



Al-Farahidi University

Course Catalogue | 2023-2024

دليل المواد

الدراسية



Al-Farahidi University

جامعة الفراهيدي



First Cycle – Bachelor’s Degree (B.Sc.) – Laser and Opto-Electronics
بكالوريوس علوم – هندسة تقنيات الليزر والالكترونيات البصرية



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1. Overview

This catalogue is about the courses (modules) given by the program of Laser and Opto-Electronics Engineering Technologies to gain a Bachelor of Science degree. The program delivers (xx) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة تقنيات البناء والأنشاءات للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (48) مادة دراسية مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

First year

Module 1

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15111 | English skills | 2 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 1 | 0 | 18 | 32 |
| Description | | | |
| <p>1-The aim of this course is to provide English learners with integrated language skills such as reading, listening and writing resulting in a level of basic language knowledge.</p> <p>2-This course will focus on grammar rules, basic word knowledge and usage, reading comprehension, reading out of the lesson, and Paragraph writing.</p> <p>3- A student may be able to listen to native speakers and speak English Language.</p> <p>4- A student may be able to write and have creativity in his writing.</p> | | | |

Module 2

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------|---------------|----------|
| AFU15112 | Calculus | 6 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL |

| | | | (hr/sem) |
|---|---|-----|----------|
| 6 | 2 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand: Dealing with different kinds of equations (curve equation, circle equation and so on) and dealing with several kinds of integrations and differentiations equations. The relation between the variables and constants values. The principle of different spaces. Developing the student abilities to dealing with 1st, 2nd and 3rd orders of equations with single, double, and triple variables. Another purpose was to help the student to develop the logical , orderly processes of thinking which characterizes the engineer .</p> | | | |

Module 3

| Code | Course/Module Title | ECTS | Semester |
|---|---------------------------------------|---------------|---------------|
| AFU15113 | Computer Fundamentals and Programming | 3 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 2 | 1 | 48 | 27 |
| Description | | | |
| <p>To develop the student ability in logical thoughts. Enhance the student skills to determine the problem, select the suitable algorithm, and finally building the correct algorithm. Determination of the suitable software which help the student in the program construction. Select the input method, and as a result the desired output process. Depending on the knowledge of the student with some important basic programming language then the student can re-arrange his thoughts about the problem.</p> | | | |

Module 4

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------|---------------|---------------|
| AFU15114 | Engineering drawing | 4 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| | 6 | 93 | 7 |

| Description |
|--|
| <p>Introducing the fundamentals of engineering drawing to the student so that he can be qualified to express his thoughts, draw & execute the projects related to laser and opto-electronics engineering; As well as aims to:</p> <p>1- Assisting requester in experimenting and creating their design ideas in the two-dimensional environment of electrical drawing and design programs with the help of a computer.</p> <p>2-Take advantage of the technologies provided by AutoCAD to complete many graphic operations quickly and with greater accuracy and present them in a professional manner.</p> <p>3-Teaching the requester how to use the devices associated with the regular drawing programs, and training students to import and export drawings to other compatible programs and how to integrate them with other information for engineering projects.</p> |

Module 5

| Code | Course/Module Title | ECTS | Semester |
|--------------|------------------------|---------------|---------------|
| AFU15115 | Electrical Circuits DC | 8 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 8 | 153 | 47 |

| Description |
|---|
| <p>After successful completion of this course the student will be able to understand: student's knowledge of electrical and electronics components.</p> <p>Demonstrates knowledge of simple connections of the electrical components and satisfying the required circuit output depending on the desired electric circuit design. definition R- resistance, C- capacitor, and L-inductor.</p> <p>The student will be able to dealing with different electrical theories and enhance his skills to dealing with different DC-circuits.</p> <p>definition of several different Laws.</p> <p>Implements the Applications of simple RLC-networks.</p> |

Module 6

| Code | Course/Module Title | ECTS | Semester |
|-----------------|---------------------|---------------|--------------|
| AFU15116 | Laser principles | 6 | 1 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 4 | 6 | 123 | 27 |

| Description |
|-------------|
| |

Definition of LASER – abbreviation.

Explain with very brief ideas the differences between the matters in nature.

Very brief ideas about the laser material construction (valance band, energy gap, and conduction band).

Enhance the student knowledge of the atomic and molecular energy levels.

The differences between atomic particles (electrons and protons) in mobility, charge, mass and so on.

At the end of the course, the student will be able to dealing with different problems which are associated with atoms and molecules which are the principle of laser light generation.

Module 7

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15117 | Arabic Language | 2 | 1 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 1 | | 18 | 32 |
| Description | | | |
| The main goal of this course is to improve the Arabic language skills of students. | | | |

Module 8

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------------|---------------|--------------|
| AFU15121 | Fundamentals of Mathematics | 6 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 6 | 2 | 123 | 27 |
| Description | | | |
| <p>The main goal of this course is:</p> <p>Increase the student abilities to dealing with matrices.</p> <p>Different matrices problems can help the student to dealing with other subjects in the laser and opto-electronics specialized to re-build the optical systems.</p> <p>Increasing the student skills to dealing with the imaginary numbers.</p> <p>Dealing with different theories to increase the student skill in math.</p> <p>Depending on the mathematics the student can use his skill to improve his expectations for some problems in the future.</p> <p>At the end of this course the student can dealing with different optical systems and optics systems.</p> | | | |

Module 9

| Code | Course/Module Title | ECTS | Semester |
|---|--------------------------------|---------------|--------------|
| AFU15122 | Digital fundamentals and logic | 6 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 4 | 4 | 115 | 35 |
| Description | | | |
| <p>The goal of this course is: Definition of the logic systems and digital systems. Construct the student skill to dealing with the digital and logical systems. Increase the student abilities to dealing with some complex systems. The student, at the end of this course will be able to recognizing the differences between the system and determine which it was compatible with the high frequency laser and general lights.</p> | | | |

Module 10

| Code | Course/Module Title | ECTS | Semester |
|--|------------------------|---------------|--------------|
| AFU15123 | Electrical Circuits AC | 8 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 4 | 6 | 143 | 57 |
| Description | | | |
| <p>The main goal of this course is: Teaching the students, the importance of the AC electric systems. Building students capabilities to dealing with different kinds of complex components networks. Expanding the student's perceptions about the AC generators and its relations with the laser generators. Training the student to discover the AC-circuits problems and fixing it. At the end of this course the student will be able to dealing with different kinds of power supplies and generators.</p> | | | |

Module 11

| Code | Course/Module Title | ECTS | Semester |
|-----------------|---------------------|---------------|--------------|
| AFU15124 | Laser Physics | 6 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |

| | | | |
|--|---|-----|----|
| 4 | 4 | 115 | 35 |
| Description | | | |
| <p>The main goal of this course is: Explain some important physical phenomenon such as the electro-optic phenomenon and explain its importance and relation to the student. Enstine's parameters and its relations with construction of lasers. The electron transformations between different energy levels. What is the importance of electron transitions between the energy levels of the atoms and molecules and its relation with temperature variations At the end of the course the student can able to understand the most basics of laser physics phenomenon.</p> | | | |

Module 12

| Code | Course/Module Title | ECTS | Semester |
|--|----------------------------|---------------|--------------|
| AFU15125 | Democracy and Human Rights | 1 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 1 | 0 | 17 | 8 |
| Description | | | |
| <p>The main goal of this course is: Definitions of the most popular laws of the democracy and democratic systems around the world. The first democratic political system in the world is the ISLAMIC system. The human rights around the world. At the end of the course the student can be able to determine the nature of the organization policy.</p> | | | |

Module 13

| Code | Course/Module Title | ECTS | Semester |
|---|---------------------|---------------|--------------|
| AFU15126 | Workshop Technology | 3 | 2 |
| Lectures (hr/w) | Lab./Prac./Tutor. | SSWL (hr/sem) | USSWL (hr/w) |
| 0 | 5 | 73 | 2 |
| Description | | | |
| <p>This course gives rise of the student's skills in dealing with different kinds of maintains of circuits.</p> | | | |

Training the student to understanding the device general ideas, jobs and operations.
Giving the student the required skill to dismantling the required device with the selection of the suitable tools and re-constructing it.

Second year**Module 14**

| Code | Course/Module Title | ECTS | Semester |
|---|-------------------------------|---------------|---------------|
| AFU15211 | Computer Programming Language | 4 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 2 | 4 | 93 | 7 |
| Description | | | |
| <p>To develop the student ability in logical thoughts. Enhance the student skills to determine the problem, select the suitable algorithm, and finally building the correct algorithm. Determination of the suitable software which help the student in the program construction. Select the input method, and as a result the desired output process. Depending on the knowledge of the student with some important basic programming language then the student can re-arrange his thoughts about the problem.</p> | | | |

Module 15

| Code | Course/Module Title | ECTS | Semester |
|--|----------------------------|---------------|---------------|
| AFU15212 | Application of Mathematics | 6 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 6 | 2 | 123 | 27 |
| Description | | | |
| <ol style="list-style-type: none"> To develop problem solving skills and understanding of mathematical Equations through the application of techniques. The ability to apply knowledge in mathematics, science, and engineering. To understand Differential Equations, Double Integrals and Triple Integrals, etc. To understand Polar Coordinates and Special Functions problems. <p>To Sketching of Geometric Shapes</p> | | | |

Module 16

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15213 | Electronics | 6 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <ol style="list-style-type: none"> 1- To review the fundamental concepts of physics to form the basis for engineering subjects taught subsequently. 2- To provide an introduction to the fundamentals of electronic materials in general and the semiconductors materials in special case. <p>To understand the general principles concept of electronic devices which is utilized in electronic circuits.</p> | | | |

Module 17

| Code | Course/Module Title | ECTS | Semester |
|---|-------------------------------|---------------|---------------|
| AFU15214 | Static Electromagnetic Fields | 4 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>This course introduces the student to the fundamentals of static electric and magnetic fields. Topics covered include:</p> <ol style="list-style-type: none"> 1. electric force field due to elementary stationary charge, 2. the magnetic force field due to electric charge moving at uniform velocity, 3. electric and magnetic forces, 4. stored electric and magnetic energy, 5. potential, i.e., voltage, 6. power loss, 7. the meaning of capacitance, resistance, and inductance, | | | |

8. electrical properties and characterization of materials (conductors, insulators and magnetic materials),

9. mathematical formulation of the physical laws governing electromagnetic fields in the time-independent case,

10. the mathematics of vector analysis: vector algebra, orthogonal coordinate systems (rectangular, cylindrical and spherical) and vector calculus (integration, differentiation, del-operator, gradient, divergence, and curl).

Module 18

| Code | Course/Module Title | ECTS | Semester |
|---|-----------------------|---------------|---------------|
| AFU15215 | Probability Theory | 4 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>The goal of this course is to provide B.Sc. students with knowledge and understanding of fundamental aspects of random variables in one and several dimensions, conditional probabilities, probability generating and characteristic functions. The multivariate normal distribution and distributions of order statistics and quadratic forms, criteria for series of random variables, the Borel-Cantelli lemma, convergence through transforms, the law of large numbers, the central limit theorem and Cramér-Slutsky's theorem.</p> | | | |

Module 19

| Code | Course/Module Title | ECTS | Semester |
|---|-----------------------|---------------|---------------|
| AFU15216 | Optics | 6 | 3 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> | | | |

- The course deals with the geometrical analysis of the optical systems via studying the Fermat principle , Analytical and matrix ray tracing methods , Optical instruments , Human eye , correction of human eye errors, Aberrations.

Module 20

| Code | Course/Module Title | ECTS | Semester |
|---|-----------------------|---------------|---------------|
| AFU15221 | Advanced Mathematics | 6 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 6 | 2 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <ol style="list-style-type: none"> • To understand and use Vector and vector analysis • To understand and use Matrices • To understand and use Multiple integrals | | | |

Module 21

| Code | Course/Module Title | ECTS | Semester |
|--|--------------------------------|---------------|---------------|
| AFU15222 | Dynamic Electromagnetic Fields | 4 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <ol style="list-style-type: none"> To provide a comprehensive understanding of the fundamental concepts and principles of magnetic fields, boundary condition and Maxwell's equations. To develop the ability to analyze and solve problems related to electromagnetic fields. To enhance critical thinking skills in applying electromagnetic field theory to practical engineering applications. To foster an appreciation for the importance of electromagnetic fields in various disciplines of engineering and science. | | | |

Module 22

| Code | Course/Module Title | ECTS | Semester |
|---|--------------------------|---------------|---------------|
| AFU15223 | Electronics applications | 6 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <ol style="list-style-type: none"> 1- To review the main applications of the most important electronic devices like diodes and transistors. 2- To understand the general principles and concepts of electronic circuits for various applications and their utilization in our lives. 3- To can be able for designing un electronic circuits for different requirement applications | | | |

Module 23

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15224 | Digital Techniques | 6 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <p>The student will be able to</p> <ul style="list-style-type: none"> • understand the basic element for memory cell. • understand the operation and the function of RS, Jk, D anf T flip flop. • Explore the shift register. • Introduce different types of the counters. | | | |

Module 24

| Code | Course/Module Title | ECTS | Semester |
|--------------|-------------------------|---------------|---------------|
| AFU15225 | Laser Detection Systems | 4 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |

| Description | |
|--------------------|--|
| 1. | To develop problem solving skills and understanding of circuit theory through the application of techniques. |
| 2. | To understand voltage, current and power from a given circuit. |
| 3. | This course deals with the basic concept of electrical circuits. |
| 4. | This is the basic subject for all electrical and electronic circuits. |
| 5. | To understand Kirchhoff's current and voltage Laws problems. |
| 6. | To perform mesh and Nodal analysis. |

Module 25

| Code | Course/Module Title | ECTS | Semester |
|---|------------------------------|----------------------|----------------------|
| AFU15226 | Signals and Systems | 4 | 4 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <p>1- An ability to classify signals (e.g., periodic, even) and systems and an understanding of the difference between discrete and continuous time signals and systems.</p> <p>2- An ability to determine the impulse response of a differential or difference equation.</p> <p>3- An ability to determine the response of linear systems to any input signal by convolution in the time domain.</p> <p>4- An ability to understand the definitions and basic properties of Fourier series, Fourier transforms.</p> <p>5- An ability to determine the response of linear systems to any input signal.</p> <p>6- An ability to apply the Sampling theorem, reconstruction, aliasing, and Nyquist's.</p> | | | |

Third year**Module 26**

| Code | Course/Module Title | ECTS | Semester |
|---------------------|------------------------------|----------------------|----------------------|
| AFU15311 | Digital Applications | 6 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 5 | 138 | 12 |
| Description | | | |

After successful completion of this course the student will be able to understand:
 The target of the course "Digital application" is the in-depth understanding of the theory for designing synchronous and asynchronous sequential digital circuits. It deals with the methodologies of analysis and design of registers and counters along with the design at Register Transfer Level (RTL). In addition, it studies the basic memory structures (RAM, ROM) and programmable logic structures (PAL, PLA, PLD, FPGA). Upon the completion of the course, the student will have understood in details the theory and the main issues for designing sequential circuits and will be able to apply techniques and methods to: a) analyze the operation and b) design (states reduction and assignment) synchronous sequential circuits. Moreover, they will be able to: a) analyze the operation of asynchronous sequential circuits and b) to apply methods and techniques for designing asynchronous sequential circuits avoiding races and hazards.

Module 27

| Code | Course/Module Title | ECTS | Semester |
|---|-------------------------------------|---------------|---------------|
| AFU15312 | Electronic Applications Advanced | 6 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| After successful completion of this course the student will be able to understand: 1-Fundamental aspect of power electronics circuits and devices. <ul style="list-style-type: none"> To understand and use power electronics devices understanding of operating and commutation methods of power To develop problem solving skills for protection of power electronic circuits This is the basic subject for all electrical and electronic circuits | | | |

Module 28

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------|---------------|---------------|
| AFU15313 | Optoelectronics | 4 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| - | | | |

Module 29

| Code | Course/Module Title | ECTS | Semester |
|--|------------------------------|----------------------|----------------------|
| AFU15314 | Engineering Analysis | 4 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>After successful completion of this course the student must know the advanced theories in mathematics & its applications in construction engineering .</p> <ol style="list-style-type: none"> 1- Providing the student with basic information in engineering analyzes and qualifying him 2- Familiarity with the formulation of physical issues and put them in a mathematical framework and within the field of specialization 3- The ability to solve the topic in numerical ways that cannot be solved analytically | | | |

Module 30

| Code | Course/Module Title | ECTS | Semester |
|--|------------------------------|----------------------|----------------------|
| AFU15315 | Communication Theory | 6 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <ol style="list-style-type: none"> 1. Understand the Basics of Analog Communications: Familiarize yourself with the fundamental concepts of analog communication systems, including modulation, demodulation, and transmission of analog signals. 2. Study Analog Modulation Techniques: Learn various analog modulation techniques, such as amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM), and their applications in analog communication. 3. Explore Analog Signal Processing: Understand the principles of analog signal processing, including filtering, amplification, and frequency conversion, as they relate to analog communication systems. 4. Investigate Noise and Interference: Learn about the effects of noise and interference on analog communication signals and techniques for mitigating their impact, such as signal-to-noise ratio (SNR) improvement and bandwidth management. 5. Understand Analog Transmission Systems: Study the characteristics of analog transmission systems, including bandwidth, power, and distortion, and their impact on | | | |

signal quality and transmission range.

6. Analyze Analog Communication Performance: Learn techniques for analyzing and evaluating the performance of analog communication systems, including signal quality metrics, frequency response, and distortion measurements.

7. Explore Analog Modems and Modulation Standards: Understand the principles and operation of analog modems and their role in connecting analog communication devices. Study modulation standards such as V.34 for dial-up modems.

8. Investigate Analog Communication Channels: Understand different types of analog communication channels, including guided media (twisted pair, coaxial cable) and wireless media (radio frequency, microwave).

9. Learn Analog Communication Protocols: Study analog communication protocols, including analog telephony protocols (such as PSTN) and analog broadcast standards (such as AM and FM radio)

Module 31

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------|---------------|---------------|
| AFU15316 | Quantum Mechanics | 4 | 5 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |

Description

The quantum mechanics course aims to introduce the student to the basic topics related to both the atom and the molecule, as indicated in the following points:

1. Introduce the student to the general basics of the components of the atom and the most important theories that have been developed to achieve this goal
2. Introduce the student to the most important developments that have occurred in the theories used to describe the Atomic State.
3. Enable the student to use those theories and theoretical and practical explanations for them
4. Train the student to use the laws of theories and general ideas of physical explanations in order to use them as tools in the processes of atomic analysis of other phenomena at the same level.
5. Teaching the student, the method of spectral reading of atomic products obtained by solving some mathematical problems
6. Train the student to interpret the physical phenomena that occur in the surrounding environment and which cannot be seen by eye but can be felt.
7. Increase the student's intellectual knowledge and support it in the process of logically mathematically interpreting physical phenomena.

Module 32

| Code | Course/Module Title | ECTS | Semester |
|---|-----------------------------------|---------------|---------------|
| AFU15321 | Communication Circuits & Networks | 6 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <ol style="list-style-type: none"> 1. Understand the Basics of Digital Communication: Familiarize yourself with the fundamental concepts of digital communication systems, including the advantages of digital transmission over analog transmission. 2. Study Digital Modulation Techniques: Learn various digital modulation techniques, such as amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), and quadrature amplitude modulation (QAM). 3. Explore Channel Coding and Error Detection/Correction: Understand the importance of channel coding in digital communication systems and learn about error detection and correction techniques, such as parity checking, cyclic redundancy check (CRC), and forward error correction (FEC) codes. 4. Investigate Source Coding and Compression: Study source coding techniques, such as Huffman coding and arithmetic coding, used for data compression in digital communication systems. 5. Analyze Digital Transmission Systems: Analyze the performance of digital transmission systems in terms of signal-to-noise ratio (SNR), bit error rate (BER), and bandwidth efficiency. 6. Learn about Multiplexing Techniques: Understand multiplexing techniques, such as time-division multiplexing (TDM) and frequency-division multiplexing (FDM), used to transmit multiple signals over a shared medium. 7. Explore Digital Modems and Modem Standards: Study digital modems and the standards used for digital communication, such as V.92, V.34, and DSL (Digital Subscriber Line) standards. 8. Investigate Digital Communication Channels: Understand different types of digital communication channels, including guided media (twisted pair, coaxial cable, optical fiber) and wireless media (radio frequency, microwave, satellite). 9. Explore Digital Communication Protocols: Study digital communication protocols, including Ethernet, TCP/IP, and wireless communication protocols (Wi-Fi, Bluetooth). 10. Analyze Digital Communication System Performance: Learn techniques for analyzing and evaluating the performance of digital communication systems, including the calculation of bit error rate, throughput, and latency. | | | |

Module 33

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15322 | Control Theory | 4 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <ol style="list-style-type: none"> Learn the process of modeling linear time-invariant (LTI) dynamical systems in dual domains: in the time domain using ordinary differential equations and in the Laplace domain (s-domain). Understand the behavior of LTI systems qualitatively and quantitatively, both in the transient and steady-state regimes, and appreciate how it impacts the performance of electro-mechanical systems. Introduce feedback control and understand, using the s-domain primarily, how feedback impacts transient and steady-state performance. Learn how to design proportional, proportional-integral, proportional-derivative, and proportional-integral-derivative feedback control systems meeting specific system performance requirements. Introduce qualitatively the frequency response of LTI systems and how it relates to the transient and steady-state system performance. | | | |

Module 34

| Code | Course/Module Title | ECTS | Semester |
|--|-----------------------|---------------|---------------|
| AFU15323 | Wave Propagation | 4 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <ol style="list-style-type: none"> Application of Maxwell's equations to practical situations Understand how electromagnetic waves propagate in unguided and guides media and through interfaces Understand the concept of impedance Understand how the electromagnetic waves are generated and received by antennas | | | |

Module 35

| Code | Course/Module Title | ECTS | Semester |
|------|---------------------|------|----------|
|------|---------------------|------|----------|

| | | | |
|---|------------------------------|----------------------|----------------------|
| AFU15324 | Numerical Analysis | 6 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <ol style="list-style-type: none"> 1. Develop numerical methods. 2. Develop mathematical tools to study the error involved in the numerical solution when compared to the exact solution of the mathematical problem. 3. Provides the basic techniques for the efficient numerical solution of problems in science and engineering, such as root finding, interpolation, approximation of functions, integration, differential equations, direct and iterative methods in linear algebra. 4. Offers an advanced introduction to numerical analysis, with a focus on accuracy and efficiency of numerical algorithms, such as sparse-matrix/iterative and dense-matrix algorithms in numerical linear algebra (for linear systems and Eigen problems), floating-point arithmetic, backwards error analysis, conditioning, and stability. 5. Presents advanced computational topics such as numerical integration or nonlinear optimization. | | | |

Module 36

| | | | |
|--|------------------------------|----------------------|----------------------|
| Code | Course/Module Title | ECTS | Semester |
| AFU15325 | Spectroscopy | 4 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>At the end of this module students will have:</p> <ul style="list-style-type: none"> • an understanding of advanced spectroscopy and concepts in and catalysis. • developed written and verbal communication skills in small group tutorials and workshops. • applied the principles taught in the module to solve unseen problems in small group tutorials and workshops • developed new and existing laboratory skills. • performed data analysis using a range of software. • developed scientific writing skills. | | | |

Module 37

| | | | |
|-------------|----------------------------|-------------|-----------------|
| Code | Course/Module Title | ECTS | Semester |
|-------------|----------------------------|-------------|-----------------|

| | | | |
|--|-------------------------------|----------------------|----------------------|
| AFU15326 | Laser Industrial Applications | 6 | 6 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 37 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <ul style="list-style-type: none"> • 1- Construct energy level diagrams of the fine structure of hydrogen and hydrogen-like ions. • Describe the origin of sub-shells, terms and multiplets for atoms with two or more electrons not in closed sub-shells. • Describe molecular energy levels, including vibrational and rotational levels. • Derive the relationship between the Einstein coefficients. • Determine a general formula for laser gain in a generalised four-level laser. • Derive an expression for Doppler broadening of a line profile. • Describe mode locking of a laser cavity. • Describe the operation of helium-neon and carbon dioxide lasers. • Describe how lasers can be used to cool atoms to form, for example, Bose-Einstein condensates.. | | | |

Fourth year**Module 38**

| | | | |
|-----------------------------|------------------------------|----------------------|----------------------|
| Code | Course/Module Title | ECTS | Semester |
| AFU15411 | Final Year Project | 4 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| | 6 | 93 | 7 |
| Description | | | |
| Projects in especial topics | | | |

Module 39

| | | | |
|---------------------|------------------------------|----------------------|----------------------|
| Code | Course/Module Title | ECTS | Semester |
| AFU15412 | Optical Fibers | 6 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |

| Description |
|---|
| <p>This course aims to enable the student to:</p> <ol style="list-style-type: none"> 1. Identify the types of building optical communication systems and their main components. 2. Identifying the principle of work, types of optical fibers and their practical specifications. 3. Identify the types and characteristics of fiber optic cables and their various applications. 4. Identifying transmission problems via optical fibers and methods of calculating them. 5. Studying the problems and obstacles that appear when connecting optical fibers. 6. Studying the main types of optical sources and detectors and identifying their characteristics. 7. Identify the measurement processes used in optical communication systems and the necessary equipment for that. |

Module 40

| Code | Course/Module Title | ECTS | Semester |
|--|------------------------------|---------------|---------------|
| AFU15413 | Advanced Control Engineering | 6 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <ol style="list-style-type: none"> 1. provide an advanced education in control and systems engineering. 2. emphasizing modern theoretical developments and their practical application 3. give a sound fundamental understanding of the principles underlying the operation of control systems 4. enable students to apply modern control principles in various areas of industry. | | | |

Module 41

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------------------|---------------|---------------|
| AFU15414 | Digital Signal & Image Processing | 6 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |

1. To develop problem solving skills and understanding of circuit theory through the application of techniques.
2. To understand voltage, current and power from a given circuit.
3. This course deals with the basic concept of electrical circuits.
4. This is the basic subject for all electrical and electronic circuits.
5. To understand Kirchhoff's current and voltage Laws problems.
6. To perform mesh and Nodal analysis.

Module 42

| Code | Course/Module Title | ECTS | Semester |
|---------------------------------------|-----------------------|---------------|---------------|
| AFU15415 | Professional Ethics | 2 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 2 | | 33 | 17 |
| Description | | | |
| Introduction to ethics of engineering | | | |

Module 43

| Code | Course/Module Title | ECTS | Semester |
|--|-------------------------|---------------|---------------|
| AFU15416 | Laser Design Technology | 6 | 7 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 6 | | 93 | 57 |
| Description | | | |
| The development of modern laser system represents a multidisciplinary effort. Based on the performance goals, the design of a new laser system typically starts with a laser physicist defining the system configuration and architecture. This conceptual effort is followed by a detailed optical and mechanical design of the laser components in parallel with the design of the analog and digital subsystems | | | |

Module 44

| Code | Course/Module Title | ECTS | Semester |
|--------------|-----------------------|---------------|----------|
| AFU15421 | Final Year Project | 4 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL |

| | | | |
|-----------------------------|---|----|-----------------|
| | | | (hr/sem) |
| | 6 | 93 | 7 |
| Description | | | |
| Projects in especial topics | | | |

Module 45

| Code | Course/Module Title | ECTS | Semester |
|---|------------------------------|----------------------|----------------------|
| AFU15422 | Medical laser applications | 6 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |
| <p>After successful completion of this course the student will be able to understand:</p> <ul style="list-style-type: none"> • 1 Give pupils the fundamental knowledge they need to comprehend science's fundamental concepts. • 2. Educating pupils on the attributes and applications of laser concepts. • 3. Giving pupils the most crucial overarching goals in professional ethics and the fundamental sciences. • • 4- The pupil must be able to use vocabulary and basic grammar in science. • 5. Understanding of current academic and scientific courses and sources. • Sixth, the student must be able to work with scientific systems.. • Determine a general formula for laser gain in a generalised four-level laser. • Derive an expression for Doppler broadening of a line profile. • Describe mode locking of a laser cavity. • Describe the operation of helium-neon and carbon dioxide lasers. • Describe how lasers can be used to cool atoms to form, for example, Bose-Einstein condensates.. | | | |

Module 46

| Code | Course/Module Title | ECTS | Semester |
|---------------------|------------------------------------|----------------------|----------------------|
| AFU15423 | Optical system & Signal Processing | 6 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |

| Description | |
|--|--|
| <ol style="list-style-type: none"> 1. To do practical optical system design 2. Learn design methods and applications 3. An emphasis in applications for optical engineering. 4. Simulation of Optical System Components: Simulate different optical components such as sources, fibers, detectors, and amplifiers. Explore the characteristics and parameters of each component in the software. 5. Design and Analysis of Optical Communication Systems: Design and simulate various optical communication system configurations using Optisystem. Analyze the performance of different system setups in terms of signal quality, power budget, and data rate. | |

Module 47

| Code | Course/Module Title | ECTS | Semester |
|---|------------------------|---------------|---------------|
| AFU15424 | Plasma & Gas discharge | 4 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>Plasma and gas discharge aims to put the student in front of one of the biggest challenges that he may face during his work, whether in the labor market or teaching at universities, and some important points can be identified as follows:</p> <ul style="list-style-type: none"> * Plasma is one of the main products of the process of interaction of high-power radiation (such as a laser) with matter. * Plasma can be diagnosed through a plasma detector or what is known as (plasma probe). * Due to the fact that plasma is composed of particles of a charged nature, we expect that it is affected by the electric and magnetic fields. * Plasma behaves as a single charged particle or behaves collectively. | | | |

Module 48

| Code | Course/Module Title | ECTS | Semester |
|--------------|-------------------------------|---------------|---------------|
| AFU15425 | Computer Interface & Networks | 6 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | 4 | 123 | 27 |
| Description | | | |

1. To introduce the basic concepts related computer networks.
2. To overview the layers of the most common models of computer networks.
3. To present the main concerns of the Physical Layer of the OSI reference model.
4. To detail Ethernet and Wi-Fi as two of the most important Data-link Layer protocols.
5. To cover the details regarding IPv4 as the most important Network Layer protocol.
6. To illustrate in details TCP and UDP as the most common Transport Layer protocols.
7. To give brief description about the most common services, protocols and applications of the Application Layer.

Module 49

| Code | Course/Module Title | ECTS | Semester |
|---|-----------------------------|---------------|---------------|
| AFU15426 | Nano fabrication technology | 4 | 8 |
| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/sem) |
| 4 | | 63 | 37 |
| Description | | | |
| <p>Nanomaterial manufacturing technologies aims to create a generation that keeps pace with modernity and the wheel of progress and rapid scientific development in the world. The most important objectives of this article are the following:</p> <ol style="list-style-type: none"> 1. To inform the student about the latest findings of science in the world 2. Expanding the student's understanding that science is not limited only to previous classical theories, but there are updates to these theories and applications have been created for them in advanced international laboratories 3. Familiarizing the student with the most important findings of the modern world of theories related to the material and the great benefits (regardless of the type of benefit) and what the process of development produces in the high scientific concept 4. Training the student on the use of important and basic tools in the process of checking raw materials and distinguishing them from materials manufactured by nanotechnology 5. Adopting sound scientific tracks in the processes of studying surfaces of nanomaterials and diagnosing defects in them 6. Clarify the basic idea of the material and its main purpose in order to understand the general concept of the material and in this case the material is made easy on the student's mind | | | |

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