effects of wettability, capillary pressure, relative permeability, mobility ratio on displacement, sweep, and recovery efficiencies.Piston-like and Buckley-Leverett models.Fractional flow and frontal advance equation.Oil recovery prediction methods for linear and pattern water floods in single and multi-layered reservoirs.
Prerequisites : PE 303 & PE 304
Lecture Hours 3 Exercise/Lab 2

**PE 504 Artificial Lift**
**Credit Hours : 2**
This course is a study of artificial lift methods used to produce liquids (oil/water) from wellbores. Methods covered include sucker rod (piston) pumps, electric submersible pumps, gas lift, hydraulic lift and plunger lift.
Prerequisites : PE 405
Lecture Hours 2 Exercise/Lab 1

**PE 505 Petroleum Economics and Asset Valuation**
**Credit Hours : 2**
Uncertainty in the estimation of oil and gas reserves; tangible and intangible investment costs; depreciation; evaluation of producing properties; federal income tax considerations; chance factor and risk determination. Petroleum economic evaluation software is introduced.
Prerequisites : PE 303
Lecture Hours 2 Exercise/Lab 2

**PE 506 Offshore Petroleum Technology**
**Credit Hours : 3**
An introduction to the development of oil and gas fields offshore, including offshore leasing, drilling, well completions, production facilities, pipelines, and servicing. Subsea systems, and deepwater developments are also included.
Prerequisites : PE 305 & PE 405
Lecture Hours 3 Exercise/Lab 2

**PE 507 Graduation Project**
**Credit Hours : 3**
An engineering assignment requiring the student to demonstrate initiative and assume responsibility, Students can propose their own project, A project report is required at the end of the tenth semester
Prerequisites : -
Lecture Hours 0 Exercise/Lab 9

**PE 508 Fundamental Digital Applications in Petroleum Engineering**

Credit Hours : 3

Applications of Windows-based Visual Basic solutions to engineering problems including selected topics in fluid flow, PVT behavior, matrices in engineering solutions, translating curves to computer solutions, predictor-corrector material balance solutions, and graphical display of results.

Prerequisites : -

Lecture Hours 3 Exercise/Lab 2

**PE 509 Advanced Drilling Technology**

Credit Hours : 3

In depth studies of directional well planning and bottom hole assemblies, hole problems and wellbore stability in deviated wells; computer aided drilling optimization and drill bit selection for directional wells. Field trip required.

Prerequisites : PE 402.

Lecture Hours 3 Exercise/Lab 2

**PE 510 Fundamentals of Petroleum Reservoir Simulation**

Credit Hours : 3

An introduction to petroleum reservoir simulation. Fundamentals of finite difference approximation of the partial differential equations of flow through porous media. Discussion of various simulation schemes, data handling, boundary conditions. Use of a dry gas and black oil simulators.

Prerequisites : PE 303.

Lecture Hours 3 Exercise/Lab 2

**PE 511 Applied Reservoir Simulation**

Credit Hours : 3

Simulation of actual reservoir problems using both field and individual well models to determine well spacing, production effects of secondary and enhanced recovery processes, future rate predictions and recovery, coning effects, relative permeability adjustments and other history matching techniques.

Prerequisites : PE 303

Lecture Hours 3 Exercise/Lab 2

**PE 512 Reservoir Characterization**

Credit Hours : 3

Principles and techniques of petroleum reservoir characterization. Subsurface data from geological and engineering sources. Univariate and bivariate characterization Estimation techniques. Reserve estimation methods.

Prerequisites : PE 406 & PE 408

Lecture Hours 3 Exercise/Lab 2

**PHY 131 Properties of Matter and Thermodynamics (Physics 1)**
**Credit Hours: 4**
Properties of Matter: Units in the SI system of units and conversion of units, Dimensions, Dimension analysis, Elastic Properties of Solids, Stress, Strain, Young's Modulus Shear modulus, Properties of Fluids, Pressure inside a fluid, Bulk Modulus, Buoyant Force, Hydrodynamics, Continuity equation for a laminar Flow, Bernoulli's equation, Pilot tube, Venturi meter, Torriccilli's Law, Viscosity, Poiseuille's law, viscous drag and Stoke's law.
Heat and thermodynamics: Zeroth law of thermodynamics, Quantity of heat, First law of thermodynamics, Heat transfer mechanisms, Entropy and the second law of thermodynamics, Some one way processes, Reversible and irreversible processes, Carnot cycle and Carnot engine, The absolute temperature scale, Principles of heat engines and refrigeration.
Prerequisites:
Lecture Hours 3 Exercise/Lab 3

**PHY 132 Electricity and Magnetism (Physics 2)**
**Credit Hours: 4**
Coulomb's Law, Electric Field and Flux, Gauss' Theorem in electrostatics and its Applications, Electric Potential and electric potential energy, Electrodynamics, electric current, electric current density, Ohms law and Kirchhoff's rules to solve an electric circuit-Magnetic field and flux, Gauss' law in magnetism Force due to a moving charge and due to an Electric current, Ampere's circuital Law, Faraday's Law for Induction, Maxwell's equation in integral form and their physical meaning for electromagnetism.
Prerequisites:
Lecture Hours 3 Exercise/Lab 3

**PHY 231 Theory of Relativity and Nuclear Physics (Physics 3)**
**Credit Hours : 3**
Special theory of relativity, Quantization and Max Planck principle, Black body radiation, The photoelectric effect, Wave particle duality and De Broglie Hypothesis, matter waves, Electron microscopes, Uncertainty principle and Heissenburg principle, Wave function for a confined particle, Schrodinger wave differential equation in one dimension, Particle in an infinite potential well, X-rays spectroscopy, Nuclear physics and radiation safety.
Prerequisites : PHY 132
Lecture Hours 3 Exercise/Lab 2

**PHY 232 Solid State Physics (Physics 4)**
**Credit Hours: 3**
Special theory of relativity, Quantization and Max Planck's principle. Photoelectric effect, Uncertainty Heissenburg's principle, Wave function for an elementary particle, Schrodinger wave differential equation in one dimension (Eigen value Equation), Applications in an infinite potential well. Theory of free conduction electrons, Kroning and Penny model, Theory of semiconductors, Electrons and holes in semiconductors, P-N junction structures,

and its energy band diagram.
Prerequisites: PHY 132
Lecture Hours 3 Exercise/Lab 2

**PHY 401 Thermal Analysis (Physics 5)**
**Credit Hours : 3**
Thermal Analysis course covers the basics of thermal analysis and heat transfer concepts using the FEA environment of Solid Works Simulation. The importance of thermal Analysis, transient and steady state analyses, Conduction, Convection, Radiation and the thermal simulation process. Analyzing thermal effects on models.
Prerequisites : PHY 132&PHY 231
Lecture Hours 3 Exercise/Lab 2

**PSC 110 Human Rights**
**Credit Hours: 2**
This course offers philosophical, legal, and political perspectives on human rights. After a short historical introduction to international human rights, it surveys international human rights treaties, courts, and institutions. Next it turns to topics in human rights theory, covering some contemporary philosophical theories of human rights. The final section explores some human rights problems and controversies such as economic and social rights, group rights, and cultural relativism
Prerequisites: -
Lecture Hours: 2 Exercise/Lab Hours 0

**PSY 101 Psychology**
**Credit Hours: 2**
Definition of psychology, Physiological bases of behavior, Sensation, attention, and perception, Memory, Learning, and training, Manual control, Process control and automation, Psycho physiological correlation with behavior, Biofeedback, Experimental psychology.
Prerequisites: -
Lecture Hours 2 Exercise/Lab 0

**SCM 211 Structural Analysis 1**
**Credit Hours: 3**
Types of structures, Loads, Supports, Reactions, Internal forces, Analysis of beams, Frames and plane trusses.
Prerequisites: MEC 121
Lecture Hours 3 Exercise/Lab 1

**SCM 212 Structural Analysis 2**
**Credit Hours: 3**
Analysis of beams subjected to moving loads, Introduction to space structures, Influence lines for statically determinate structures.

Prerequisites: SCM 211
Lecture Hours 3 Exercise/Lab 1

**SCM 213 Strength and Technology of Materials 1**
**Credit Hours: 3**
Engineering materials, Standardization, Standard specifications, Codes, Total quality concept, Technical inspection and quality control, Principles of materials science, Concrete technology: constituent materials for reinforced concrete (aggregates, cement, mixing water, admixtures, steel reinforcement), Concrete manufacturing, Mechanics of engineering materials: loads, stresses, strains, elastic constants, failure criteria, Mechanical properties, Testing machines, Strain gages, Calibration, Strength and behavior of materials under static loading (tension, compression, bending, shear, torsion, hardness), Miscellaneous conventional and Non-conventional construction materials and products.
Prerequisites: SCM 211
Lecture Hours 3 Exercise/Lab 2

**SCM 214 Theory of Structures**
**Credit Hours: 3**
Equilibrium, stability & compatibility, External & internal equilibrium of statically determinate plane structures: beams, frames & trusses, Normal, shear, tensional stresses & combined stresses, Elastic deformations, Introduction to the analysis of statically in determinate structures through consistent deformations & moment distribution, Buckling of columns, Introduction to space structures.
Prerequisites: MEC 121
Lecture Hours 3 Exercise/Lab 1

**SCM 215 Properties & Strength of Materials**
**Credit Hours: 2**
Various building materials, their properties, testing and uses, Materials used in engineering products, Standards, Codes and inspections, The development of innovative uses of building materials, Concrete: components, manufacturing, quality control, Partitioning materials: gypsum, lime, timber and bricks, The effects of water on building materials, The mechanics of
Prerequisites: SCM 214
Lecture Hours 2 Exercise/Lab 2

**SCM 217 Civil Engineering**
**Credit Hours: 2**
Types and usage of buildings: concrete, metallic, Construction materials and Specifications, Types of walls and ceilings, Foundations, Design methods of machine base and foundations, First principles of geodetic surveying, Surveying equipment, Leveling methods, Longitudinal and transverse contour sections.
Prerequisites: --
Lecture Hours 2 Exercise/Lab 0

**SCM 221 Planimetric Surveying 1**
**Credit Hours: 2**
Distance measurements and their corrections, Surveying operations using distance measurements, Area computations, Leveling, Grid leveling, Contour maps, Profiles, Cross sections, Volume computations, Angle measurements using theodolites.
Prerequisites: MTH 112
Lecture Hours 2 Exercise/Lab 1

**SCM 222 Planimetric Surveying 2**
**Credit Hours: 2**
Traverse, Tachometry, Surveying using plain table, Topographic surveying, Mapping, Horizontal and vertical curves layout, Engineering projects layout, Accuracy of surveying measurements, Probability theory.
Prerequisites: SCM 221
Lecture Hours 2 Exercise/Lab 1

**SCM 223 Surveying**
**Credit Hours: 2**
Basic elements of surveying and their architectural applications, Plotting scales, verniers, linear of angular and simple angular measurement devices, Chain surveying, Leveling & theodolites, Map drawing, Photogrammetry and its architectural applications.
Prerequisites: MTH 112
Lecture Hours 2 Exercise/Lab 2

**SCM 231 Civil Engineering Drawing 1**
**Credit Hours: 2**
Introduction: characteristics of civil engineering projects, legend, scales and sizes of drawings, types of projections, views, cross sections and details, Earthwork drawings: geometric surfaces, hatching, use of contour lines for irregular surfaces, applications related to canals, drains, roadways, earth reservoirs, landscape, Retaining walls and floors: shaping, projection, hatching, typical cross sections, Applications on drawing complete structures: half-earth-removed views, pitching and protection works.
Prerequisites: GRA 142
Lecture Hours 0 Exercise/Lab 4

**SCM 232 Civil Engineering Drawing 2**
**Credit Hours: 2**
Drawing of steel structures: views, sections, details, reverts, welding, hatching, applications on drawing steel joints and members, Drawing of reinforced concrete structures: views and cross sections, concrete dimensions, reinforcement details, Advanced applications on drawing of civil engineering projects.
Prerequisites: SCM 231
Lecture Hours 0 Exercise/Lab 4

**SCM 233 Engineers and the Environment**
**Credit Hours: 2**
Overview: ecosystem and its balance, unbalance and restoration.
Water: water resources and its balance, Water quality, Types of pollution, and its sources, Basis of pollution control.
Air: composition of air, air pollution, sources of air pollution, air quality monitoring and measurements, air pollution control.
Noise: noise pollution, characteristics of noise and acoustic environment, sources of noise pollution, noise monitoring and measurements, effects of noise, noise control.
Vision: vision pollution.
Solid and hazardous wastes: sources, handling, and its management, recycle and reuse.
Environmental impact assessment (EIA): environmental awareness, environmental protection acts.
Prerequisites: -
Lecture Hours 2 Exercise/Lab 0

**SCM 311 Structural Mechanics 1**
**Credit Hours: 3**
Properties of plane areas, Stresses and strains in sections due to axial forces and bending moments, Shear stresses in symmetrical solid and hollow sections, Torsional shear stresses in circular and non-circular sections, Combined stresses, Principal stresses.
Prerequisites: SCM 212
Lecture Hours 3 Exercise/Lab 1

**SCM 312 Strength and Technology of Materials 2**
**Credit Hours: 3**
Concrete technology: mix design, properties of fresh and hardened concrete, dimensional changes, concrete manufacturing under severe weathering conditions, durability of concrete in aggressive environments, types and repair of cracks, fire resistance, repairing materials, special types.
Mechanics of engineering materials: stress/strain relations, Mohr's strain circle, experimental mechanics, mechanisms and theories of failure, strength and behavior of materials under dynamic and repeated loading, high temperature, and creep, Technical Inspection and quality control: technical reports, statistical methods, in-situ testing, non-destructive testing.
Prerequisites: SCM 213
Lecture Hours 3 Exercise/Lab 2

**SCM 313 Engineering Geology**
**Credit Hours: 2**
Engineering classification and properties of minerals and rocks, Nature and properties of the earth's crust, Faults, folds, joints and joint systems, Earthquakes : centre, waves, the centre of the earth, Geologic map of Egypt, Building materials, Concrete materials (aggregates and cement), Geophysics applied in civil engineering, Ground water : distribution G.W, motion of G.W., G.W.

Level ,G.W. Pollution ,Problems related to extraction of G.W., Weathering problems ,Field visits to geologic sites.
Prerequisites: SCM 212
Lecture Hours 2 Exercise/Lab 1

**SCM 314 Structural Mechanics 2**
**Credit Hours: 3**
Deformations: differential equation, method of virtual Work, Analysis of statically in determinate structures: method of consistent deformations, method of moment distribution, Influence lines for statically in determinate structures.
Prerequisites: SCM 311
Lecture Hours 3 Exercise/Lab 1

**SCM 315 Reinforced Concrete 1**
**Credit Hours: 3**
Methods of design, Codes, Structural systems, Load distribution, Design using limit states method, Section subjected to bending moments, Section subjected to shear and torsion, Reinforced details for beams, Limit state of deflection.
Prerequisites: SCM 311
Lecture Hours 3 Exercise/Lab 2

**SCM 316 Building Construction and City Planning**
**Credit Hours: 2**
Building construction techniques: buildings construction phases, wall bearing construction, skeleton construction (RC, Steel), Wall techniques: stone and brick, architectural finishing techniques: arches, stairs design, floorings and plastering, Water and heat proofing techniques, Architectural drawings and symbols techniques, City principals: regional planning, site planning, landscaping, housing development, planning levels and street planning, development schemes , land-use fundamentals, site analysis and distribution.
Prerequisites: SCM 311
Lecture Hours 2 Exercise/Lab 2

**SCM 317: Reinforced Concrete for Architects**
**Credit Hours: 2**
Design principles of concrete, Fundamentals of reinforced concrete structures, Analysis and design of sections subjected to bending, Loads and load distribution, Reinforcement details of beams, Solid slabs, Columns, Stairs, statically determinate frames, Ribbed and hollow block slabs, Paneled Beam slabs, Flat slabs, Connections of precast concrete structural elements.
Prerequisites: SCM 214
Lecture Hours: 2 Tutorial: 2

**SCM 321 Geo-informatics 1**
**Credit Hours: 2**

Photo coordinates refinement, Flight planning, Stereoscopy and parallax, Theory of orientations, Analytical photogrammetry, Fundamentals of remote sensing, Theory of measurements and errors.
Prerequisites: SCM 222
Lecture Hours 2 Exercise/Lab 2

**SCM 322 Geo-informatics 2**
**Credit Hours : 2**
Photogrammetry: Aeriel cameras, Vertical photograph, Tilted photograph, Rectification, Electronic distance measurements, Earth surface, Geodetic coordinate Systems, Geodetic networks, Fundamentals of satellite geodesy, Global positioning system GPS, Fundamentals and structure of Geographic information systems GIS, Basics of astronomy, Map projections.
Prerequisites : SCM 222
Lecture Hours 2 Exercise/Lab 2

**SCM 351 Construction Project Management**
**Credit Hours : 3**
Introduction to structure engineering project management, Introduction to the construction environment, Construction project phases, Selecting the special services for managing and executing the construction project, Construction projects organization, Construction management approaches, Introduction to CPM method, Labor productivity, Material management, Equipment optimum use, Project control, Constructability, Safety in construction, Application with emphasizing on civil engineering projects.
Prerequisites : -
Lecture Hours 3 Exercise/Lab 1

**SCM 352 Engineering Economics and Finance**
**Credit Hours : 2**
Economic principles, Nominal and effective rate of interest, District and continues payments, Present value, Source and cost of capitals, Rate of return, Cost benefit ratio, Breakeven point, Replacement, Depreciation, Inflation, Principles of project evaluation, Risk management, Construction Economy, Housing economy, Transportation economy, Principle of finance.
Prerequisites : MTH 214
Lecture Hours 2 Exercise/Lab 1

**SCM 411 Structural Mechanics 3**
**Credit Hours : 3**
Matrix analysis of structures: flexibility method, stiffness method, Applications on all types of plane and space skeletal structures.
Prerequisites : SCM 314
Lecture Hours 3 Exercise/Lab 2

**SCM 412 Reinforced Concrete 2**
**Credit Hours : 3**

Design of sections under eccentric forces, Design and reinforcement details of concrete columns, Structural systems for large span concrete structures, Design and reinforcement details of frames, Bearings, Concrete footings, Working loads design method.
Prerequisites : SCM 315
Lecture Hours 3 Exercise/Lab 2

**SCM 413 Metallic Structures 1**
**Credit Hours : 3**
Introduction, Tension members, Compression members, Columns, Beams (Rolled sections), Beam-columns, Wind bracings.
Prerequisites : SCM 314
Lecture Hours 3 Exercise/Lab 2

**SCM 414 Advanced Technology of Construction Materials**
**Credit Hours : 3**
Advanced concrete technology, Advanced technology of finishing and insulating materials, Adapted technology of alternative building materials for low-cost construction, New developments and innovative uses of construction materials, Introduction to fracture mechanics, Miscellaneous non-conventional construction materials and products : ceramics, refractories, polymers and plastics, injection materials and joint sealants, composite, optical fibers, carbon fibers, Pipes for water and sewage networks, Material-related failures of structures, Maintenance and repair techniques of materials in structures, Welding technology.
Prerequisites : SCM 316
Lecture Hours 3 Exercise/Lab 1

**SCM 415 Structural Mechanics 4**
**Credit Hours : 3**
Elastic buckling of columns and beam columns, Stresses in circular plates under ax symmetric normal loads, Stresses in rectangular plates, Membrane stresses in shells of revolution and cylindrical shells.
Prerequisites : SCM 411
Lecture Hours 3 Exercise/Lab 1

**SCM 416 Reinforced Concrete 3**
**Credit Hours : 3**
Design and reinforcement details: solid slabs, ribbed slabs, paneled beams slab, flat slabs (beam less slabs), Stairs, Design of sections under axial loading.
Prerequisites : SCM 412
Lecture Hours 3 Exercise/Lab 2

**SCM 417 Metallic Structures 2**
**Credit Hours : 3**
Riveted and bolted connections, High strength bolted connections, Welded connections, Base connections, Roof trusses, Rigid frames details.

Prerequisites : SCM 413
Lecture Hours 3 Exercise/Lab 2

**SCM 418: Steel Structures for Architects**
**Credit Hours : 2**
Design principles of steel structures, Structural systems, Design loads, Design of members subjected to axial forces, or shear, Design of bolted and welded connections, Structural details for trusses and frames, Details of connections, Steel structures.
Prerequisites: SCM 214
Lecture Hours: 2 Tutorial: 2

**SCM 441 Soil Mechanics**
**Credit Hours : 4**
Main properties of soil, Soil classification, Soil compaction, Permeability, stresses distribution in soil, Compressibility of soil, Theory of consolidation, shear strength of soil, Lateral earth pressure, Bearing capacity of soil.
Prerequisites : SCM 411
Lecture Hours 3 Exercise/Lab 2

**SCM 442: Foundations for Architects**
**Credit Hours : 3**
Soil characteristics and mechanics, Selection and design of foundations, Soil properties, Soil classification, Soil compaction, Stresses in soil, Soil compressibility, Theory of consolidation, Lateral earth pressure, Design of shallow foundations, Pile foundations, Retaining walls, Site investigations and selection of suitable foundations.
Prerequisites: -
Lecture Hours: 2 Tutorial: 2

**SCM 451 Project Planning and Control**
**Credit Hours : 3**
Network planning concept: critical path, preceding, project evaluation and review techniques, Bar chart, Line of balance, Network compression, Resource allocation, Project monitoring, Corrective action.
Prerequisites : SCM 351
Lecture Hours 3 Exercise/Lab 1

**SCM 461 Hydraulic Engineering**
**Credit Hours : 4**
Open channel flow: types of flow, conservation laws of mass and energy, specific energy concept, flow resistance in channels, sketching and calculations of water surface profile for gradually varied flow, design of cross sections in open channels, momentum equation and specific force concept, design of stilling basins downstream of gates and pipe outlets, physical models, Introduction to river engineering and sediment transport, Pumps: types and

characteristics of pumps, pumps and pipeline systems, Hydraulics of groundwater: types of aquifers, groundwater flow.
Prerequisites : MPR 252
Lecture Hours 3 Exercise/Lab 2

**SCM 462 Irrigation and Drainage Engineering.**
**Credit Hours : 3**
Definitions of irrigation and drainage, Different sources of water for irrigation and its quality, Soil water plant relationship, Estimation of crop consumptive use, Introduction to the design of different irrigation systems: surface irrigation, sprinkler irrigation, drip irrigation, Introduction to the design of agricultural drainage system: tile drainage, surface drainage, and vertical drainage.
Prerequisites : MPR 252
Lecture Hours 3 Exercise/Lab 1

**SCM 500 Graduation Project**
**Credit Hours : 0**
An engineering assignment requiring the student to demonstrate initiative and assume responsibility, The student will select a project at the end of the ninth semester, Students can propose their own project, A faculty member will provide supervision, A project report is required at the end of the tenth semester.
Prerequisites : As Advised
Lecture Hours 0 Exercise/Lab 4

**SCM 501 Graduation Project**
**Credit Hours : 4**
Continuation to the bachelor project started in SCM 500
Prerequisites : SCM 500
Lecture Hours 0 Exercise/Lab 4

**SCM 511 Reinforced Concrete 4**
**Credit Hours : 2**
Cracking limits, Design and detailing of elevated, rested on ground and underground water tanks
Prerequisites : SCM 416
Lecture Hours 2 Exercise/Lab 2

**SCM 512 Metallic Structures 3**
**Credit Hours : 3**
High rise steel buildings: structural systems, design loads (dead, live, wind and seismic), Static analysis, Floors, Connections: flexible, rigid, semi-rigid, cold formed steel members.
Prerequisites : SCM 417
Lecture Hours 3 Exercise/Lab 1

**SCM 513 Advanced Structural Analysis**
**Credit Hours: 3**
Undamped and damped free vibration analysis of SDOF systems, Response of SDOF system to harmonic loading, Free vibration analysis of MDOF systems, The nature of earthquake ground motion, Seismicity of the world and of Egypt, Causes of earthquakes, basic glossary and terminology, Seismic waves, Quantification of earthquakes, Damage mechanism, Characteristics of earthquake ground motions, Philosophy of design, Seismic response spectral analysis of SDOF system, Seismic response spectral analysis of MDOF systems, Architectural considerations, Seismic design by ECP-201.
Prerequisites: SCM 411
Lecture Hours 3 Exercise/Lab 1

**SCM 514 Reinforced Concrete 5**
**Credit Hours : 3**
Wind and earthquake loads resistant structures, Design of reinforced concrete walls, Fundamentals of pre-stressed concrete.
Prerequisites: SCM 416
Lecture Hours 3 Exercise/Lab 1

**SCM 515 Metallic Bridges**
**Credit Hours : 3**
Structural systems for bridges, Floors types, Design loads, Design of plate girders: buckling considerations, fatigue effect, cross-section design, construction details, Design of composite beams, Design of box girders.
Prerequisites : SCM 417
Lecture Hours 3 Exercise/Lab 1

**SCM 516 Applied Topics in Structural Analysis and Mechanics**
**Credit Hours : 3**
Computer analysis and design of structures, Computer programming, Earthquake engineering, Dynamics of structures, Analysis of high-rise buildings, Analysis of bridges, Analysis of tunnels, Analysis of shell.
Prerequisites : SCM 513
Lecture Hours 3 Exercise/Lab 1

**SCM 517 Computer Aided Structural Analysis**
**Credit Hours : 3**
Selection of suitable models for analysis of different structures, Preparation of simple programs for analysis of structural elements, Training on using ready-made programs for analysis of structures, Applications.
Prerequisites : SCM 513
Lecture Hours 3 Exercise/Lab 1

**SCM 518 Dynamics of Structures**
**Credit Hours : 3**
Undamped single degree of freedom system, Damped single degree of freedom system, Response of single degree of freedom system to harmonic load, Dynamic response to general loading, Multi-degree of freedom systems, Damped motion of shear buildings.
Prerequisites : SCM 513
Lecture Hours 3 Exercise/Lab 1

**SCM 519 Metallic Structures 4**
**Credit Hours : 3**
Fatigue, Truss bridges, Tanks: ground, elevated, circular, rectangular, Silos, Towers: types, loads.
Prerequisites : SCM 512
Lecture Hours 3 Exercise/Lab 1

**SCM 521 Environmental and Sanitary Engineering**
**Credit Hours : 3**
Definitions, Fields of environmental and sanitary engineering, Biosphere and environmental cycles, Issues of environmental pollution, Water supply engineering: Water demands, sources of water supply, collection works, purification works, distribution works, Sanitary drainage: sources of wastewaters, sewerage systems, hydraulic design, network accessories, sewage treatment systems.
Prerequisites : SCM 461
Lecture Hours 3 Exercise/Lab 2

**SCM 523 Engineering Applications of Surveying**
**Credit Hours : 3**
Specifications of surveying projects, Design and pre-analysis of surveying projects, Planning and setting out of structures, Planning and partition of lands, Monitoring of high rise structures, Detection of vertical movements, Detection of horizontal movements.
Prerequisites : SCM 321
Lecture Hours 3 Exercise/Lab 1

**SCM 524 Highway and Airport Engineering**
**Credit Hours : 3**
Introduction to highway and airport planning, Classification of highways, Design controls and criteria, Design of elements in the longitudinal direction, Design of cross sections, Design of At-Grade intersections, Grade separations and interchanges, Types of pavements, Calculation of stresses in flexible and rigid pavements, Types and characteristics of paving materials and mixtures, Equivalent axel loads, Design of flexible and rigid pavement thickness, Introduction to pavement maintenance and repair.
Prerequisites : -
Lecture Hours 3 Exercise/Lab 1

**SCM 525 Introduction to Earthquake Engineering**
**Credit Hours : 3**
Characteristics of earthquakes: causes, seismic waves, scales, regionalization, Response of structures to earthquakes, Concept and philosophy of seismic design regulations, Minimum requirements for different types of buildings in seismic codes, Applications.
Prerequisites : SCM 513
Lecture Hours 3 Exercise/Lab 1

**SCM 526 Metallic Bridges 2**
**Credit Hours : 3**
Design of truss bridges: cross-sections used, design of members and connections, construction details, Design of cable-stayed bridges: types of cross-sections, structural analysis methods, design of cross-section.
Prerequisites : SCM 512
Lecture Hours 3 Exercise/Lab 1

**SCM 527 Transport Planning and Traffic Engineering**
**Credit Hours : 3**
Transport planning: introduction to transport sciences, Definitions, Time horizons of transport planning, Elements of urban transport planning procedures, Data base, Introduction to travel demand forecasting models, Introduction to traffic management and public transport improvements, Introduction to evaluation of strategic transport plans and traffic management schemes, Traffic engineering: vehicle, user and road characteristics, Studies of traffic stream characteristic (speed, volume, trip time & delay), Fundamentals of traffic flow: speed, volume and density relationships,, Highway capacities, Traffic control devices.
Prerequisites : -
Lecture Hours 3 Exercise/Lab 1

**SCM 531 Analysis and Design of Masonry Buildings**
**Credit Hours : 3**
Specification and design methods, Materials, Advanced construction method, Calculation and analysis of forces acting on members, Analysis and design of un-reinforced and reinforced masonry, Columns and walls, Masonry building systems, Arch action, One and multi story buildings.
Prerequisites : SCM 414
Lecture Hours 3 Exercise/Lab 1

**SCM 532 Design of Coastal Protection Works**
**Credit Hours : 3**
Introduction, Hydrodynamics of coastal areas, Sediment transport, Shoreline changes, Beach erosion, Design of shore protection structures: marine walls, groins, breakwaters, Off-shore marine structures, Floating structures, Design of non structural beach protection systems, Design of marine pipelines and cables, Selection of construction methods and type of materials, Environmental impact assessment.

Prerequisites : SCM 332, SCM 431
Lecture Hours 3 Exercise/Lab 1

**SCM 533 Design of Massive Irrigation Structures**
**Credit Hours : 3**
Locks: types; planning, filling and emptying systems, design of foundation and retaining walls; dams: purpose, types, annual and long-semester storage, reservoir design and operation, design of concrete dams, earthquake loads, design of embankment dams, seepage control- spillways: types, hydraulic design, stilling basins: types, effects and design.
Prerequisites : SCM 332
Lecture Hours 3 Exercise/Lab 1

**SCM 534 Design of Modern Irrigation Systems**
**Credit Hours : 3**
Sprinkler irrigation: types, distribution uniformity and efficiency, Planning: sprinkler types and properties, Hydraulic design of main and lateral lines, Pumping needs, Drip irrigation: system elements, design basics, emitters selection, layout and network design, filters design and clogging, Irrigation system selection, “Misqa” design: low pressure pipelines, concrete canals, pumping and intake works, Field structures.
Prerequisites : SCM 332
Lecture Hours 3 Exercise/Lab 1

**SCM 535 Mechanics and Technology of Engineering Materials**
**Credit Hours : 3**
In-situ testing, Composite materials, Similitude and analysis of structural models, Stress/strain analysis: stress concentration, stress relaxation, residual stresses, strain energy, Applications of computer and modeling techniques in materials engineering, Code provisions related to quality control and assurance.
Prerequisites : SCM 414
Lecture Hours 3 Exercise/Lab 1

**SCM 536 Mechanics of Solids**
**Credit Hours : 3**
Tensor analysis, Stress tensors, Strain analysis, Constitutive relations for linear elastic materials, Symmetry in elasticity, Experimental determination of elasticity constants, Boundary value problems, Two-dimensional problems in elasticity, Bending of prismatic bars, Torsion of bars and hollow shafts, Axisymmetric problems of elasticity, Introduction to inelastic behavior of materials.
Prerequisites : SCM 513
Lecture Hours 3 Exercise/Lab 1

**SCM 541 Foundations**
**Credit Hours : 3**

Design of shallow foundations, Pile foundations, Retaining walls, Sheet pile walls, Dewatering, Stability of slopes, Site investigation and choice of type of foundation.
Prerequisites : SCM 441
Lecture Hours 3 Exercise/Lab 2

**SCM 551 Applied Topics In Construction Engineering**
**Credit Hours : 3**
Using computer in project planning and cost estimate, Application on a real project and submitting a report at the end of the semester.
Prerequisites : SCM 451
Lecture Hours 3 Exercise/Lab 1

**SCM 552 Quantity Surveying And Cost Control**
**Credit Hours : 2**
Approximate estimate, Detailed estimate: quantity survey, labor cost, equipment cost, subcontractor cost, purchasing orders, indirect cost, Bid calculation, Unit cost estimate, Cost planning, Traditional cost control methods, Network base cost control methods.
Prerequisites : SCM 451
Lecture Hours 2 Exercise/Lab 2

**SCM 553 Construction Technology**
**Credit Hours : 3**
Introduction to construction methods, Earth work, Foundation technology, Temporary structural, Precast concrete, Prestressed concrete, Steel structure fabrication and erection, Scaffolding: materials, connections, principles of design and erection, economy, Safety
equipment: types, Prerequisites : -
Lecture Hours 3 Exercise/Lab 1

**SCM 581 Resource Management**
**Credit Hours : 3**
Resource management, Inventory management, Labor management, Work Study, Construction operation analysis, Simulation.
Prerequisites : SCM 351
Lecture Hours 3 Exercise/Lab 1

**SCM 591 Inspection and Maintenance of Structures**
**Credit Hours : 3**
Introduction: causes of distress and reasons for repair, approach and strategy of repair, and anamnesis, Diagnosis, Repair, Strength evaluation of concrete elements and concrete structures, Repair materials, Repair methods, Repair and Strengthening of concrete elements, Inspection and repair of masonry, Case studies.
Prerequisites : SCM 414
Lecture Hours 3 Exercise/Lab 1

**SCM 592 Special Reinforced Concrete Structures 1**
**Credit Hours : 3**
Pre-cast concrete elements, Design of reinforced concrete walls, Pile caps, High-rise buildings.
Prerequisites : SCM 511
Lecture Hours 3 Exercise/Lab 1

**SCM 593 Special Reinforced Concrete Structures 2**
**Credit Hours : 3**
Pre-stressed concrete, Concrete bridges, Design of concrete raft foundation, Computer application in design of reinforced concrete structures.
Prerequisites : SCM 511
Lecture Hours 3 Exercise/Lab 1

**SCM E01 Elective 1**
**Credit Hours : 3**
See List of available Electives
Prerequisites : See List
Lecture Hours 3 Exercise/Lab 1

**SCM E02 Elective 2**
**Credit Hours : 3**
See List of available Electives
Prerequisites : See List
Lecture Hours 3 Exercise/Lab 1

**SCM E03 Elective 3**
**Credit Hours : 3**
See List of available Electives
Prerequisites : See List
Lecture Hours 3 Exercise/Lab 1

**SCT 101 Scientific Thinking**
**Credit Hours : 2**
Scientific thinking is the process of thinking logically, critically and creatively about real, as opposed to imaginary, problems. Students will develop an understanding of the scientific thinking process from a psychological perspective and will develop skill in scientific thinking. Topics will include the psychology of thought, logical operations and fallacies, convergent and divergent thinking, the relationship between language and thought, valid and invalid arguments, logic and probability, decision making and hypothesis testing in the science of psychology.
Prerequisites : -
Lecture Hours 2 Exercise/Lab 0

**SOC 101 Sociology**
**Credit Hours : 2**
A scientific approach to the analysis of culture, socialization, social organization, the development of society, study of social processes, human groups, social institutions, and the effects of group relations on human behavior.
Prerequisites : -
Lecture Hours 2 Exercise/Lab 0

**UNV E01 University Elective Course 1**
**Credit Hours : 2**
See List of available Electives
Prerequisites : -
Lecture Hours 2 Exercise/Lab 0

**UNV E02 University Elective Course 2**
**Credit Hours : 2**
See List of available Electives
Prerequisites : -
Lecture Hours 2 Exercise/Lab 0