# TRIMESTER CURRICULAR PLAN

## 1. UNIVERSITY REQUIREMENTS

### a. Obligatory University Courses

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1601101 | Islamic Culture 1 | --- | 2 | 3 |
| 2 | 1601201 | Islamic Culture 2 | --- | 2 | 3 |
| 3 | 1602101 | Arabic Language | --- | 2 | 3 |
| | | | **Total Credit Hours** | **6** | **9** |

### b. Elective University Courses (2 from 6)

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1601301 | Islamic Culture 3 | --- | 2 | 3 |
| 2 | 1601302 | Islamic Culture 4 | --- | 2 | 3 |
| 3 | 1601303 | Islamic Culture 5 | --- | 2 | 3 |
| 4 | 1601401 | Islamic Culture 6 | --- | 2 | 3 |
| 5 | 1601402 | Islamic Culture 7 | --- | 2 | 3 |
| 6 | 1601403 | Islamic Culture 8 | --- | 2 | 3 |
| | | | **Total Credit Hours** | **4** | **6** |

## 2. COLLEGE REQUIREMENTS

### a. Obligatory College Courses

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1606114 | Reading I | --- | 2 | 3 |
| 2 | 1101101 | General Physics 1 | --- | 4 | 9 |
| 3 | 1104111 | Engineering Mathematics I | --- | 4 | 7.5 |
| 4 | 1104212 | Engineering Mathematics II | 1104111 | 4 | 7.5 |
| 5 | 1104313 | Engineering Mathematics III | 1104212 | 4 | 7.5 |
| 6 | 1104314 | Engineering Mathematics IV | 1104111 | 3 | 6 |
| 7 | 1402300 | Numerical Methods in Engineering | 1104313 | 3 | 6 |
| 8 | 1403101 | Engineering Drawing | --- | 3 | 9 |
| 9 | 1403111 | Basic Workshop | 1403101 | 2 | 6 |
| 10 | 1405101 | Introduction to Engineering Design | --- | 2 | 4.5 |
| 11 | 1405202 | Engineering Economy | 1104111 | 2 | 3 |
| 12 | 1405203 | Engineering Management | --- | 2 | 3 |
| 13 | 1405204 | Probability and Statistics | 1104212 | 3 | 4.5 |
| 14 | 1405405 | Engineering Ethics | --- | 1 | 1.5 |
| | | | **Total Credit Hours** | **39** | **78** |

## 3. PROGRAM REQUIREMENTS

### a. Obligatory Program Courses

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1402120 | Structured Computer Programming | --- | 2 | 4.5 |
| 2 | 1402221 | Object-Oriented Computer Programming | --- | 3 | 6 |
| 3 | 1402201 | Analytical Methods in Engineering | 1104212 | 3 | 6 |
| 4 | 1402208 | Physics of Electricity and Magnetism | 1101101 & 1104212 | 3 | 6 |
| 5 | 1402102 | Basic Electrical Circuits | 1101101 | 3 | 6 |
| 6 | 1402203 | Electrical Circuits and Systems | 1402120 & 1402102 & 1104313 | 3 | 6 |
| 7 | 1402210 | Electronics I | 1402102 | 3 | 6 |
| 8 | 1402430 | Introduction to Communications | 1402203 | 3 | 6 |
| 9 | 1402340 | Principles of Automatic Control | 1402201 & 1402203 | 3 | 6 |
| 10 | 1402204 | Digital Design I | 1402102 | 3 | 6 |
| 11 | 1402322 | Microprocessors and microcontrollers | 1402204 & 1402221 | 3 | 6 |
| 12 | 1402205 | Electromagnetic Fields | 1402102 & 1402208 & 1104314 (co) | 3 | 6 |
| 13 | 1402306 | Electrical Measurements and Instrumentation | 1402210 | 3 | 6 |
| 14 | 1402360 | Electromechanical Energy Conversion I | 1402205 | 3 | 6 |
| 15 | 1402350 | Electrical Power Systems I | 1402205 & 1402120 | 3 | 6 |
| 16 | 1402361 | Electromechanical Energy Conversion II | 1402205 | 3 | 6 |
| 17 | 1402411 | Power Electronics I | 1402210 | 3 | 6 |
| 18 | 1402451 | Electrical Power Systems II | 1402350 & 1402361 | 3 | 6 |
| 19 | 1402452 | Power Transmission and Distribution | 1402451 | 3 | 6 |
| 20 | 1402453 | Switch Gear and Protection of Power Syst. I | 1402451 | 3 | 6 |
| 21 | 1402454 | Power systems lab | 1402350 | 1 | 3 |
| 22 | 1402362 | Machines lab | 1402360 & 1402361 (co) | 1 | 3 |
| 23 | 1402498 | B. SC. Project 1 | 96 C.H. & Dept. Appr. | 2 | 4.5 |
| 24 | 1402499 | B. SC. Project 2 | 1402498 | 2 | 4.5 |
| | | | **Total Credit Hours** | **65** | **133.5** |

### b. Obligatory Program Courses (From Outside the department)

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1404101 | Chemistry for Engineers | --- | 3 | 6 |
| 2 | 1403465 | Power Plants for Non-ME Students | 1101101 & 1104212 | 3 | 6 |
| 3 | 1606110 | Writing (I) | --- | 2 | 3 |
| 4 | 1606111 | Writing (II) | 1606110 | 2 | 3 |
| 5 | 1505101 | Principles of Law | --- | 3 | 6 |
| | | | **Total Credit Hours** | **13** | **24** |

### c. Elective Program Courses (2 courses with 6 Credit Hours)

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1402455 | Power Syst. Instrument. and Measur. | 1402306 | 3 | 4 |
| 2 | 1402441 | Advanced Control Systems | 1402340 | 3 | 4 |
| 3 | 1402456 | Power System Transients | 1402360 & 1402350 | 3 | 4 |
| 4 | 1402463 | Electromechanical Energy Conversion III | 1402361 | 3 | 4 |
| 5 | 1402412 | Power Electronics II | 1402411 | 3 | 4 |
| 6 | 1402457 | High Voltage Techniques | 1402350 | 3 | 4 |
| 7 | 1402458 | Economic Operation of Power Systems | 1402451 | 3 | 4 |
| 8 | 1402464 | Special Electrical Machines | 1402361 | 3 | 4 |
| 9 | 1402465 | Electrical Drive Systems | 1402360 & 1402361 & 1402411 | 3 | 4 |
| 10 | 1402442 | Program. Logic Controller and its Appl. | 1402322 | 3 | 4 |
| 11 | 1402459 | Energy Efficiency | 1402451 | 3 | 4 |
| | | | **Total Credit Hours** | **6** | **12** |

### d. Field Training

The student spending 8 weeks at the training on-site in a manufacturing or service industry, 5 days a week and 6 hours per day with a total number of hours 240 hours.

| No. | Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|---|
| 1 | 1405391 | Summer Training | 90 C.H. & Dept. Appr. | 2 | 240 |
| | | | **Total Credit Hours** | **2** | **240*** |

(*) Summer Training has a special nature which is different from other courses.

## TYPICAL STUDY PLAN

### Year 1/ Term 1

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1101101 | General Physics I | --- | 4 | 9 |
| 1104111 | Engineering Mathematics 1 | --- | 4 | 7.5 |
| 1403101 | Engineering Drawing | --- | 3 | 9 |
| | | **Total Credit Hours** | **11** | **25.5** |

### Year 1/ Term 2

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1405101 | Introduction to Engineering Design | --- | 2 | 4.5 |
| 1601101 | Islamic Culture 1 | --- | 2 | 3 |
| 1606114 | Reading (I) | --- | 2 | 3 |
| 1403111 | Basic Workshop | 1403101 | 2 | 6 |
| 1104212 | Engineering Mathematics II | 1104111 | 4 | 7.5 |
| | | **Total Credit Hours** | **12** | **24** |

### Year 1/ Term 3

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1404101 | Chemistry for Engineers | --- | 3 | 6 |
| 1405202 | Engineering Economy | 1104111 | 2 | 3 |
| 1402102 | Basic Electrical Circuits | 1101101 | 3 | 6 |
| 1402120 | Structured Computer Programming | --- | 2 | 4.5 |
| | | **Total Credit Hours** | **10** | **19.5** |

### Year 2/ Term 4

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1104313 | Eng. Math III | 1104212 | 3 | 7.5 |
| 1402208 | Physics of Electricity and Magnetism | 1101101 & 1104212 | 3 | 6 |
| 1405204 | Probability and Statistics | 1104212 | 3 | 6 |
| 1606110 | Writing I | | 2 | 3 |
| | | **Total Credit Hours** | **11** | **22.5** |

### Year 2/ Term 5

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1402210 | Electronics I | 1402102 | 3 | 6 |
| 1402204 | Digital Design I | 1402102 | 3 | 6 |
| 1104314 | Eng. Math IV | 1104111 | 3 | 6 |
| 1402221 | Object-Oriented Computer Programming | --- | 3 | 6 |
| | | **Total Credit Hours** | **12** | **24** |

### Year 2/ Term 6

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1402201 | Analytical Methods in Engineering | 1104212 | 3 | 6 |
| 1402203 | Electrical Circuits and Systems | 1402120 & 1402102 & 1104313 | 3 | 6 |
| 1402205 | Electromagnetic Fields | 1402102 & 1402208 & 1104314 (co) | 3 | 6 |
| 1602101 | Arabic Language | | 2 | 3 |
| | | **Total Credit Hours** | **11** | **21** |

**Year 3/ Term 7**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1505101 | Principles of Law | - | 3 | 6 |
| 1402306 | Electrical Measurements and Instrumentation | 1402210 | 3 | 6 |
| 1402360 | Electromechanical Energy Conversion I | 1402205 | 3 | 6 |
| 1402340 | Principles of Automatic Control | 1402201 & 1402203 | 3 | 6 |
| | | **Total Credit Hours** | **12** | **24** |

**Year 3/ Term 8**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1402350 | Electrical Power Systems I | 1402120 & 1402205 | 3 | 6 |
| 1402300 | Numerical Methods in Engineering | 1104313 | 3 | 6 |
| 1601201 | Islamic culture 2 | --- | 2 | 3 |
| 1402361 | Electromechanical Energy Conversion II | 1402205 | 3 | 6 |
| | | **Total Credit Hours** | **11** | **21** |

**Year 3/ Term 9**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1402362 | Machines lab | 1402360 & 1402361 (co) | 1 | 3 |
| 1402322 | Microprocessors and microcontrollers | 1402204 & 1402221 | 3 | 6 |
| 1403465 | Power Plants for Non-ME Students | 1104212 & 1101101 | 3 | 6 |
| 1405405 | Engineering Ethics | --- | 1 | 3 |
| 1606111 | Writing II | --- | 2 | 3 |
| | | **Total Credit Hours** | **10** | **21** |

**Summer Term**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1405391 | Summer Training | 90 C.H. & Dept. Appr. | 2 | 240 |
| | **Total Credit Hours** | | **2** | **240*** |

(*) Summer Training has a special nature which is different from other courses.

**Year 4/ Term 10**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| **1402430** | Introduction to Communications | 1402203 | 3 | 6 |
| **1402411** | Power Electronic I | 1402210 | 3 | 6 |
| **1402451** | Electrical Power Systems II | 1402350 & 1402361 | 3 | 6 |
| **1601xxx** | Elective (1) Islamic culture | --- | 2 | 3 |
| | | **Total Credit Hours** | **11** | **21** |

**Year 4/ Term 11**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1405203 | Engineering Management | --- | 2 | 3 |
| 1402454 | Power systems lab | 1402350 | 1 | 3 |
| 1402498 | B.SC. Project 1 | Complete (96 Cr) and department approval | 2 | 4.5 |
| 14024xx | Elective I | * | 3 | 6 |
| 1601xxx | Elective (2) Islamic culture | --- | 2 | 3 |
| | | **Total Credit Hours** | **10** | **19.5** |

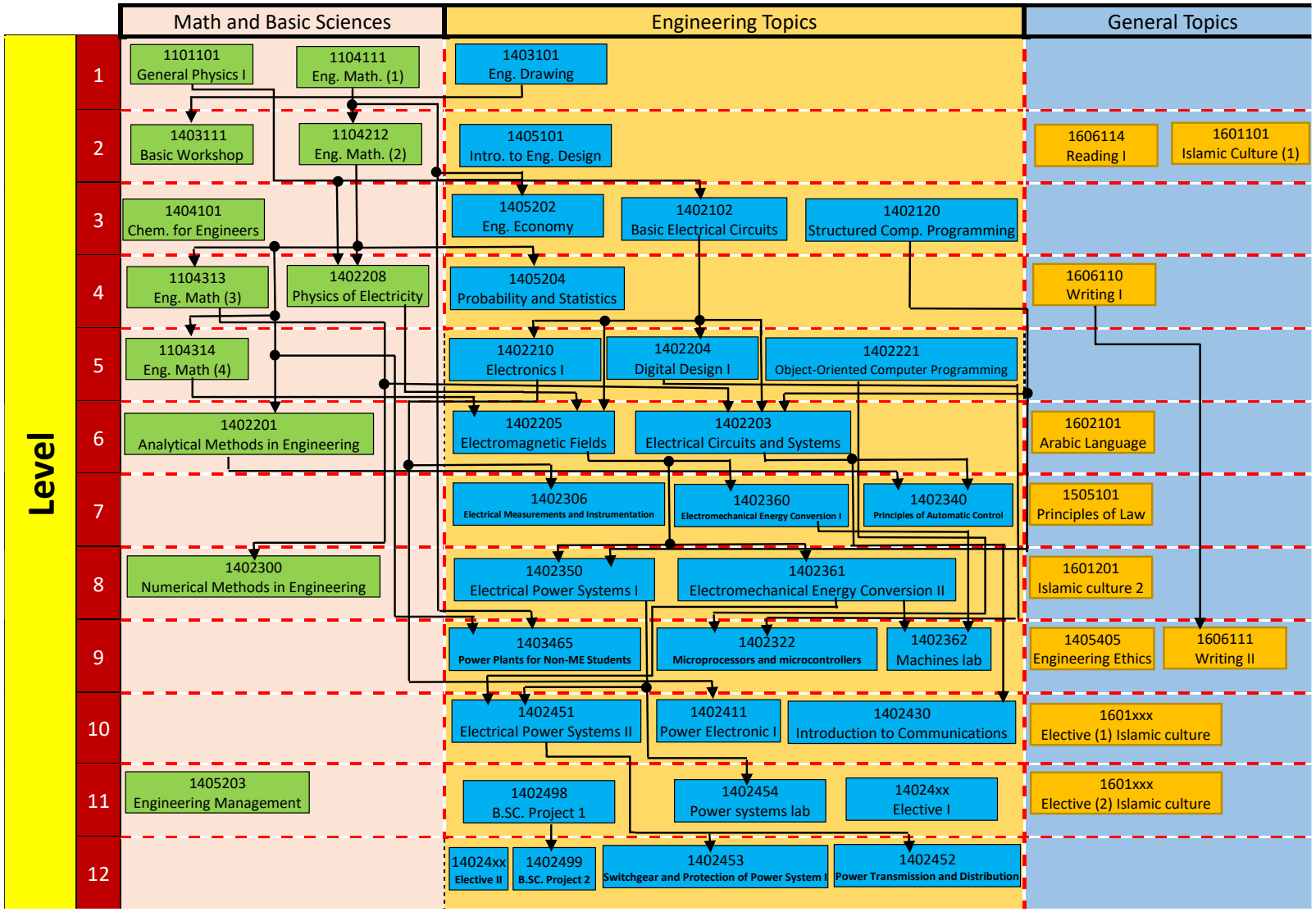
(*) The prerequisites for elective courses vary depending on each individual course.

**Year 4/ Term 12**

| Course Number | Course Title | Prerequisites | Credit Hours | Contact Hours |
|---|---|---|---|---|
| 1402452 | Power Transmission and Distribution | 1402451 | 3 | 6 |
| 1402453 | Switchgear and Protection of Power System I | 1402451 | 3 | 6 |
| 14024xx | Elective II | * | 3 | 6 |
| 1402499 | B.SC. Project 2 | 1402498 | 2 | 4.5 |
| | | **Total Credit Hours** | **11** | **22.5** |

(*) The prerequisites for elective courses vary depending on each individual course.

# FLOWCHART OF PREREQUISITES



## BRIEF COURSE DESCRIPTIONS

| A - REQUIRED COURSES FROM EE DEPARTMENT | | |
|---|---|---|
| **1** | **1402120: Structured Computer Programming** | **2** |
| | The layout of this course presented in the following order: In 1st part, The Matlab basics are introduced. In 2nd part, the built-in functions, used for the computation of mathematical formulae, are presented. In 3rd part of the course, the user-defined functions are designed to solve some engineering problem cases. Finally, various structured computer programs are developed via the m-files of Matlab to improve the student techniques and skills necessary for engineering practice | |
| **2** | **1402221: Object-oriented computer programming** | **3** |
| | This course presents a conceptual and practical introduction to imperative and object-oriented programming, exemplified by C++. As well as providing grounding in the use of C++, the course will cover general principles of programming. | |
| **3** | **1402102: Basic Electrical Circuits** | **3** |
| | This course covers the basic definitions of electric quantities, Ohm's and Kirchhoff's laws in DC circuits, nodal and mesh analysis. Sinusoidal sources and the concept of phasor in circuit analysis; Introduction to concept of average, reactive, complex power and power factor. Analysis of single phase and three-phase circuits | |
| **4** | **1402201: Analytical Methods in Engineering** | **3** |
| | The different subsections of this course are presented in the following order: complex numbers, analytic functions (limits, continuity, derivatives, Cauchy-Riemann equations, analytic functions, harmonic functions), Elementary functions (exponential, logarithm, complex exponents, trigs, hyperbolic functions), Integrals (definite integrals, contour integrals, Cauchy theorem, Cauchy integral formula), Series (sequences, convergence of series, Taylor series, Laurent series, power series techniques), Residues and poles (residues, Cauchy's residue theorem, residue at infinity, zeros of analytic functions), Matrix introduction, linear system solution using determinant and matrices, eigenvalues and eigenvectors | |
| **5** | **1402208: Physics of Electricity and Magnetism** | **3** |
| | This course aims to provide the student with the basic fundamental and theories of vector algebra; Electric Fields; Gauss's Law; Electric Potential; Capacitance and Dielectrics; Current and Resistance; Magnetic Fields; Biot-Savart Law. | |
| **6** | **1402203: Electrical Circuits and Systems** | **3** |
| | This course contains electrical circuits' topics on operational amplifiers, magnetically-coupled circuits, and resonance circuits. It also contains transient analysis via the conventional and Laplace method. Fourier series will be used to analyze electrical systems in this course. | |
| **7** | **1402205: Electromagnetic Fields** | **3** |
| | This course aims to provide the student with the basic fundamental and theories of Magnetic field; Magnetic forces & torques; Biot-Savart law; Force between parallel conductors; Ampere's law; Magnetic boundary conditions; Inductance; Magnetic energy; Time Varying Fields: Faraday's Law; Stationary Loop in Time-Varying Magnetic Field; Ideal Transformer; Moving Conductor in Static Magnetic Field; Moving Conductor in a Time-Varying Magnetic Field; Continuity Equation will be attained; Finally, Maxwell's Equations and Hertz's Discoveries ; Plane Electromagnetic Waves; Energy Carried by Electromagnetic Waves. | |
| **8** | **1402306: Electrical Measurements and Instrumentations** | **3** |
| | The course provides students with a background in electrical and electronic measurements and instrumentation. Terms related to electrical measurements are investigated. The function elements of a general measuring instrument are introduced. Principles, limitations, and applications of analog DC and AC ammeters and voltmeters will be studied. Ohmmeters, DC and AC bridges are analyzed. The principle of operation and construction of oscilloscope and function generator will be investigated. Electronic and digital measurement systems will also be given some consideration. | |

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| **9** | **1402210: Electronics I** | **3** |
| | This course introduces semiconductors physics, which are the basics of electronic devices. It also introduces the concepts in the analysis and design of electronic circuits. The subsequent parts of this course are presented in the following order: an introduction to semiconductors physics, the construction of diode and its characteristics and application circuits; the construction of bipolar junction transistors (BJT) and its characteristics; operation modes of BJT; DC and AC analysis of BJT circuits; BJT application and circuits, the construction of field effect transistors (FET) and its characteristics; operation modes of FET; DC and AC analysis of FET circuits, and FET application and circuits. Finally, an explanation of the construction of operational amplifiers with all its configurations and applications | |
| **10** | **1402430: Introduction to Communications** | **3** |
| | This course gives an introduction to communication engineering. It introduces to signals and systems analysis that will be used in analysis and design of communication systems. The course represents linear modulation schemes such as AM, DSB-SC, and SSB. It also reviews angle modulation schemes such as FM and PM modulations. An introduction to sampling theory is included in this course. Some techniques of pulse modulation are represented too such as PAM, PDM, PPM, TDM, and PCM | |
| **11** | **EE 1402340: Principles of Automatic Control** | **3** |
| | This course introduces different concepts in the analysis and synthesis of control systems. The subsequent parts of this course are presented in the following order: an introduction to automatic control systems with various examples of real controlled systems is addressed in the first part, while modeling of these systems by means of transfer functions and signal flow graphs is presented in the second part. The other parts are devoted especially to the stability analysis, the industrial controllers' synthesis and the performance study of automatic control systems in their closed-loop architecture. | |
| **12** | **1402300: Numerical Methods in Engineering** | **3** |
| | This course covers the concepts and techniques for numerical analysis, methods and algorithms, Solution of non-linear equations- solution of large systems of linear equations, Interpolation, Curve fitting, Numerical differentiation and integration, Solution of the Initial value problem of ordinary differential equations. | |
| **13** | **1402360: Electromechanical Energy conversion I** | **3** |
| | This course is presented in the following parts: Theory and modeling of electromechanical devices, Magnetic circuit, Physical construction and applications of D. C. machines, types of dc machines, characteristics of dc machines, Starting and control of dc machines. Construction and applications of power transformers, types of transformer, equivalent circuit of power transformer, regulation and efficiency of transformer, and parallel operation. | |
| **14** | **1402350: Electrical Power System I** | **3** |
| | This course describes the concept of generation, transmission and distribution in Electrical Power System by considering the transmission Line Parameters, Line Model and Performance, Complex Power Flow, Equivalent Circuit, Diagrams and Per unit Systems model. | |
| **15** | **1402204: Digital Design I** | **3** |
| | The course is a study of the basic principle of logic design. It enables the student to apply algebraic and graphical techniques such as Boolean Algebra and Karnaugh Maps among others. A wide variety of devices such a MUX, Decoder, are made handy to the student for designing complex combination networks. Special emphasis on the study of flip-flops memory devices enables the student to design several sequential networks. | |
| **16** | **1402322: Microprocessor and Microcontrollers** | **3** |
| | This is an introductory course in designing microcontroller-based systems. Topics include an overview of a single-chip microcontroller, hardware and software concepts in microcomputers, system architecture, central processing unit (CPU), internal memory (ROM, EEPROM, RAM, | |

| | | |
|---|---|---|
| | FLASH), Input/Output ports, serial communication, programmable interrupts and timers, microcontroller programming model and instruction set, assembly language programming. | |
| **17** | 1402398: Senior Design Project 1 | 2 |
| | The B. Sc. Senior project constitutes the major design experience for students during graduating. Thereby, students must emphasize their knowledge and design principles acquired across their study program and professional competence constructed along their prior years. Furthermore, the EE design senior project continues to 2-semesters and is performed by a small group of students under the supervision of a faculty member. B.SC. Project 1 is the first semester where each group selects one design problem with help of their supervisor. Also the group makes a review of the issues related to this problem and prepares the required materials. | |
| **18** | **1402390: Summer Training** | **2** |
| | The summer training provides an opportunity to expose students to the reality of professional practice. Thus, students are required to spend 8 weeks in training on-site in a manufacturing or service industry under the supervision of an industry-based advisor. Students are required to submit a report presenting details of the work undertaken and the documentation used during the training. | |
| **19** | **1402454: Power systems laboratory** | **1** |
| | Transmission Line Model, Transmission Line at no-load, Faults on Transmission Line, Methods of earthing, Reactive Power Compensation, 3-phase Alternator, Characteristics of isolated alternator, Characteristics of alternator coupled to network, Manual synchronization, Automatic synchronization circuits, Active and reactive power sharing. | |
| **20** | **1402362: Electrical Machines Laboratory** | **1** |
| | No-load and short circuit tests for single phase transformer, Load characteristics of single phase transformer, Different connections for three phase transformer, Voltage build up for dc generator, No-load and load characteristics of dc generator, Study the performance of dc motor under different conditions, Study the performance of synchronous motor under different conditions, V-curves of synchronous motor, No-load and short circuit tests for synchronous generator, Study the performance of induction motor under different conditions, Speed control of induction motor. | |
| **21** | **1402361: Electromechanical Energy conversion II** | **3** |
| | the different subsections of this course are presented in the following order: Construction and principle of operation of synchronous machine, induced emf equation, equivalent circuit for synchronous machine, circle diagram, voltage regulation, and parallel operation for synchronous generators. Construction and principle of operation of induction motor, equivalent circuit for induction motor, starting and speed control of induction motor. | |
| **22** | **1402411: Power Electronics I** | **3** |
| | It is an introductory course to power electronics. It begins with an introduction to power semiconductor devices emphasizing Thyristors and gate drivers. It covers also uncontrolled and controlled rectifiers, AC voltage controllers, DC-DC converters, DC-AC converters and cycloconverters. | |
| **23** | **1402451: Electrical Power System II** | **3** |
| | This course covers the basic definitions of Symmetrical components and analysis of unsymmetrical faults, definition of Load Flow problem, and solution methods (Gauss-Seidel, Newton Raphson and Fast-Decoupled), Power-System Steady-State and Transient Stability problem. | |
| **24** | **1402452: Electrical Power Transmission and Distribution** | **3** |
| | This course presents the transmission line parameters, mechanical design of overhead transmission lines, underground cables, distribution systems. distribution substation design. Surges on transmission systems, System earthing, Load characteristics. | |
| **25** | **1402453: Switchgear and Protection of Power System I** | **3** |
| | This course introduces students with the basic power system protection techniques. It includes the following items, Switchgear, busbar systems, couplers, cubicles, auxiliaries, single line diagram. | |

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|---|---|---|
| | Relays, electromagnetic, digital relay, overcurrent, voltage, directional. Distance relays. Differential relays. Feeder protection. Transformer protection. Generator protection. | |
| **26** | **1402499: Senior Design Project 2** | **2** |
| | This course is designed to give students the experience of integrating the knowledge acquired in the various courses of the undergraduate curriculum to an open-ended problem. Each project is carried out by a group of students in consultation with one or two faculty advisors. The project advisor guides the student in the utilization of the engineering design process in proposal development, defining and limiting project objectives, literature review, contacting representatives of industry, government agency or community institutions, design, procurement of materials, testing and implementation of the project, writing final report and oral presentation to faculty and other interested parties at the end of the semester. | |

| **B – ELECTIVE COURSES FROM EE DEPARTMENT** | | |
|---|---|---|
| **1** | **1402455: Power System Instrumentation and Measurements** | **3** |
| | Principles analog and digital measurements. Power factor meter, Frequency meter, Synchroscope, Measurement of earth resistance, Symmetrical components measurements, Wave analyzer and harmonic distortion analyzer, Localization of cable faults. | |
| **2** | **1402441: Advanced Control Systems** | **3** |
| | The course provides students with the basic principles of deriving equivalent differential equations for mechanical, electrical, and electromechanical systems (Electrical Machines), state-space models, controllability, observability, and transfer functions. Besides, many feedback control syntheses are addressed namely the pole placement control, the state observer-based feedback control, and the optimal control. The stability analysis is also carried out in the Lyapunov framework. Nevertheless, the digital control synthesis, the stability analysis in the Z-plane, and the closed-loop control are provided in the last part of the course. | |
| **3** | **1402456: Power System Transients** | **3** |
| | Transients in lumped circuits, Lightning strokes, shielding, back flashovers, Switching transients and temporary overvoltages, Current interruption in AC circuits, Travelling waves, Transient behavior of synchronous generators, Flicker, bus-transfer, Transients in low-voltage and grounding systems, Surge arresters, Horn gap. | |
| **4** | **1402463: Electromechanical Energy conversion III** | **3** |
| | This course aims to make graduates aware of the basic principles of electrical machine design. The course discusses the different aspects in designing dc machines, three phase salient and non-salient synchronous machines and three phase induction motors. | |
| **5** | **1402412: Power Electronics II** | **3** |
| | DC-DC Converters - Uninterruptible Power Supplies - High Voltage DC Transmission Systems - Static Switches - Static Circuit Breakers - Solid State Relays - Power Factor Improvement - DC Drives - AC Drives. | |
| **6** | **1402457: High Voltage Techniques I** | **3** |
| | The aims of this course are to provide the students with the basic knowledge and skills of high voltage engineering. This course will also provide the students with the high voltage phenomena concerning breakdown mechanism (in gas, liquid and solid) and high voltage generation and measurements (DC, AC and impulse types). Also, basic knowledge of the overvoltage phenomena will be attained. | |
| **7** | **1402458: Economic Operation of Power Systems** | **3** |

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|---|---|---|
| | This course discusses the Operating constraints. Short-term load forecast. Load curve analysis. Economical load sharing between units and between stations, tariffs, and incremental costs. Unit commitment and generator scheduling. Voltage and VAR control. Energy conservation. | |
| **8** | **1402464: Special Electrical Machines** | **3** |
| | Special Electrical Machines; Single-phase induction motors - AC Commutator motors: universal motor, repulsion motor – Synchronous reluctance motors – Switched reluctance motors – Servo motors – Steppers motors. Dynamics of Electrical Drives - Selection of motor power rating. | |
| **9** | **1402465: Electrical Drive Systems** | **3** |
| | This course includes: Introduction to electric drives, Dynamics of electrical drives, Selection of motor power rating, DC motor drives, Induction motor drives, Synchronous motor drives, Solar and battery powered drives. | |
| **10** | **1402442: Programmable Logic Controller and its Applications** | **3** |
| | This course is designed to give students a basic knowledge of Programmable Logic Controller (PLC) and its applications in industry. It covers basic PLC definitions, history, systems and Hardware. In addition, the course presents the different input/output devices such as sensors, transducers, actuators and PLC Interface. PLC programming, Ladder diagram, timers, counters and comparators. Application of PLC programming on industrial processes. | |
| **11** | **1402-459: Energy Efficiency** | **3** |
| | This course contains an introduction to the technologies and their applications used to increase electrical energy efficiency. It also contains the different types of cables, lines and lighting systems. This course includes an overview on the Saudi Building Code. Losses in transformers and electric motors will be detailed in this course. This course contains also the technologies of distributed energy resources and microgrids concept. Power quality will be treated and reactive power compensation methods will be analyzed. | |

| **C - REQUIRED COURSES FROM OTHER ENGINEERING DEPARTMENTS** | | |
|---|---|---|
| **1** | **1403101: Engineering Drawing** | **3** |
| | Introduction: Skills of freehand sketching. Methods of projection: orthographic, isometric. Dimensioning of views. Third view prediction. Primary and successive auxiliary views. Intersections of surfaces and bodies. Development of surfaces. Sectioning. Introduction to assembly drawings and Steel sections. | |
| **2** | **1403111: Basic Workshop** | **2** |
| | Introduction to manufacturing processes. Workshop safety. Engineering materials. Workshop measurements. Bench work. Sand casting process. Metal forming processes and sheet metal working. Metal cutting processes. Joining of materials. | |
| **3** | **1405101: Introduction to Engineering Design** | **2** |
| | This course introduces to the engineering students the basic concepts required for solving real engineering problems by using creative methods. Teamwork tools and skills. Characteristics, environment, and skills necessary for effective problem solving. Problem solving heuristics: Problem definition, generating solutions, Deciding the course of actions, Implementing the solution, Evaluating the solution. Real- Life problem solving. | |
| **4** | **1405202: Engineering Economy** | **2** |
| | Engineering Economy covers various topics, including the time value of money, interest rates, present worth, future worth, annual worth, equivalent uniform annual cost, benefit-cost analysis, and risk analysis. Throughout the course, students will acquire the necessary skills to analyze cash flow series, evaluate different alternatives, allocate costs and capital budgets, and assess the impact of depreciation and inflation on engineering investments. By applying these concepts, students will | |

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| | develop problem-solving abilities specific to engineering contexts. Moreover, they will learn to critically evaluate the economic feasibility of engineering projects. In Engineering Economy, students will gain a comprehensive understanding of the financial aspects associated with engineering decision making. The course provides a solid foundation for students to apply economic analysis techniques to real-world engineering scenarios. | |
| **5** | **1405203: Engineering Management** | **2** |
| | This course introduces engineering management and technology management. Topics covered include the historical development of industrial management, introductory operations management, functions of technology management, planning production activities and managing engineering projects. | |
| **6** | **1405204: Probability and Statistics** | **3** |
| | This course introduces statistics and data description, probability theory, random variables and probability distributions, mathematical expectation, essential discrete and continuous random variables, fundamental sampling distributions, and data analysis techniques for one- and two-sample estimation problems. | |
| **7** | **1405405: Engineering Ethics** | **1** |
| | This course introduces engineering professionalism and ethics. Students will learn about codes of ethics and professional conduct in various engineering disciplines, including NSPE, IEEE, AIChE, ASCE, ASME, and ACM-IEEE/CS. The course will explore the ethical responsibilities of engineers, including their commitment to safety, honesty, and environmental ethics. Students will also examine the role of engineering in social experimentation and in addressing global issues. Workplace responsibilities and rights will be discussed, along with the impact of technological progress on society. Through case studies and ethical dilemmas, students will develop critical thinking skills to identify and analyze ethical issues that arise in engineering practice. By the end of the course, students will be able to apply ethical principles to real-world engineering scenarios and make informed ethical decisions. | |
| **8** | **1404101: Chemistry for Engineering** | **3** |
| | Thermochemistry, gases, liquids, solids, solutions, chemical kinetics, oxidation-reduction reactions and electrochemistry. | |

| **D - REQUIRED COURSES FROM OTHER COLLEGES** | | |
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| **1** | **1104111: Engineering Mathematics I** | **4** |
| | Fundamental functions (polynomials power, trigonometric, logarithmic, exponential, hyperbolic functions), limits, continuity, derivatives, differentiation rules, Inverse functions, inverse trigonometric and hyperbolic functions and their derivatives, L'Hopital rule, the chain rule, implicit differentiations, and finally applications of differentiation (monotonicity, concavity, extrema , sketching the plane curves, cavity , extrema , sketching the plane curves. | |
| **2** | **1101101: General Physics I** | **4** |
| | Study of units and dimensions. Study of vectors and their properties. Motion in different dimensions and projectile motion. Newton's laws with examples involving friction force or without friction force. The study of kinetic and potential energy conservation and the calculation of work and power. Elastic and inelastic collision and the difference between them. The study rigid body rotation. Lab Experiments: Simple pendulum, Verification of Newton's 2nd law, Static and kinetic friction, Projectile motion, Hook's law, Free fall, Force balance table, Rotational motion. | |
| **3** | **1104212: Engineering Mathematics II** | **4** |
| | The indefinite integral, methods of integration (substitutions, parts, trigonometric substitutions, partial fractions.). The definite integral, the fundamental theorem of calculus. Application of definite integral. Parametric equations and polar coordinates. Functions of several variables, limits and continuity, partial derivatives, Multiple integrals: Double integrals over rectangles, general | |

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| | regions, polar coordinates, applications of double integrals. Triple integrals. Change of variables in multiple integrals. | |
| **4** | **1104313: Engineering Mathematics III** | **4** |
| | Basic definitions and construction of an ordinary differential equation, Methods of solving ordinary differential equations of first order, Orthogonal trajectories, and Ordinary differential1equations of higher orders with constant and variable coefficients, Laplace transform. Systems of linear first-order differential equations, Series solutions of linear equations around ordinary and regular singular points (method of Frobenius), Special functions: Gamma, Beta and Bessel functions, Fourier series. | |
| **5** | **1104314: Engineering Mathematics IV** | **3** |
| | This course deals with vector calculus and linear algebra including: Vector algebra, vector fields, vector differentiations (del operator, gradient, divergence, curl, conservative fields and potential functions), Vector integration (Line integrals, Green's theorem, and surface integrals). Matrices and linear systems, determinant, orthogonal projection, linear transformation, Eigen values and Eigenvectors, diagonalization, power of a matrix, differential system. | |