**Modules Catalogue|  2023-2024  دليل الموادالدراسية**

**Ninevah University**

First Cycle–Bachelor's Degree (B.Sc.)-Electrical Engineering

بكالوريوس هندسة الكترونيك

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# 1. Overview

This catalogue is about the courses (modules) given by the program of Electronic Engineering to gain the 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.

نظره عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة الالكترونيك للحصول على درجة بكالوريوس العلوم .يقدم البرنامج ) (٤٠مادة دراسية، على سبيل المثال، مع ) (٦٠٠٠إجمالي ساعات حمل الطالب و ٢٤٠إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

# 2. Undergraduate Courses 2023-2024

**Module 1**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI215 | DC Circuit Analysis | 4 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/3/0/1 | 109 | 67 |

**Description**

This course will provide an overview of fundamental concepts necessary to work with electrical circuits including: electron theory; conductors; insulators; direct current; voltage; resistance; Ohm's law; resistors in series; parallel and series/parallel; distribution of voltage and current; voltage and current divider rules; electrical power; and Kirchhoff's laws.

Also, it will provide theoretical background in the following topics: distribution of voltage and current in series/parallel DC networks; advanced methods of circuit analysis for DC circuits such as source conversion, superposition, Nodal and Mesh analysis and Thevenin theorem.

**Module 2**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI206 | Mathmatics I | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/3//1 | 58 | 76 |

**Description**

The Differentiation and Integration course is designed to provide students with a comprehensive understanding of the fundamental concepts, techniques, and applications of differential and integral calculus. Throughout the course, students will explore the concepts of differentiation and integration, which are two fundamental operations in calculus. Differentiation focuses on the study of rates of change, while integration deals with the accumulation of quantities. These concepts are interconnected and form the foundation for solving problems involving functions, equations, and mathematical modeling.

The course will begin with a review of basic algebraic functions and their properties. From there, students will delve into the fundamental principles of differentiation, including the concept of limits,

differentiation rules, and the application of derivatives in analyzing the behavior of functions. Topics such as rates of change, optimization, curve sketching, and related rates problems will be covered.

The course will then shift its focus to integration and the fundamental theorem of calculus. Techniques of integration, such as substitution, integration by parts, and partial fractions, will be explored .

Throughout the course, students will engage in problem-solving activities, both theoretical and practical, to develop their analytical and critical thinking skills.

**Module 3**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI218 | Physical Electronics | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 46 | 65 |
| **Description** | | | |

This course deals with the theorical study and investigation of semiconductor devices structure and formation, and laws governing the characteristics and specifications of electronic devices. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving mathematically various simple device applications. To follow successfully this subject the students have to be familiar with basic theory of semiconductor physics.

The semiconductor devices course covers and focus on the most important behavior of semiconductor devices including the formation of pn junction diode, diode characteristics, and electronic equivalent circuit. Also a rectifier circuits are considered as a basic application of diodes.

At the end of this course the students have to be gained a good knowledge and understanding in theorical and mathematical solution to semiconductor diode characteristic, performance, and rectifier application that results in a different characteristic and specification.

**Module 4**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 214 | Computer Science | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 60 | 65 |
| **Description** | | | |

The Computer Science Course covers a wide range of topics related to personal computer architecture and operating systems. The course begins with a general overview of personal computer architecture,

focusing on components such as computer peripherals (keyboard, screen, mouse) and storage media. Students learn about computer busses, ports, and interfaces, gaining an understanding of how devices communicate and interact with the computer.

The course then delves into the fundamentals of the MSDOS operating system, exploring both internal and external commands. Students become familiar with using the text editor and learn how to navigate and manipulate files and directories within the MSDOS environment.

Another significant portion of the course is dedicated to an overview of the Windows operating system. Students learn essential skills such as customizing the Windows desktop, launching programs, file management (creating, deleting, copying, moving, and searching), and utilizing various Windows utilities like "My Computer," "My Documents," and the help facility. They also gain proficiency in using the Windows Control Panel and accessing Windows accessories like Paint, Notepad, and WordPad.

Furthermore, students are introduced to the Microsoft Word and Excel applications, developing skills in word processing and spreadsheet management. The course concludes with a focus on connecting to the internet and using the Windows Explorer for online browsing and file management.

Overall, this course equips students with a comprehensive understanding of personal computer architecture, operating systems, and essential software applications, enabling them to navigate and utilize computers effectively in various contexts.

**Module 5**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 203 | Mechanical engineering principles | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 44 | 81 |
| **Description** | | | |

The Mechanical Engineering Principles course provides students with a comprehensive understanding of the fundamental principles, concepts, and applications of mechanical engineering. This course serves as an introduction to the diverse and multidisciplinary field of mechanical engineering, covering topics ranging from mechanics and materials to thermodynamics and design.

Throughout the course, students will explore the core components of mechanical engineering, including statics, dynamics, mechanics of materials, and fluid mechanics. They will learn how to analyze and solve engineering problems involving forces, motion, stresses, and deformations in mechanical systems.

By the end of the course, students will have a solid foundation in mechanical engineering principles. They will be equipped with analytical

and problem-solving skills, an understanding of engineering materials, and the ability to analyze and design mechanical systems. Additionally, students will develop critical thinking abilities and the capacity to work effectively in multidisciplinary engineering teams.

**Module 6**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NV12 116 | Technical English | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/0 | 30 | 70 |
| **Description** | | | |
| The Scientific English Language course is designed to equip students with the necessary language skills and communication strategies required for effective scientific communication in academic and professional settings. This course serves as a platform for enhancing English language proficiency specifically tailored for scientific and technical fields.<br>Throughout the course, students will focus on developing skills in reading, writing, listening, and speaking with a specific emphasis on scientific topics and terminology. They will learn to comprehend and critically analyze scientific literature, including research papers, articles, and technical reports. | | | |

**Module 7**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 216 | AC Circuit Analysis | 4 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/3/0/1 | 102 | 67 |
| **Description** | | | |
| This course will provide an overview of fundamental concepts of an AC current and voltage to work with an AC electrical circuits.<br>Also, it will provide theoretical background in the following topics: distribution of voltage and current in series/parallel DC networks; advanced methods of circuit analysis for DC circuits such as source conversion, superposition, Nodal and Mesh analysis and Thevenin theorem. alternating current and voltage; sine wave form | | | |

and values; capacitors or inductors in DC/AC circuits, energy storage and time constant; phase relationship; complex numbers; polar/rectangular conversions; vector representation; alternating current RL, RC and RLC series circuits. Also, it will provide an overview of circuit analysis techniques for AC circuits including the following topics: AC series, parallel and series/parallel circuit analysis; phasors; Kirchhoff's Law; network theorems; AC power, maximum power transfer, power factor and power factor correction; resonance; polyphase systems: delta-wye connections, three-phase voltage/current/power, vector representation, and balanced and unbalanced three-phase loads; magnetic circuits; transformers; and mesh and nodal analysis.

**Module 8**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 207 | Mathematics II | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/0/0/1 | 58 | 76 |
| **Description** | | | |
| The Mathematics: Concepts and Applications course provides students with a solid foundation in mathematical principles, problem-solving techniques, and their practical applications. This course serves as an introduction to the diverse and fundamental concepts of mathematics, essential for various academic disciplines and everyday life.<br>Throughout the course, students will explore topics such as algebra, geometry, trigonometry, and calculus. They will develop a strong understanding of mathematical operations, equations, functions, and their graphical representations.<br>The course will cover fundamental mathematical concepts, including number systems, algebraic expressions, equations, inequalities, geometric properties, and geometric transformations. Students will learn to apply mathematical principles to solve real-world problems, analyze patterns, and make informed decisions. | | | |

**Module 9**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 219 | Physics of Semicondutor | 3 | 2 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 2 | 0/0/0/1 | 46 | 65 |

**Description**

This section includes a description of the module, 100-150 words This course concentrate on semiconductor devices especially the pn junction diode structure, operation and its applications. A theorical study and investigation of semiconductor pn junction diode properties and behavior, structure and formation, and laws governing the characteristics and specifications of electronic devices. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving mathematically various simple device applications. To follow successfully this subject the students have to be familiar with basic theory and principle of semiconductor physics.

The semiconductor devices course covers and focus on the most important behavior of diode operation, characteristics, and its applications. This include the most important application as rectifier circuit governing these components are studied and analyzed.

At the end of this course the students have to be gained a good knowledge and understanding in theorical and mathematical solution to diode principle of operation and its applications.

**Module 10**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 217 | Digital Techniques | 3 | 2 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 2 | 0/2/0/1 | 74 | 65 |

**Description**

Digital Techniques is a comprehensive course that provides students with a solid foundation in the fundamental concepts and practical applications of digital systems. This course aims to equip students with the knowledge and skills necessary to design, analyze, and implement digital circuits and systems using modern digital logic techniques.

Throughout the course, students will explore a wide range of topics related to digital techniques, including Boolean algebra, logic gates, combinational and sequential circuits, number systems, arithmetic operations, and digital logic families. The course will also delve into more advanced concepts such as memory systems, programmable logic devices, and digital system design using hardware description languages (HDLs).

**Module 11**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 201 | Engineering Drawing | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/0 | 44 | 81 |

**Description**

Engineering Drawing is a comprehensive course that aims to provide students with the necessary skills and knowledge to create accurate and detailed technical drawings used in various engineering disciplines. This course emphasizes the principles, techniques, and standards of engineering drawing, enabling students to effectively communicate and visualize engineering designs.

Throughout the course, students will learn the fundamental concepts of engineering drawing, including orthographic projection, isometric projection, and auxiliary views. They will gain proficiency in sketching, dimensioning, and creating multiview drawings of machine parts, assemblies, and structures. Additionally, students will explore the principles of geometric dimensioning and tolerancing (GD&T), which are essential for conveying precise engineering specifications.

The course will utilize industry-standard computer-aided design (CAD) software to facilitate the creation and modification of engineering drawings. Students will learn how to effectively use CAD tools to produce accurate and professional-looking drawings, enabling them to improve their design efficiency and productivity.

**Module 12**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NV12 | Human Rights and Democratic | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tut or** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/0 | 32 | 43 |

**Description**

The Human Rights and Democratic Governance course offers an interdisciplinary exploration of the principles, theories, and practices related to human rights, democracy, and governance. This course aims to provide students with a comprehensive understanding of the foundations, challenges, and opportunities in promoting and protecting human rights within democratic societies.

Throughout the course, students will examine the conceptual framework of human rights, including the historical evolution, international legal instruments, and philosophical underpinnings. They will explore the fundamental principles of human rights, such as universality, indivisibility, and interdependence, and analyze the role of human rights in shaping democratic governance.

==========الالكترونيات الاجهزة الطبية==========

**Module 13**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2211 | Engineering Analysis | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 47 | 103 |
| **Description** | | | |
| Engineering Analysis is a comprehensive course designed to equip students with the fundamental mathematical and analytical techniques necessary for solving engineering problems. This course focuses on developing students' skills in mathematical modeling, numerical analysis, and data analysis, enabling them to analyze and interpret complex engineering systems and phenomena.<br>Throughout the course, students will explore a wide range of topics in engineering analysis, including calculus, linear algebra, differential equations, probability and statistics, and numerical methods. They will learn how to apply these mathematical concepts to model, analyze, and solve engineering problems encountered in various disciplines. Upon completion of this course, students will have developed a strong foundation in engineering analysis and will be able to apply calculus and differential equations to model and solve engineering problems.<br>Utilize linear algebra for systems of equations, matrix operations, and eigenvalue analysis.<br>Employ probability and statistics to analyze and interpret engineering data.<br>Understand and apply numerical methods for solving engineering problems, including interpolation, numerical integration, and solving differential equations numerically. | | | |

**Module 14**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2212 | Signal Analysis | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 64 | 86 |
| **Description** | | | |
| Signal Analysis is an in-depth course that explores the principles and techniques used to analyze and process signals in various engineering and scientific applications. This course aims to provide students with a solid foundation in signal analysis, enabling them to understand, manipulate, and extract valuable information from different types of signals encountered in fields such as telecommunications, audio processing, image processing, and control systems.<br>Throughout the course, students will study the fundamental concepts of signals and systems, including continuous-time and discrete-time signals, Fourier analysis, and linear time-invariant systems. They will learn various mathematical tools and techniques for analyzing signals, such as Fourier transforms, Laplace transforms, and Z-transforms. Additionally, the course will cover advanced topics including spectral analysis, filter design, sampling theory, and time-frequency analysis.<br>The course will employ theoretical lectures, hands-on laboratory experiments, and computational assignments to enhance students' understanding and practical skills in signal analysis. Students will have the opportunity to work with software tools and programming languages commonly used in signal processing, allowing them to implement and experiment with different analysis techniques. | | | |

**Module 15**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2313 | Electronic devices | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 94 | 31 |
| **Description** | | | |
| This section includes a description of the module, 100-150 words | | | |

**Module 16**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2214 | Digital design | 4 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/0/0/1 | 64 | 36 |
| **Description** | | | |
| The Digital Design Fundamentals course provides students with a comprehensive introduction to the principles and techniques of digital design. In this course, students will gain a solid understanding of the core concepts and tools used in the field of digital design, equipping them with the necessary skills to create visually appealing and engaging digital content such as top -down design of combainaonal circuits, synchrous sequential logic and sequential logic circuits design | | | |

**Module 17**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2215 | Electrostatic fields | 4 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 51 |
| **Description** | | | |
| The Electrostatic Fields and Applications course provides students with a comprehensive understanding of the fundamental principles and applications of electrostatic fields. In this course, students will explore the behavior of electric charges at rest and gain insight into the mathematical models and laws that govern electrostatic phenomena. The course begins with an introduction to basic concepts, including electric charge, electric force, and electric field. Students will learn about Coulomb's law, which describes the force between charged particles, and Gauss's law, which relates the electric field to the charge distribution. Through theoretical explanations and practical examples, students will develop an understanding of how electric charges interact and how electric fields are generated.<br>As the course progresses, students will delve deeper into advanced topics, such as electric potential and capacitance. They will learn about the concept of electric potential energy, equipotential surfaces, and | | | |

the relationship between electric potential and electric field. The course will also cover capacitors and their applications, including energy storage, filtering, and coupling in electronic circuits.

**Module 18**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2316 | Human Physiology | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |
| **Description** | | | |
| The Human Physiology course offers an in-depth exploration of the complex functions and mechanisms that contribute to the normal functioning of the human body. This course provides students with a comprehensive understanding of the physiological processes that occur at the cellular, tissue, organ, and system levels.<br>Throughout the course, students will examine the various systems of the human body, including the nervous system, endocrine system, cardiovascular system, respiratory system, digestive system, renal system, and musculoskeletal system. They will learn about the structure and function of each system, as well as the integration and coordination among them to maintain homeostasis. | | | |

**Module 19**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2321 | Signals and Systems | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 62 | 88 |
| **Description** | | | |
| The Signals and Systems course offers a comprehensive introduction to the fundamental principles and techniques used in the analysis and processing of continuous and discrete signals. This course explores the mathematics and concepts that form the foundation of signal processing and system analysis, providing students with a solid understanding of how signals and systems behave and interact.<br>The course begins by introducing students to the basic concepts of signals and systems. They will learn about different types of signals, such as continuous-time and discrete-time signals, as well as the properties and representations of signals, including amplitude, frequency, and phase. Students will also study linear time-invariant (LTI) systems, understanding their characteristics and response to different input signals. Building upon this foundation, students will delve into the mathematical techniques used to analyze signals and systems. They will learn about Fourier series, Fourier transforms, and their applications in signal representation and spectral analysis. The course will cover topics such as frequency-domain analysis, frequency response, and filtering techniques, both in the analog and digital domains. | | | |

**Module 20**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2222 | Differential equation and linear algebra | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 26 |
| **Description** | | | |
| The course will emphasize the connection between differential equations and linear algebra. The Differential Equations and Linear Algebra course provides students with a solid understanding of the fundamental concepts and techniques in both differential equations and linear algebra. This course explores the interplay between these two branches of mathematics and their applications in various scientific, engineering, and mathematical disciplines.<br>The course begins with an introduction to linear algebra, covering topics such as vector spaces, matrices, determinants, eigenvalues, and eigenvectors. Students will learn about linear transformations, matrix operations, and the fundamental properties of vector spaces. They will also study systems of linear equations, matrix inverses, and the applications of linear algebra in solving practical problems.<br>Building upon the linear algebra foundation, students will then delve into the study of differential equations. They will explore different types of differential equations, including ordinary differential equations (ODEs) and partial differential equations (PDEs). Students will learn various methods to solve ODEs, such as separation of variables, integrating factors, and power series solutions. They will also investigate PDEs and their applications in physics, engineering, and other fields. | | | |

**Module 21**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2223 | Electronic circuits | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 94 | 56 |
| **Description** | | | |
| This course concentrates on the theorical study, investigation, design, and analysis of transistor circuits using bipolar and field effect transistor (FET). In addition to that a practical laboratory work is needed to realize and perform these electronic circuits to verify their operation. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving electronic circuits mathematically using existing circuit theory theorem's. To follow successfully this subject the students have to be familiar with basic electronic theory including the theory of operation of bipolar and FET devices, as well as a good background in circuit theory and its theorem's.<br>The electronic circuits course covers and focus on the most important bipolar and FET amplifiers . A transistor Bipolar and FET amplifiers are considered with different topologies. Negative feedback concept is applied and analyzed to illustrate the advantage of feedback on amplifier performance.<br>At the end of this course the students have to be gained a good knowledge and understanding in theorical and practical parts of FET and transistor amplifier circuits design and analysis. | | | |

**Module 22**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2224 | Programming | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 77 | 73 |
| **Description** | | | |
| The C Programming course provides students with a comprehensive introduction to the C programming language, focusing on the fundamental concepts and techniques used in software development. This course is designed to equip students with the necessary skills to write efficient, structured, and robust programs using the C programming language.<br>The course begins with an overview of programming concepts and the basics of the C language. Students will learn about variables, data types, operators, control structures (such as loops and conditional statements), and functions. They will gain a solid understanding of the syntax and semantics of the C language, as well as the principles of modular and procedural programming. | | | |

**Module 23**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2225 | Electromagnetics Fields | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 101 |
| **Description** | | | |
| The Electromagnetic Fields course provides students with a comprehensive understanding of the principles and applications of electromagnetic fields. This course explores the fundamental concepts and theories that govern the behavior of electric and magnetic fields, their interactions, and their applications in various fields of science and engineering.<br>The course begins with an introduction to vector calculus and Maxwell's equations, which form the foundation of electromagnetic theory. Students will learn about the laws of electromagnetism, including Gauss's law, Faraday's law of electromagnetic induction, Ampere's law, and the relationship between electric and magnetic fields. They will gain a solid understanding of how electric and magnetic fields are generated and propagate in different scenarios. | | | |

**Module 24**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM2326 | Electrical Machines | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 26 |
| **Description** | | | |

The Electrical Machines course provides students with a comprehensive understanding of the principles, operation, and applications of electrical machines. This course explores the fundamentals of various types of electrical machines, including generators, motors, and transformers, and their role in power generation, conversion, and distribution.
The course begins with an introduction to the basic principles of electromagnetism and the behavior of magnetic fields. Students will learn about the fundamental concepts of magnetic flux, magnetic induction, and magnetic circuits. They will also study the principles of electromagnetic force production and magnetic field interactions in electrical machines.

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**Module 25**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3211 | Digital signal processing | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |

**Description**

The Digital Signal Processing course provides students with a comprehensive understanding of the theory, algorithms, and applications of digital signal processing. This course explores the fundamental concepts and techniques used in the analysis, manipulation, and synthesis of digital signals, with an emphasis on real-world applications in various fields.
The course begins with an introduction to the fundamentals of signals and systems. Students will learn about discrete-time signals, system representation, and properties of linear time-invariant (LTI) systems. They will gain a solid understanding of signal classification, signal representation in time and frequency domains, and the concepts of linearity, time invariance, and causality.
Building upon this foundation, students will delve into digital signal processing techniques. They will explore sampling and quantization of continuous-time signals to obtain discrete-time signals. Students will study the discrete Fourier transform (DFT), fast Fourier transform (FFT), and their applications in spectral analysis and signal representation. They will also learn about filtering techniques, such as finite impulse response (FIR) and infinite impulse response (IIR) filters, and their design and implementation.

**Module 26**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3312 | Medical devices | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 79 | 71 |

**Description**

The Medical Electronic Devices course provides students with a comprehensive understanding of the principles, design, and applications of electronic devices used in medical and healthcare settings. This course explores the essential concepts and technologies employed in medical devices, focusing on their role in diagnosis, treatment, monitoring, and patient care.
The course begins with an overview of medical device regulations, standards, and safety considerations. Students will learn about the regulatory framework governing medical devices and the importance of adherence to quality assurance and safety standards. They will gain an understanding of the ethical considerations and challenges associated with the development and use of medical

electronic devices.
Building upon this foundation, students will delve into the principles and characteristics of medical sensors and transducers. They will study different types of sensors used in medical devices, such as biosensors, pressure sensors, temperature sensors, and imaging sensors. Students will gain insights into the operation, calibration, and limitations of these sensors in acquiring accurate physiological measurements.
Furthermore, students will explore the design and functionality of medical electronic circuits and systems. They will study topics such as analog and digital signal processing, amplifiers, filters, data acquisition, and instrumentation circuits used in medical devices. Students will learn to analyze, design, and evaluate electronic circuits specifically tailored for medical applications.

**Module 27**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3313 | Measurement instruments principles | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 101 |
| **Description** | | | |
| The Measurement Instruments Principles course provides students with a comprehensive understanding of the principles, techniques, and applications of measurement instruments in various fields of science and engineering. This course explores the fundamental concepts and methodologies used in the design, operation, and calibration of measurement instruments, focusing on accuracy, precision, and reliability.<br>The course begins with an introduction to the fundamentals of measurement. Students will learn about the different types of measurements, including physical, electrical, and environmental parameters. They will gain an understanding of measurement units, standards, and traceability, as well as the principles of measurement uncertainty and error analysis.<br>Building upon this foundation, students will delve into the principles of measurement instruments. They will study various types of measurement instruments, such as analog and digital multimeters, oscilloscopes, signal generators, spectrum analyzers, temperature sensors, pressure sensors, and flow meters. Students will learn about the working principles, characteristics, and limitations of these instruments. | | | |

**Module 28**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3214 | Communication principles | 4 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 51 |
| **Description** | | | |
| The Communication Principles course provides students with a comprehensive understanding of the fundamental concepts, theories, and techniques used in communication systems. This course explores the principles and methodologies employed in transmitting, receiving, and processing information over various communication channels, including wired and wireless networks.<br>The course begins with an introduction to the basics of communication systems. Students will learn about the elements of a communication system, including the source of information, the transmitter, | | | |

the channel, and the receiver. They will gain an understanding of the different communication techniques, such as analog and digital modulation, multiplexing, and error detection and correction.
Building upon this foundation, students will delve into the principles of signal transmission and modulation. They will study the characteristics and properties of analog and digital signals, including amplitude, frequency, and phase modulation techniques. Students will explore the concepts of modulation index, bandwidth, and signal-to-noise ratio (SNR) in determining the quality and efficiency of communication systems.

**Module 29**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3315 | Electronics systems | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 92 | 33 |

**Description**

The Electronics Systems course provides students with a comprehensive understanding of the principles, design, and operation of electronic systems. This course explores the fundamental concepts and techniques used in the integration of electronic components and subsystems to create complex and functional electronic systems.
Building upon this foundation, students will delve into the principles of analog and digital electronic circuits. They will study topics such as voltage and current amplification, linear and nonlinear circuits, operational amplifiers, feedback systems, and power supplies. Students will learn to analyze, design, and troubleshoot electronic circuits using circuit simulation software and laboratory experiments.
Furthermore, students will explore the principles and design considerations for digital logic circuits. They will learn about logic gates, Boolean algebra, combinational and sequential logic circuits, flip-flops, and registers. Students will gain insights into the design and implementation of digital systems using logic gates and programmable logic devices.

**Module 30**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3216 | Computer Aided design | 4 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/0/0/1 | 62 | 38 |

**Description**

The Computer-Aided Design (CAD) course provides students with a comprehensive understanding of the principles, tools, and techniques used in computer-based design and drafting. This course explores the application of CAD software in various fields, including engineering, architecture, industrial design, and manufacturing.
The course begins with an introduction to the fundamentals of CAD. Students will learn about the history and evolution of CAD, the role of CAD in design processes, and the advantages of using CAD software over traditional manual drafting methods. They will gain an understanding of the essential concepts and terminology used in CAD systems.
Building upon this foundation, students will delve into the principles of geometric modeling. They will study 2D drafting techniques, including drawing tools, layer management, dimensioning, and annotation. Students will also learn about 3D modeling techniques, such as solid modeling, surface

modeling, and parametric modeling, using industry-standard CAD software.
Furthermore, students will explore advanced CAD techniques and tools. They will learn about assembly modeling, mechanisms, and constraints for designing complex mechanical systems. Students will gain insights into simulation and analysis tools used in CAD software to validate and optimize designs for factors like stress, motion, and thermal behavior..

**Module 31**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3221 | VHDL | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |
| **Description** | | | |
| The VHDL course provides students with a comprehensive understanding of the principles, syntax, and applications of VHDL in digital design and synthesis. VHDL is a hardware description language widely used in the design and verification of digital systems, including integrated circuits, programmable logic devices, and FPGA-based designs.<br>The course begins with an introduction to digital design concepts and the role of VHDL in the design process. Students will learn about the advantages of using hardware description languages, the basic elements of VHDL, and the structure of VHDL models. They will gain an understanding of the design hierarchy and the concept of behavioral, structural, and dataflow modeling.<br>Building upon this foundation, students will delve into the syntax and semantics of VHDL. They will study the data types, operators, and control structures used in VHDL programming. Students will learn to define and instantiate entities and architectures, specify the behavior of digital circuits using concurrent and sequential statements, and simulate and test VHDL designs.<br>Furthermore, students will explore advanced VHDL topics and techniques. They will learn about using VHDL for modeling and designing digital components such as registers, counters, multiplexers, and arithmetic circuits. Students will gain insights into designing finite state machines (FSMs) using VHDL, including the concept of state encoding and the use of VHDL constructs for modeling FSMs. | | | |

**Module 32**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3322 | Medical instruments | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 79 | 46 |
| **Description** | | | |
| The Electronic Medical Instruments course provides students with a comprehensive understanding of the principles, design, and operation of electronic instruments used in medical and healthcare settings. This course explores the essential concepts and technologies employed in medical instruments, focusing on their role in diagnosis, monitoring, and treatment of various medical conditions.<br>The course begins with an overview of medical instrument categories and their applications in healthcare. Students will learn about diagnostic instruments such as electrocardiographs (ECG), electromyographs (EMG), electroencephalographs (EEG), and imaging instruments such as ultrasound scanners and magnetic resonance imaging (MRI) systems. They will gain insights into therapeutic | | | |

instruments such as defibrillators, surgical lasers, and ventilators.
Building upon this foundation, students will delve into the principles and characteristics of electronic sensors and transducers used in medical instruments. They will study different types of sensors, including biosensors, pressure sensors, temperature sensors, and imaging sensors, and learn about their principles of operation, calibration, and limitations in acquiring accurate physiological measurements.

**Module 33**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3323 | Medical sensors | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |
| **Description** | | | |
| The Medical Sensors course provides students with a comprehensive understanding of the principles, technologies, and applications of sensors in the field of healthcare and medicine. This course explores the fundamental concepts and advancements in medical sensor technology, focusing on their role in monitoring, diagnosis, and treatment of various medical conditions.<br>The course begins with an introduction to the importance of medical sensors in healthcare. Students will learn about the different types of medical sensors used for physiological measurements, including biosensors, imaging sensors, pressure sensors, temperature sensors, and motion sensors. They will gain an understanding of the principles of sensor operation and the specific requirements for sensor applications in medical settings.<br>Building upon this foundation, students will delve into the design and characteristics of medical sensors. They will study the principles and technologies behind different types of sensors, such as electrochemical sensors, optical sensors, bioimpedance sensors, and microelectromechanical systems (MEMS) sensors. Students will learn about sensor materials, transduction mechanisms, signal conditioning, and calibration techniques specific to medical sensors. | | | |

**Module 34**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3224 | Microprocessor programming | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 79 | 46 |
| **Description** | | | |
| The Microprocessor Programming course provides students with a comprehensive understanding of the principles, techniques, and applications of programming microprocessors. This course explores the fundamentals of microprocessor architecture, assembly language programming, and the development of software for microprocessor-based systems.<br>The course begins with an introduction to microprocessor architecture and organization. Students will teach about the components of a microprocessor, including the arithmetic logic unit (ALU), control unit, registers, memory, and input/output (I/O) interfaces. They will gain insights into the instruction set architecture (ISA) and the execution cycle of a microprocessor.<br>Building upon this foundation, students will delve into assembly language programming for microprocessors. They will study the syntax, structure, and features of assembly language instructions. | | | |

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|---|
| Students will learn how to write and debug assembly language programs, including program flow control, data manipulation, arithmetic and logic operations, and interaction with memory and I/O devices. |

**Module 35**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3225 | Power electronics | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |
| **Description** | | | |
| Power Electronics is an advanced engineering discipline that focuses on the design, analysis, and control of electronic systems involved in the conversion and processing of electrical power. This course provides a comprehensive introduction to the fundamental principles, theory, and applications of power electronics.<br>The course begins by covering the basics of power electronics, including the concept of power, energy, and their relationships, as well as an overview of semiconductor devices commonly used in power electronic circuits such as diodes, transistors, and thyristors.<br>Students will delve into the study of various power electronic circuits and their applications. Topics covered include AC/DC converters (rectifiers), DC/DC converters (choppers), DC/AC inverters, AC/AC converters, and resonant converters. The analysis and design of these circuits, including the selection of appropriate switching devices and control strategies, will be emphasized. | | | |

**Module 36**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM3326 | Digital image processing | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 49 | 76 |
| **Description** | | | |
| Digital Image Processing is an interdisciplinary field that encompasses various techniques and algorithms for manipulating, analyzing, and interpreting digital images. This course provides a comprehensive introduction to the principles, methods, and applications of digital image processing.<br>The course begins by covering the fundamentals of digital image representation, including the basics of image formation, sampling, quantization, and color models. Students will gain an understanding of how images are captured, digitized, and stored in computer systems.<br>Students will then explore various image enhancement techniques used to improve the visual quality of digital images. Topics covered include point processing operations (e.g., histogram equalization, contrast stretching), spatial domain techniques (e.g., filtering, image sharpening), and frequency domain techniques (e.g., Fourier transform, image restoration). | | | |

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**Module 37**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4311 | Industrial Electronic | 6 | 1 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 3 | 0/0/0/1 | 64 | 86 |

**Description**

Industrial Electronics is an advanced-level course designed to provide students with a comprehensive understanding of electronic systems used in industrial settings. This course focuses on the practical applications of electronic components, circuits, and systems in various industrial processes and automation.

The course begins by introducing students to the fundamental concepts of industrial electronics, including electronic components, circuit analysis, and electronic measurements. Students will learn about basic electronic devices such as diodes, transistors, operational amplifiers, and digital logic gates, and their applications in industrial systems.

Additionally, the course will delve into various motor control techniques, including speed control, direction control, and position control using electronic circuits and drives. Students will gain knowledge about motor types, motor starters, and electronic control strategies employed in industrial machinery.

Furthermore, the course will provide an in-depth understanding of programmable logic controllers (PLCs) and their role in industrial automation. Students will learn about ladder logic programming, interfacing sensors and actuators, and troubleshooting techniques for industrial control systems.

**Module 38**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4212 | Microprocessor application | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 79 | 46 |

**Description**

Microprocessor Applications is an intermediate-level course designed to provide students with a comprehensive understanding of microprocessor architecture, programming, and practical applications. This course aims to equip students with the necessary knowledge and skills to design, develop, and implement microprocessor-based systems in various fields, including embedded systems, robotics, automation, and more.

In this course the student will understand the fundamental concepts of microprocessors, including architecture, instruction set, and memory organization, gain proficiency in programming microprocessors using a high-level language, such as C or Assembly, learn how to interface peripherals and devices with microprocessors, including input/output (I/O) devices, sensors, and actuators, explore various techniques for data transfer, communication protocols, and serial and parallel interfacing and acquire knowledge of real-time operating systems and their application in microprocessor-based systems.

**Module 39**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4213 | Digital communication | 5 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 47 | 78 |

| Description |
|---|
| The Digital Communication Fundamentals course is designed to provide students with a comprehensive understanding of the principles, techniques, and applications of digital communication systems. In today's interconnected world, digital communication plays a vital role in transmitting information efficiently and reliably across various digital platforms. This course explores the fundamental concepts and technologies that underpin digital communication, enabling students to develop a solid foundation in this rapidly evolving field.<br>In this course the student will explore different modulation techniques, including amplitude shift keying (ASK), frequency shift keying (FSK), and phase shift keying (PSK), study the fundamentals of information theory, channel capacity, and source coding techniques. In addition to familiarize with various types of digital communication channels, such as wireless, fiber optic, and satellite channels. |

**Module 40**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4214 | Analogue control | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 94 | 56 |
| **Description** | | | |
| The Analogue Control Systems course is designed to provide students with a comprehensive understanding of the principles and applications of analogue control in various engineering fields. This course focuses on the theoretical concepts, design techniques, and practical considerations associated with analogue control systems.<br>Throughout the course, students will delve into the fundamentals of analogue control, starting with an introduction to control theory and system modeling. They will gain a solid foundation in topics such as transfer functions, block diagrams, signal flow graphs, and Laplace transforms. The course will also cover the analysis of open-loop and closed-loop systems, stability criteria, and the frequency response of analogue control systems. Students will explore different types of analogue control systems, including proportional, integral, and derivative (PID) controllers. They will learn how to design and tune these controllers for optimal performance in various applications. The course will delve into techniques such as root locus, Bode plots, and Nyquist stability analysis to assess and improve system stability and response. | | | |

**Module 41**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4315 | Microelectronics | 6 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 47 | 103 |
| **Description** | | | |
| Microelectronics Fundamentals is an introductory course designed to provide students with a comprehensive understanding of the principles and applications of microelectronics. The course aims to lay a solid foundation for further studies in the field of microelectronics and integrated circuit design.<br>The course begins with an overview of semiconductor materials and their properties, including crystal | | | |

structures, energy bands, and doping techniques. Students will learn about the operation and characteristics of diodes, bipolar junction transistors (BJTs), and field-effect transistors (FETs). The course covers topics such as transistor biasing, small-signal analysis, and amplifier configurations.

**Module 42**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4116 | Engineering project principles | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 0/0/0/0 | 17 | 33 |
| **Description** | | | |
| The Engineering graduation project is a significant milestone in the academic journey of engineering students. It is a culmination of their years of theoretical learning and practical training, where they apply their acquired knowledge and skills to solve real-world engineering problems.<br>Typically, the Engineering graduation project involves a team of students working under the guidance of faculty members or industry professionals. The project aims to showcase the students' ability to analyze, design, develop, and implement an innovative solution to a specific engineering challenge. | | | |

**Module 43**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4321 | Biomedical Imaging | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 79 | 46 |
| **Description** | | | |
| Biomedical Imaging: Principles and Applications is an in-depth course designed to provide students with a comprehensive understanding of various imaging modalities used in the field of biomedicine. This course explores the fundamental principles, technologies, and applications of different imaging techniques employed for visualization, diagnosis, and monitoring of anatomical structures and physiological processes within the human body.<br>The course begins by introducing the basic principles of biomedical imaging, including image formation, acquisition, and reconstruction. Students will gain knowledge about the physical principles underlying different imaging modalities, such as X-ray imaging, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound imaging, nuclear medicine imaging, and optical imaging. | | | |

**Module 44**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4222 | Computer Networks | 4 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/0/0/1 | 64 | 36 |

| Description |
|---|
| The Computer Networks course provides a comprehensive study of the principles, protocols, and technologies that underlie modern computer networks. It explores the fundamental concepts and techniques necessary for the design, implementation, and management of computer networks in various environments.<br>Throughout the course, students delve into the architecture, components, and operations of computer networks, covering both local area networks (LANs) and wide area networks (WANs). The course also addresses network protocols, network layering models, and the role of network devices and technologies in facilitating communication and data transfer. |

**Module 45**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4323 | Medical Laser systems | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 77 | 48 |
| **Description** | | | |
| Throughout the course, students will explore the principles of laser physics, including the interaction of lasers with biological tissues, the concept of selective photothermolysis, and the different laser-tissue interactions. The course will cover a wide range of medical laser modalities, such as diode lasers, Nd:YAG lasers, CO2 lasers, and excimer lasers, along with their specific applications in dermatology, ophthalmology, urology, dentistry, and other medical specialties.<br>Key topics covered in the course include:<br>Laser Safety: Understanding the potential hazards associated with medical lasers and implementing safety measures to ensure the well-being of both patients and operators.<br>Laser-Tissue Interaction: Exploring the interaction mechanisms between lasers and biological tissues, including absorption, scattering, and thermal effects.<br>Laser Systems: Studying the different types of medical lasers, their construction, working principles, and delivery systems.<br>Clinical Applications: Examining the specific applications of medical lasers in various medical fields, such as laser surgery, laser therapy, cosmetic procedures, and diagnostic imaging.<br>Laser Parameters and Settings: Understanding the importance of laser parameters, such as wavelength, pulse duration, fluence, and spot size, and their effects on treatment outcomes. | | | |

**Module 46**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4224 | Control Systems Design | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 94 | 31 |
| **Description** | | | |
| The Control Systems Design course is an advanced-level course designed to provide students with a comprehensive understanding of control theory and its practical applications in engineering systems. The course focuses on the principles, techniques, and methodologies involved in designing control | | | |

systems to regulate and optimize the behavior of dynamic systems.
This course will cover:
Mathematical modeling of dynamic systems: Students will learn how to represent dynamic systems using mathematical equations, including ordinary differential equations and transfer functions. They will explore the process of deriving mathematical models from physical principles and experimental data.
Time and frequency domain analysis: The course introduces students to time and frequency domain representations of control systems. They will learn how to analyze the transient and steady-state responses of systems, as well as frequency response characteristics such as gain, phase, and bandwidth.
Stability analysis: Students will study the stability of control systems and learn various stability criteria, including Routh-Hurwitz and Nyquist stability criteria. They will understand the impact of system parameters on stability and explore techniques for improving stability.

**Module 47**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4125 | Industrial management and Ethics | 5 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/0 | 32 | 93 |
| **Description** | | | |
| Industrial Management is a comprehensive course designed to provide students with a solid understanding of the principles, strategies, and techniques involved in managing industrial operations effectively. The course encompasses various aspects of industrial management, including planning, organizing, leading, and controlling within an industrial setting.<br>Throughout the course, students will explore introduction to Industrial Management, Human Resource Management, and Legal and Ethical Considerations.<br>The Industrial Management course combines theoretical concepts with practical applications, encouraging students to analyze real-world case studies and engage in interactive discussions. Students will develop critical thinking, problem-solving, and decision-making skills necessary to address the challenges faced by industrial managers. | | | |

**Module 48**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NEEM4126 | Engineering project | 6 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 3 | 0/0/0/0 | 47 | 103 |
| **Description** | | | |
| The Engineering graduation project is a significant milestone in the academic journey of engineering students. It is a culmination of their years of theoretical learning and practical training, where they apply their acquired knowledge and skills to solve real-world engineering problems.<br>Typically, the Engineering graduation project involves a team of students working under the guidance of faculty members or industry professionals. The project aims to showcase the students' ability to analyze, design, develop, and implement an innovative solution to a specific engineering challenge. | | | |

**Module 13**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 212 | Electronic I | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/3/0/1 | 88 | 76 |
| **Description** | | | |
| This course concentrates on the theorical study, investigation, design, and analysis of transistor circuits using bipolar and field effect transistor (FET). In addition to that a practical laboratory work is needed to realize and perform these electronic circuits to verify their operation. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving electronic circuits mathematically using existing circuit theory theorem's. To follow successfully this subject the students have to be familiar with basic electronic theory including the theory of operation of bipolar and FET devices, as well as a good background in circuit theory and its theorem's.<br>The electronic circuits course covers and focus on the most important bipolar and FET amplifiers . A transistor Bipolar and FET amplifiers are considered with different topologies. Negative feedback concept is applied and analyzed to illustrate the advantage of feedback on amplifier performance.<br>At the end of this course the students have to be gained a good knowledge and understanding in theorical and practical parts of FET and transistor amplifier circuits design and analysis | | | |

**Module 14**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 313 | DC Machines | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 40 |
| **Description** | | | |
| This course will provide theoretical background in the following topics: magnetics; electromagnetics; B-H curves; Faraday's Law; ideal transformer; practical transformer; losses; hysteresis; Eddy currents; equivalent circuit, Lenz's Law; short circuit/open circuit testing; introduction to heat, torque, speed, inertia; DC motor theory; shunt, series, compound motor characteristics; armature reaction; Lorentz's Law.<br>Students are able to understand the basic principles, the physical construction, mathematical | | | |

model and calculations, and practical implementations of DC machines.

Understand DC *motor construction, characteristics, control, and applications. Construct circuits using actual machines in the lab to examine their operations*.

**Module 15**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 214 | Computer Programming | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 58 | 40 |
| **Description** | | | |
| | | | |

**Module 17**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 221 | Electromagnatic Fields | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 44 | 65 |
| **Description** | | | |

The Electromagnetic Fields course provides students with a comprehensive understanding of the principles and applications of electromagnetic fields. This course explores the fundamental concepts and theories that govern the behavior of electric and magnetic fields, their interactions, and their applications in various fields of science and engineering.

The course begins with an introduction to vector calculus and Maxwell's equations, which form the foundation of electromagnetic theory. Students will learn about the laws of electromagnetism, including Gauss's law, Faraday's law of electromagnetic induction, Ampere's law, and the relationship between electric and magnetic fields. They will gain a solid understanding of how electric and magnetic fields are generated and propagate in different scenarios.

**Module 18**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 201 | Engineering Analysis I | 2 | 2 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 2 | 0//0/1 | 44 | 81 |

**Description**

Numerical Analysis is an advanced-level course designed to provide students with a solid foundation in the numerical methods and techniques used for solving mathematical problems and performing computations. This course focuses on the theory, algorithms, and practical applications of numerical analysis in various fields of science, engineering, and finance. The course begins by introducing students to the fundamental concepts of numerical analysis, including approximation, error analysis, and numerical stability. Students will learn about the importance of representing real-world problems in mathematical form and the limitations and sources of errors in numerical computations.

The course covers a wide range of numerical methods, including interpolation, numerical integration, solving systems of linear and nonlinear equations, and numerical solutions of ordinary and partial differential equations. Students will explore algorithms and techniques such as polynomial interpolation, Simpson's rule, Gaussian elimination, Newton-Raphson method, and finite difference methods.

**Module 19**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 322 | Electronic II | 3 | 2 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 2 | 0/2/0/1 | 74 | 101 |

**Description**

This course concentrates on the theorical study, investigation, design, and analysis of transistor circuits using bipolar and field effect transistor (FET). In addition to that a practical laboratory work is needed to realize and perform these electronic circuits to verify their operation. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving electronic circuits mathematically using existing circuit theory theorem’s. To follow successfully this subject the students have to be familiar with basic electronic theory including the theory of operation of bipolar and FET devices, as well as a good background in circuit theory and its theorem’s.

The electronic circuits course covers and focus on the most important bipolar and FET amplifiers . A transistor Bipolar and FET amplifiers are considered with different topologies. Negative feedback concept is applied and analyzed to illustrate the advantage of feedback on amplifier performance.

At the end of this course the students have to be gained a good knowledge and understanding in theorical and practical parts of FET and transistor amplifier circuits design and analysis.

**Module 20**

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

| NVEEELI 323 | AC Machines | 3 | 2 |
|---|---|---|---|
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 101 |
| **Description** | | | |
| Students are able to understand the basic principles, the physical construction, mathematical model and calculations, and practical implementations of transformers.<br><br>Students are able to understand the basic principles, the physical construction, mathematical model and calculations, and practical implementations of AC machines.<br><br>Understand Induction Motor *construction, characteristics, control, and applications. Construct circuits using actual machines in the lab to examine their operations*. So it will provide a review of three phase power; AC motor theory; induction, synchronous, three phase and single phase motors; stepper motors. | | | |

**Module 21**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 224 | Computer Languages | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 58 | 81 |
| **Description** | | | |
| The Computer Languages course provides an in-depth understanding of various programming concepts and languages. The course covers a range of topics, starting with sample C standard functions such as "getchar," "putchar," "getch," "getche," "putch," "gets," "puts," "delay," "sound," "random," and more. Students become familiar with these functions and learn how to use them effectively in programming.<br><br>Macros play a significant role in programming efficiency, and the course covers the use of the "define" directive and provides sample applications. Students gain experience in utilizing macros to simplify code and improve readability.<br><br>Functions are a fundamental aspect of programming, and the course explores different types of functions. Students learn about user-defined functions, library functions, and recursive functions. Sample functions are provided to demonstrate the application of these concepts.<br><br>Arrays are essential data structures, and the course covers one-dimensional, two-dimensional, and multidimensional arrays. Students learn about array initialization, indexing, and gain proficiency in writing programs that manipulate arrays. They also explore the concept of passing arrays to functions, | | | |

enabling modular and efficient programming.

The course delves into different variable types, including local, global, constant, static, and volatile variables. Students understand the scope and lifetime of variables and learn how to effectively use them in programs.

Pointers are a powerful concept in programming, and the course provides a comprehensive understanding of pointers. Students learn about pointer definitions, near and far pointers, referencing, and sample pointer applications. They also explore the relationship between pointers and strings, as well as pointers and functions.

Data structures are introduced, along with their definitions and sample applications. Students gain an understanding of how data structures can be used to organize and manipulate data efficiently. The course also covers the concept of passing structures to functions, enabling more complex data manipulation.

An introduction to object-oriented programming is provided, focusing on C++ classes. Students learn about the concepts of private and public members within a class and explore sample classes to understand their implementation. The course also covers constructors and destructors, which play a crucial role in object initialization and memory management.

By the end of the Computer Languages course, students develop a solid understanding of programming concepts and techniques. They gain proficiency in using standard functions, macros, arrays, functions, pointers, data structures, and object-oriented programming principles. This knowledge equips them to write efficient and organized code in various programming languages.

**Module 22**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 223 | Digital Design | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 60 | 76 |

**Description**

The Digital System Design course encompasses various aspects of designing digital circuits and systems. The course covers the minimization of Boolean functions with five variables, focusing on additional minimization techniques such as tabular, prime, implicit, Mcklusky, and entered variables methods.

The top-down design approach is introduced for the design of combinational circuits. Students learn about gate-level design and explore specific components such as adders, subtractors, multiplexers, and decoders.

The course also delves into the design of arithmetic and logic units, focusing on their fundamental concepts and implementation.

Sequential logic circuits are a crucial part of the course, with an emphasis on understanding counters and registers. Students explore various types of counters, including binary counters, BCD counters, up-down

counters, Johnson counters, and module-n counters. They learn how to design counters using state diagrams and tables and also study sequence generators and shift registers. Additionally, different types of registers, such as serial-in parallel-out (SIPO) and parallel-in serial-out (PISO), are covered. Various flip-flop types are utilized in register design, and students also learn about sequence generators.

The course further delves into sequential logic circuits, covering topics like delay modeling, characteristics equations, PS/NS tables, state diagrams, ASM (Algorithmic State Machine) charts, Karnaugh maps, transition maps, and timing diagrams of flip-flops.

Synchronous sequential logic is explored, with an emphasis on Mealy and Moore circuits. Students learn about timing diagrams, implicit table state reduction, and assignment techniques.

The study of synchronous counters is another essential aspect of the course. Students gain an understanding of shift registers, twisted ring counters, and maximum-length shift counters.

By the end of the Digital System Design course, students develop proficiency in designing digital circuits and systems, including minimizing Boolean functions, designing combinational and sequential logic circuits, implementing arithmetic and logic units, and working with various types of counters and registers.

**Module 23**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 210 | Signals and Systems | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 60 | 76 |

**Description**

The Signals and Systems course provides a comprehensive understanding of the fundamental concepts and analysis techniques used in the field. The course begins with basic definitions and mathematical models, covering both continuous-time and discrete-time systems.

Students learn about signal and system characteristics, including basic operations on signals, signal representations, and system models. The focus is on understanding the properties and behaviors of signals and systems.

Continuing into continuous-time signals and systems, students explore time-domain representations of continuous-time signals, such as sinusoidal and complex exponential signals, as well as singularity function signals. They also learn about signal energy and power, analyzing the properties related to these measures.

Time-domain analysis of continuous-time signals is covered extensively, including solving system equations, determining system impulse responses, and understanding the zero-state response of linear, time-invariant systems. The superposition integral, continuous-convolution, and their properties are studied in detail.

Frequency-domain representation of continuous-time signals is introduced, with topics including spectra

and bandwidth of signals, Fourier series representations, amplitude and phase spectra of periodic signals, and the Fourier transform for aperiodic energy and no energy signals.

The course also explores frequency-domain analysis of continuous-time systems, focusing on system frequency response, determining frequency response, analyzing the frequency response of electric circuits, and understanding phase delay and group delay. Bode plots are used to visualize the amplitude and phase responses of systems.

Analysis of continuous-time systems using the Laplace transform is a key component of the course. Students learn about the Laplace transform, its evaluation, and associated theorems. They also gain proficiency in evaluating inverse Laplace transforms, solving linear integro-differential equations, determining system transfer functions, and analyzing frequency responses.

The course concludes with the study of continuous-time filters, including distortionless transmission, ideal filters, and the approximation of ideal filters. Students learn about the design principles of Butterworth and Chebyshev filters.

By the end of the Signals and Systems course, students develop a strong foundation in analyzing signals and systems, enabling them to comprehend and manipulate various types of signals and understand the behavior of systems in different domains.

**Module 25**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 311 | Power Electronic Devices | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 46 | 76 |
| **Description** | | | |
| This course will provide an entrance to the oscillator and timer circuits; SCRs, TRIACs, many other power electronics devices and power control circuits; linear and switching regulators. Activities include component and circuit identification, description of behavior and troubleshooting methods. SCR characteristics and SCR power control, TRIAC characteristics and power control, linear regulators, switching regulators. | | | |

**Module 26**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 213 | Analoge Control | 2 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 46 | 76 |
| **Description** | | | |
| This course provides an introduction to feedback control systems, viewed through the continuous time, or analog, lens. The course focuses on developing mathematical system models, developing basic feedback controllers, and analyzing their performance and stability. This also involves understanding block diagrams and signal flow graphs, frequency response analysis techniques. | | | |

**Module 27**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 313 | Integrated Electronics | 3 | \ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 60 | 76 |
| **Description** | | | |
| This course deals with the theorical study, investigation, design, and analysis of analog electronic circuits. In addition to that a practical laboratory work is needed to realize and perform these electronic circuits to verify their operation. As a tutorial a one hour weekly is also included to this course to exercise and to practice solving electronic circuits mathematically using existing circuit theory theorem's. To follow successfully this subject the students have to be familiar with basic electronic theory including the theory of operation of bipolar and FET devices, as well as a good background in circuit theory and its theorem's.<br><br>The integrated electronic course covers and focus on the most important electronic circuits such as operational amplifier design and characteristics and its applications in various communication circuits. Also the study of waveform generators such as oscillator and multivibrators are also considered, tuned and power amplifiers are also studied.<br><br>At the end of this course the stjudents have to be gained a good knowledge and understanding in theorical and practical parts of various analog electronic circuits design for integrated circuit realization. | | | |

**Module 28**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 204 | Digital Signal Processing | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 46 | 90 |

**Description**

The Digital Signals Processing course explores the fundamental principles and techniques used in analyzing and manipulating digital signals. The course covers various topics, starting with the Discrete Fourier Series. Students learn about the spectra of periodic digital signals and the properties of the series.

Next, the course delves into the Discrete Fourier Transform (DFT), including its properties and its application in determining the frequency response of Linear Time-Invariant (LTI) systems.

Convolution and correlation are essential operations in signal processing, and the course covers these topics, emphasizing their applications and properties.

The Discrete Fourier Transform (DFT) is further studied, along with its fast implementation through the Fast Fourier Transform (FFT) algorithm. Students gain an understanding of the DFT and FFT and learn how to efficiently compute them.

The Z-Transform is introduced and reviewed, focusing on its applications in analyzing digital signals. Students explore the Z-plane, poles, and zeros, and understand their significance in signal processing.

A framework for digital filter design is presented, providing students with a systematic approach to designing digital filters. They learn about different design methods and techniques and gain hands-on experience in implementing filters.

The course covers Finite Impulse Response (FIR) digital filter design, including the window method, frequency sampling method, and the realization of FIR filters. Students learn how to design and implement FIR filters using these techniques.

Infinite Impulse Response (IIR) digital filter design is also covered. Students explore the pole-zero method, the Bilinear Z-transform, and gain insight into the realization of IIR filters.

By the end of the Digital Signals Processing course, students develop a strong foundation in analyzing and processing digital signals. They gain proficiency in working with the Discrete Fourier Series and Transform, convolution and correlation, the Z-transform, and designing both FIR and IIR digital filters. This knowledge equips them with the skills necessary to process and manipulate digital signals in various applications, such as audio processing, image processing, telecommunications, and more.

**Module 29**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 215 | Microprocessor pogramming | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 90 |

**Description**

The Microprocessors course provides students with a comprehensive understanding of 16-bit microprocessors, specifically focusing on the 8086 architecture. The course covers various topics, starting with an introduction to the 8086 architecture, including its machine language, instruction set, internal execution, and timing.

Assembly language programming for the 8086 family is a key component of the course. Students learn about data transfer instructions, arithmetic instructions, logical instructions, shift and rotate instructions, branch instructions, loop instructions, NOP (No Operation), HLT (Halt), and flag manipulation instructions. They also gain familiarity with assembler directives that guide the assembly process.

The course then explores the system connections and timing of the 8086 microprocessor. Students gain an understanding of the hardware overview of the 8086, including the basic signal flow on the 8086 buses. They learn how to analyze a minimum mode system and gain proficiency in addressing and address decoding on the 8086. Timing parameters for the 8086 microprocessor are also covered in detail.

Interrupts play a crucial role in microprocessor systems, and the course focuses on understanding interrupts and their service procedures in the context of the 8086 microprocessor. Students learn about 8086 interrupts and how the microprocessor responds to interrupts. They explore different interrupt types supported by the 8086 and gain insight into the hardware and software considerations when using interrupts effectively.

By the end of the Microprocessors course, students develop a solid foundation in working with 16-bit microprocessors, specifically the 8086 architecture. They gain proficiency in assembly language programming for the 8086 family, understanding system connections and timing, and handling interrupts. This knowledge equips them to design, program, and analyze microprocessor-based systems and applications.

**Module 30**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 316 | PLC | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |

| | | | |
|---|---|---|---|
| 2 | 0/2/0/1 | 72 | 106 |

**Description**

The PLC (Programmable Logic Controller) course provides a comprehensive understanding of PLC systems and their applications. Students learn about the basic components of a PLC, including control transformers, switches, relays, and time delay relays, along with their corresponding symbols. They also become familiar with reference designators such as on, off, run, stop, and cycle.

The course covers various types of sensors used in PLC systems, including inductive proximity sensors, ultrasonic sensors, and optical sensors. Students gain an understanding of analog input/output and learn how to interface analog signals with PLCs.

The basic elements of a PLC are explored, emphasizing inputs and outputs interfaces. Students learn ladder programming, which is a graphical programming language commonly used in PLC systems. They gain proficiency in writing ladder logic programs and utilizing PLC instructions for various tasks such as latching, comparisons, timers, counters, sequencers, and shift registers.

Math instructions, including addition, subtraction, multiplication, division, clearing, and square root operations, are covered in detail. Move and logic instructions, such as moving data, performing logical operations (AND, OR, NOR, NOT), and clearing data, are also discussed.

The course delves into standard buses used in PLC systems, including internal and external buses, as well as serial and parallel buses. Students learn about the communication interfaces and protocols used for data exchange between PLCs and other devices.

By the end of the PLC course, students develop a strong foundation in working with PLC systems. They gain proficiency in understanding the basic components, programming using ladder logic, utilizing various PLC instructions, and interfacing with sensors and analog devices. This knowledge equips them to design, program, and maintain PLC systems in industrial automation and control applications.

**Module 31**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 321 | DC Converters | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 90 |

**Description**

The course will engage engineers in a combined lecture/laboratory instructional format, providing hands-on experience in the AC/DC and DC/DC converter analysis, modeling, simulation, control design and frequency domain measurement techniques. This course is a design oriented. There are many dc-dc

converter topologies that are used in power supplies. The course starts with a discussion on rectifier circuits and leads on upto multi-output dc-dc converters. The discussion on the various topologies is strengthened with the aid of simulation demonstrations and design exercises.

**Module 32**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 214 | Digital control | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 76 |

**Description**

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. Elementary lead-lag compensation.

Upon successful completion of the course, students should be able to

(i) explain the advantages and disadvantages feedback control,

(ii) describe common control objectives, specs, and control strategies

**Module 33**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 323 | VHDL | 3 | 2 |

| Class (hr/w) | Lect/Lab./Prac./Tutor | SSWL (hr/sem) | USWL (hr/w) |
|---|---|---|---|
| 2 | 0/2/0/0 | 60 | 90 |

**Description**

The VHDL (V-Hardware Description Language) course provides students with a comprehensive understanding of programmable logic devices and how to describe digital systems using VHDL. Students learn about various programmable logic devices such as GAL (Generic Array Logic), SPLD (Simple Programmable Logic Device), CPLD (Complex Programmable Logic Device), OLMC (One Look Multi-Function Cell), ISP (In-System Programmability), and FPGA (Field-Programmable Gate Array).

The course begins with an introduction to VHDL, covering its syntax, structure, and basic concepts. Students learn how to describe combinational networks using VHDL and model flip-flops using VHDL processes. They gain hands-on experience with compilation and simulation of VHDL code to verify the functionality of their designs.

The course explores the modeling of sequential machines, including finite state machines, using VHDL. Students learn about the use of variables, signals, and constants in VHDL and understand their roles in describing digital systems. They also explore the use of arrays in VHDL for efficient data manipulation.

VHDL operators, functions, and procedures are covered to enhance the students' ability to write complex and efficient VHDL code. They learn about the use of packages and libraries to organize and reuse code components.

Memory expansion is a significant aspect of digital systems, and the course covers the VHDL description of ROM (Read-Only Memory) and RAM (Random Access Memory) modules. Students gain insights into designing memory-based systems using VHDL.

To apply their knowledge and skills, students engage in system projects where they design and implement digital systems using VHDL. These projects provide practical experience and allow students to demonstrate their proficiency in VHDL and programmable logic devices.

By the end of the VHDL course, students develop a strong foundation in using VHDL to describe digital systems. They gain proficiency in designing and simulating combinational and sequential circuits, utilizing variables and signals effectively, implementing memory expansion, and utilizing VHDL libraries and packages. This knowledge equips them to design, simulate, and implement complex digital systems using VHDL and programmable logic devices.

**Module ٣٤**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 324 | Microelectronics | ٢ | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/1/0/0 | 46 | 90 |

| Description |
|---|
| The microelectronic course deals with the theorical study and investigation of integrated circuit design and fabrication. The aim of this course is to study and investigate the electronic circuits studied before in integrated circuit realizations, As a tutorial a one hour weekly is also included to this course to exercise and to practice solving mathematically various logic families applications. To follow successfully this subject the students have to be familiar with basic theory of semiconductor physics and devices.<br><br>The microelectronic course covers and focus IC fabrication process, device and electronic circuit fabrication. Bipolar and MOS based logic families are realized in integrated forms. Integrated circuit methodologies are considered including custom, semicustom, and slandered cells are given.<br><br>At the end of this course the students have to be gained a good knowledge and understanding in integrated circuit design and fabrication in analog and digital forms. |

**Module 35**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 325 | Measurments | 2 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 46 | 90 |
| **Description** | | | |
| The Measurement Instruments Principles course provides students with a comprehensive understanding of the principles, techniques, and applications of measurement instruments in various fields of science and engineering. This course explores the fundamental concepts and methodologies used in the design, operation, and calibration of measurement instruments, focusing on accuracy, precision, and reliability.<br>The course begins with an introduction to the fundamentals of measurement. Students will learn about the different types of measurements, including physical, electrical, and environmental parameters. They will gain an understanding of measurement units, standards, and traceability, as well as the principles of measurement uncertainty and error analysis.<br>Building upon this foundation, students will delve into the principles of measurement instruments. They will study various types of measurement instruments, such as analog and digital multimeters, oscilloscopes, signal generators, spectrum analyzers, temperature sensors, pressure sensors, and flow meters. Students will learn about the working principles, characteristics, and limitations of these instruments. | | | |

**Module ٣٦**

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

| NVEEELI 226 | Microprocessor Applications | 3 | 2 |
|---|---|---|---|
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 72 | 90 |
| **Description** | | | |
| The Microprocessor Applications course focuses on various aspects of interfacing and programming peripheral devices with microprocessors. The course covers I/O programming fundamentals, including considerations for input/output operations, programmed I/O, interrupt-driven I/O, block transfers, and Direct Memory Access (DMA). Students also gain practical insights through an I/O design example.<br><br>Interfacing plays a vital role in connecting microprocessors with external devices. Students learn about programmable parallel ports, handshake input/output, and interfacing microprocessors with keyboards, displays, D/A converters, and A/D converters. They explore the operation, specifications, and interfacing techniques for these devices, as well as serial communication interfaces.<br><br>Parallel I/O and interfacing applications are discussed, with a focus on interfacing memory and memory-mapped I/O. Students gain an understanding of the concepts and techniques involved in effectively interfacing microprocessors with memory and utilizing memory-mapped I/O.<br><br>The course also covers general-purpose programmable peripheral devices, such as the PPI 8255 and Timer 8254. Students learn about the features, functionalities, and programming of these devices and explore their applications in various microprocessor systems.<br><br>By the end of the Microprocessor Applications course, students develop proficiency in I/O programming, interfacing techniques, and working with general-purpose peripheral devices. They acquire the skills necessary to effectively connect microprocessors with external devices, design I/O systems, and utilize various peripherals in microprocessor-based applications. | | | |

**Module ٣٧**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 311 | AC Convertors | 3 | 1 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 115 |
| **Description** | | | |
| Inverter is a most utilized device amongst the entire power electronics converters. That’s why it gained importance and covers major part of syllabus like subject Power Electronics Devices or Power Electronics DC convertes or under similar | | | |

title of power electronics subject. This course explains all about inverter with most simplified way. This course has a capability to lift you from beginner to expert for the subject power electronics. Major topics covered in this course are single phase inverter, three phase inverter, harmonics analysis, Fourier series, total harmonics distortion –THD, voltage & frequency control of Inverter & PWM control techniques. This course also covered the AC to AC cyclo-converter and phase controller in single-phase and Three-Phase.

Note: Harmonics analysis portion of this course explains fundamental of harmonics and use of Fourier series to analyses output voltage of inverters.

**Module ٣٨**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 321 | DC Drives | 3 | ١ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | ٧٤ | ٨٧ |
| **Description** | | | |
| The aim of this course is to equip students with knowledge of variable-speed drives and motion control systems which are used in many industrial processes such as in conveyors, machine tools, pumps, compressors, mining drives, electric vehicles, ship propulsion, wind energy systems, air-craft actuators, servo drives and automation systems, to name a few. The course stresses the basic understanding of characteristics of machines driven from appropriate power electronic converters and controllers. This course is a skill-building course that provides a basic understanding of DC motor and drive concepts and terminology. | | | |

**Module ٣٩**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 222 | Communication Principles | ٢ | ١ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 44 | 81 |
| **Description** | | | |
| The Communication Principles course provides students with a comprehensive understanding of the fundamental concepts, theories, and techniques used in communication systems. This course explores the principles and methodologies employed in transmitting, receiving, and processing information over various communication channels, including wired and wireless networks.<br>The course begins with an introduction to the basics of communication systems. Students will learn about the elements of a communication system, including the source of information, the transmitter, the channel, and the receiver. They will gain an understanding of the different communication techniques, such as analog and digital modulation, multiplexing, and error detection and correction.<br>Building upon this foundation, students will delve into the principles of signal transmission and modulation. They will study the characteristics and properties of analog and digital signals, including amplitude, frequency, and phase modulation techniques. Students will explore the concepts of modulation index, bandwidth, and signal-to-noise ratio (SNR) in determining the quality and efficiency of communication systems.various peripherals in microprocessor-based applications. | | | |

**Module 40**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 314 | Microcontroller Programming | 3 | ١ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 72 | 90 |
| **Description** | | | |
| The Microcontroller Programming course focuses on understanding microprocessors and microcontrollers, comparing their features and capabilities. The course starts by comparing microprocessors and microcontrollers, with a specific emphasis on the Z80 and MCS-51 architectures. Students gain a comprehensive understanding of various microcontrollers through a survey of different | | | |

models.

The MCS-51 architecture is introduced, covering the hardware components of the MCS-51 family microcontrollers. Topics include input/output pins, ports and circuits, external memory interfacing, counters, timers, serial data input/output, and interrupts. Students learn how to effectively utilize these features in microcontroller programming.

The course delves into the basic concepts of assembly language programming for microcontrollers. Students learn about addressing modes, data movement instructions, code memory operations, stack operations (push and pop), data exchanges, logical and arithmetic operations, branching instructions, and interrupts and returns. They gain hands-on experience in writing assembly language programs for microcontrollers.

An MCS-51 microcontroller design is explored, covering microcontroller specifications and requirements. Students learn about external memory and memory space decoding, expanding input/output capabilities, memory mapping input/output, memory address decoding, and testing the design. Additionally, students gain insight into using lookup tables and implementing serial data transmission.

Throughout the course, students engage in practical exercises and projects to apply their knowledge of microcontroller programming. They gain proficiency in designing and implementing microcontroller-based systems, utilizing the MCS-51 architecture, and effectively programming microcontrollers for various applications.

By the end of the Microcontroller Programming course, students develop a strong foundation in microcontroller programming. They gain proficiency in understanding microprocessor and microcontroller differences, working with the MCS-51 architecture, writing assembly language programs, and designing microcontroller-based systems. This knowledge equips them to program and develop innovative applications using microcontrollers.

**Module ٤١**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 315 | Renewable Energy Systems | ٢ | ١ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 44 | 81 |
| **Description** | | | |
| The course presents the various sources of renewable energy including wind, solar, and biomass as potential sources of energy and investigates the contribution they can make to the energy profile of the country. The technology used to harness these resources will be presented. Discussions of | | | |

economic, environment, politics and social policy are integral components of the course.

The course provides the students with an introduction to the renewable energy sources for electric power generation with focusing on photovoltaic and wind energy systems. Enable students to understand theory, physics, construction, auxiliary equipment related to renewable energy sources.

By the end of this course, students will learn about Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, and Limitations of RE sources.

**Module ٤٢**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 211 | Design of GraduationProject | 2 | ١ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 1 | 0/0/0/0 | 16 | 81 |
| **Description** | | | |
| The Engineering graduation project is a significant milestone in the academic journey of engineering students. It is a culmination of their years of theoretical learning and practical training, where they apply their acquired knowledge and skills to solve real-world engineering problems.<br><br>Typically, the Engineering graduation project involves a team of students working under the guidance of faculty members or industry professionals. The project aims to showcase the students' ability to analyze, design, develop, and implement an innovative solution to a specific engineering challenge | | | |

**Module ٤3**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 321 | Power Electronic Applications | 3 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 90 |
| **Description** | | | |
| This course focuses on presenting the fundamental concepts on conversion, | | | |

control and monitoring of electric energy using power semiconductor devices. Methods for analyzing power electronic converters suitable for AC/DC, DC/DC and DC/AC electrical energy conversions are presented. Also provide a knowledge of dealing with power supplies (uninterruptible, switch-mode), power electronic control principles, Modulation methods. System design, implementation and control, and computer interfacing. EMI in Power Electronics Systems. HVDC transmission. Static circuit breaker, UPS, static VAR controller.

**Module ٤٤**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 322 | AC Drives | 3 | ٢ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/1 | 74 | 90 |

**Description**

The aim of this course is to equip students with knowledge of variable-speed drives and motion control systems which are used in many industrial processes such as in conveyors, machine tools, pumps, compressors, mining drives, electric vehicles, ship propulsion, wind energy systems, air-craft actuators, servo drives and automation systems, to name a few. The course stresses the basic understanding of characteristics of machines driven from appropriate power electronic converters and controllers. The steady-state behavior of such drives and design of high-performance drives delivering high dynamics will be covered. The dynamic issues of drive representation and control system design for the latter will also be covered in this course. This course is a skill-building course that provides a basic understanding of AC motor drive concepts and terminology. At the completion of this course, the necessary fundamental knowledge and skills

required to attend other Rockwell Automation AC and DC drives courses will be obtained.

**Module 45**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 323 | Battery Manegement System | ٢ | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/0/1 | 44 | 106 |

**Description**

An electric vehicle generally contains the following major components: an electric motor, a motor controller, a traction battery, a battery management system, a plug-in charger that can be operated separately from the vehicle, a wiring system, a regenerative braking system, a vehicle body, and a frame. The battery management system is one of the most important components, especially when using lithium-ion batteries. Battery Management System is an embedded system that ensures human safety in an Electric Vehicle. BMS not only ensures safety but also estimates the various state of health parameters of a battery pack. As the demand for Electric Vehicles is increasing so the demand for Lithium-ion batteries is increasing. Every battery pack developer needs an Engineer who can develop the required BMS. The BMS Specialization Course has several levels which will make you a BMS Developer. The Level 1 of Complete Battery Management System Course which will be provided in this course is designed for anyone who wishes to pursue a career in BMS embedded systems. In this course, participants will engage in hands-on testing of a simple battery pack and battery management system. Additionally, participants will gain an understanding of energy storage and conversion, BMS functions, algorithms, and fault detection for battery

applications. By the course end, participants will learn how the BMS communicates through a CAN network, identify Battery and BMS failure modes and mitigation strategies, and how to monitor voltage, temperature, and current within a battery.

**Module ٤٦**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 324 | Microwaves Engineering | ٣ | ٢ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 60 | 90 |
| **Description** | | | |
| This course aims to help the students understanding the basics of Microwave theory and techniques. It also intends to introduce the applications of Microwave Engineering in the modern communication and radar systems. Microwave Engineering introduces the student to RF/microwave analysis and design techniques. Scattering parameters are defined and used to characterize device and system behavior. The passive and active devices commonly used as components in a microwave subsystem are studied. Device design procedures and methods to evaluate performance are developed.<br>By the end of this course, the students should be able to understand basic Microwave electromagnetic structures, analyze Microwave networks, and design simple passive and active Microwave components. | | | |

**Module ٤٧**

| Code | Course/Module Title | ECTS | Semester |
|---|---|---|---|
| NVEEELI 325 | Modelling and Simulation | ٣ | ٢ |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/2/0/0 | 44 | 75 |

| Description |
| --- |
| This course provides an introduction to the process of designing models of existing or proposed real-world systems, and how to use the models to perform simulations that allow for predictions about the future behavior of the system. The system could be something as mundane as a cricket match, to something more complex, such as a communication network, or transportation system. Most systems of interest will require the development of one or more statistical models. Thus, modeling and simulation has a significant overlap with probability and statistics. The course topics will include a review of concepts from probability and statistics that are relevant to modeling and simulation, algorithms for random-variable sampling, modeling and analysis of basic queueing systems, variance-reduction techniques, statistical-validation techniques, Independent Monte Carlo (IMC) and Markov-Chain Monte Carlo (MCMC) simulations, and discrete-event modeling and simulation. |

**Module ٤٨**

| Code | Course/Module Title | ECTS | Semester |
| --- | --- | --- | --- |
| NVEEELI 126 | Implementation of graduation Project | 1 | 2 |
| **Class (hr/w)** | **Lect/Lab./Prac./Tutor** | **SSWL (hr/sem)** | **USWL (hr/w)** |
| 2 | 0/0/3/0 | 72 | 64 |
| **Description** | | | |
| The Engineering graduation project is a significant milestone in the academic journey of engineering students. It is a culmination of their years of theoretical learning and practical training, .where they apply their acquired knowledge and skills to solve real-world engineering problems<br><br>Typically, the Engineering graduation project involves a team of students working under the guidance of faculty members or industry professionals. The project aims to showcase the students' ability to .analyze, design, develop, and implement an innovative solution to a specific engineering challenge | | | |

# 8. Contact

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