

# Al-Nahrain University

## جامعة النهرين



*First Cycle – Bachelor's degree (B.Sc.) – Prosthetics and Orthotics Engineering.*

بكالوريوس علوم في هندسة الاطراف والمساند الصناعية



## Table of Contents

1. Overview
2. Undergraduate Modules 2023-2024
3. Contact

### 1. Overview

This catalogue is about the courses (modules) given by the program of Prosthetics and Orthotics Engineering to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة الاطراف والمساند الصناعية للحصول على درجة بكالوريوس علوم. يقدم البرنامج (48) مادة دراسية، مع (6000) إجمالي ساعات حمل الطالب و (240) إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على مسار بولونيا.

### 2. Undergraduate Courses 2023-2024

#### Module 1

Code	Course/Module Title	ECTS	Semester
UREQ110	Human Rights and Democracy	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	30	45
Description			
<p>This module deals with understanding rights and freedoms, learning about children's rights, the meaning of democracy, its types, and its historical development up to the present time. Paying attention to the student's knowledge of democracy, how to implement it, and the difference between it and freedom. Learn about elections, their role, and the importance of the voter's voice.</p> <p>Learn about his country's system, and learn about the democratic systems practiced by countries and the reason for the emergence of different types of democracy, to develop the student's ability to dialogue and discussion, adhere to duties, and learn about integrity and its role in the democratic system.</p>			

**Module: 2**

Code	Course/Module Title	ECTS	Semester
UREQ111	Programming	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	72	28
Description			
<p>This module description provides a full explanation of the basics of programming using MATLAB, in addition to identifying the special and important functions in the application of MATLAB, which serve the specialization of the section from the functions of drawing, rotation, zooming in, zooming out and reflection, all the way to learning programming in order to achieve the goal in integrating the design process with programming.</p>			

**Module 3**

Code	Course/Module Title	ECTS	Semester
MATH110	Math I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	2	86	64
Description			
<p>This module aims to enhance students' problem-solving skills and deepen their understanding of derivatives and integrals. It focuses on developing the ability to differentiate between various types of functions and utilize derivative concepts to analyze and sketch the behavior of functions. The course covers fundamental concepts such as functions, limits, continuity, derivatives, and integrals. It also emphasizes the practical applications of derivatives and integrals, providing students with a clearer understanding of their real-world significance. By the end of the course, students should have improved problem-solving abilities, a solid grasp of differentiation and integration, and a better understanding of how these concepts relate to practical scenarios. By exploring these topics, students are encouraged to develop their knowledge and understanding in the field of differentiation and integrals. At the conclusion of the course, students are expected to demonstrate enhanced problem-solving skills, a firm understanding of differentiation and integration, and an improved comprehension of the practical applications of these concepts.</p>			

**Module 4**

Code	Course/Module Title	ECTS	Semester
CREQ110	Engineering Drawing I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	5	100	50
<b>Description</b>			
<p>This module includes two parts; descriptive engineering and hand drawing. In the first part, topics including planes of projection, theory of projection of points, traces of lines, projection of lines, finding true length of lines using rebatement and rotation methods will be covered. The second part deals with the hand drawing techniques such as types of sheets, drawing tools, sheet layout, types of lines, drawing operations, projection of solids, hidden lines and adding dimensions to sketches. By exploring these topics, students can develop and enhance the engineering sense of scaled drawing, projections and drawing sheets. These aspects will provide opportunities for students to develop understanding and interpretation of various engineering drawing sheets and formats that they may face during their career.</p>			

#### Module 5

Code	Course/Module Title	ECTS	Semester
POER110	Statics	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	86	64
<b>Description</b>			
<p>This module Statics is the branch of engineering mechanics that is concerned with the analysis of forces on physical systems in static equilibrium. Statics will also help students interpret the forces supporting objects that are encountered in their daily lives (our interest application here is the prosthesis and orthosis). Besides pure Statics, also covers topics to lay the foundation for Dynamics. It will also help students interpret the force analysis or load applied to the prosthesis and orthosis design and manufacturing. By exploring these topics, students are encouraged to go beyond the typical understanding of analysis of the prostheses and orthosis in an equilibrium state. This course provides opportunities for actually using statics concepts to calculate and analyse the forces applied to the human limbs.</p>			

#### Module 6

Code	Course/Module Title	ECTS	Semester
CREQ111	Chemistry	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	72	53
<b>Description</b>			
<p>Those who will take this course will have extensive training in the subjects that deal with chemical analysis, like calculations based on the weight relations of chemical formulas and equations, begin our study of quantitative analysis with special emphasis on analytical applications (molarity, normality, pH of solution, Equilibrium constants) and using of some measuring devices, UV Spectrometry, Atomic</p>			

Spectrometry, Gas Chromatography. This will give the students background and strong basic to higher level courses involving dealing with different solutions specifically during dealing with solutions in laboratory.

### Module 7

Code	Course/Module Title	ECTS	Semester
MATH120	Math II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	2	86	64
Description			
<p>This module aims to enhance students' problem-solving skills and deepen their understanding of different types of indefinite integrals. It focuses on developing the ability to differentiate between various types of functions, including logarithmic, exponential, inverse, and hyperbolic functions. The course utilizes the concepts of various integral types to analyze the behavior of functions through integration. It covers fundamental concepts of integration and provides a brief introduction to matrices. The course also emphasizes important types of integrals, such as integration by parts, partial fractions integrals, and numerical integrals, with the goal of clarifying their significance. By the end of the course, students should have improved problem-solving abilities, a solid grasp of various types of integrals, and a better understanding of how these concepts relate to practical scenarios. By exploring these topics, students are able to solve different types of integrations as well as have a good background in the field of inverse function, logarithm, exponential, hyperbolic functions and the basic concepts of matrices. Upon completion of the course, students can expect to have enhanced problem-solving skills, a comprehensive understanding of diverse types of integrals, and a heightened awareness of the practical applications of these concepts.</p>			

### Module 8

Code	Course/Module Title	ECTS	Semester
UREQ120	English Language I	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	-	44	31
Description			
<p>College requirement.</p>			



**Module 9**

Code	Course/Module Title	ECTS	Semester
PHYS120	Physics	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	4	114	61
Description			
This module deals with basics for physics with different subject begins with universal forces units, physics quantities general laws. Know the basics for analysis and serve specific problems. Some experiments will be conducted to justify the theory. By exploring these topics, students are encouraged to go beyond the typical understanding of most branch of physics with application in environments and general law to solve problems. These aspects will provide opportunities for actually understanding the information of physics concepts to application in other subject during their studies			

**Module 10**

Code	Course/Module Title	ECTS	Semester
CREQ120	Engineering Drawing II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	86	64
Description			
This module covers the computer assisted 3D modelling using SOLIDWORKS including basic sketches, sketch relations, extruded boss, extruded cut, pattern, fillet, chamfer, material addition, volume calculation, planes, sweep, revolve features and 2D sheet drawings from 3D models. By exploring these topics, students are able to build 3D solid models and modify it using SOLIDWROKS. In addition, students will have the ability to make simple 2D sketches from the 3D built models using the drawing part of SOLIDWORKS. These aspects will provide opportunities for designing, modifying and presenting various prosthetics and orthotics and analyze these models or applying some parametric studies for optimum design.			

**Module 11**

Code	Course/Module Title	ECTS	Semester
POER120	Dynamics	5	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	4	86	39
Description			
<p>This module is a mid-level course in engineering mechanics which is concerned with the motion of bodies under and not under the action of forces. The study of dynamics has numerous engineering applications one of them in the motion of prosthesis and orthosis (which is our interest application here). It will also help students interpret the movement of all moving objects we encounter in our daily lives. Students are expected to have a linear algebra, calculus, and basic physics background. By exploring these topics, students are encouraged to go beyond the typical understanding of analysis of the movement of prostheses and orthosis. These course items provide opportunities for actually using dynamics concepts to determine and analyses the movements of human limbs.</p>			

### Module 12

Code	Course/Module Title	ECTS	Semester
UREQ121	Workshop Technology	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	2	30	45
Description			
College requirement.			

### Module 13

Code	Course/Module Title	ECTS	Semester
UREQ210	English Language II	3	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	-	44	31
Description			
College requirement.			

**Module 14**

Code	Course/Module Title	ECTS	Semester
UREQ211	Principles of Management	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	30	20
Description			
<p>This unit deals with the meaning, functions and types of management, strategic management, human resources management and leadership, understanding the interrelationship between these functions, highlighting the basic principles, related concepts, knowledge of electronic management, the role and development of networks in management. Understands of the principles of administrative work that can be practiced in all positions and how to apply these concepts and theories in organizations, Understanding the levels of management, its importance , role, the concept , theories of leadership and its role in the survival of any organization. Through the main management functions, which are planning, organizing, directing and controlling, the role of the manager in project management, how to manage any project, the reasons for gradation in administrative levels, and their importance in engineering work.</p>			

**Module 15**

Code	Course/Module Title	ECTS	Semester
MATH210	Math III	5	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	72	53
Description			
<p>This module focuses on developing students' problem-solving skills and enhancing their understanding of various types of differential equations. It covers the different types of first-order ordinary differential equations and provides an explanation and solution methods for second-order linear ordinary differential equations. The course also introduces the fundamental concept of Laplace transform. Additionally, it aims to clarify the important aspects of Laplace transform, Laplace inverse, and how to solve ordinary differential equations using Laplace transforms. By the end of the course, students should have improved problem-solving abilities, a solid grasp of differential equations, and the ability to apply Laplace transforms to solve relevant problems. By exploring these topics, students can solve different types of ordinary differential equations as well as have a good background in the field of Laplace transform. Upon completion of the course, students can expect to have enhanced problem-solving skills, a strong understanding of differential equations, and the capability to utilize Laplace transforms effectively for solving practical problems.</p>			



**Module 16**

Code	Course/Module Title	ECTS	Semester
POER210	Anatomy	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	86	64
Description			
<p>Knowledge of the natural structure, organs and internal structures of the human body and their locations and connections. Through anatomy and other means such as gypsum and plastic models and showing educational films. And x-ray and magnetic resonance films and provide students with knowledge about the appropriate and necessary ethics for vocational education to deal with corpses and humans and teach and learn the superficial anatomical signs of the body that indicate the locations of bones, muscles, Tendons, blood vessels, nerves and other internal organs. To link basic anatomy and embryology with manifestations of pathological conditions to reach a diagnosis the correct.</p>			

**Module 17**

Code	Course/Module Title	ECTS	Semester
POER211	Strength of Material	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	86	64
Description			
<p>This module deals with the effect of external loads (forces, moments, etc.) on the structures, parts, and how stress, and strain is related to the structural part. There are different types of stresses that might occur due to the external load. Direct stress, indirect stress, torsional stress, bending stress, thin cylinder stress, etc. All these stress types can be determined with their strain, deflection, and deformation results. Studying the effect of external load on the mechanical part will increase the general understanding of what is causing mechanical failure, and how to avoid any particular failure by knowing the design weak points. The P&amp;O student will understand the effect of the patient weight and his specific biomechanics condition on the prosthetic or the orthosis. So, he/she can avoid any expected failure or any extra deformation or deflection might happened due to the patient usage of the prosthetic or the orthosis.</p>			

**Module 18**

Code	Course/Module Title	ECTS	Semester
POER212	Orthoses I	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	6	128	72
Description			
<p>This module aims to understand types of deformity of lower and upper limb. To know the aim and indication of use orthosis ,to understand types of lower and upper limb orthosis ,to identify the procedure of manufacturing orthosis. The course aims to provide the student with the practical experience and skill required to manufacture upper and lower orthosis of all types</p>			

**Module 19**

Code	Course/Module Title	ECTS	Semester
POER220	Biomaterials	4	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	58	42
Description			
<p>This module gives information about types of biomaterial and the basic interaction with human body. Starting with requirement and properties of different types of biomaterial. Also the important of corrosion term in biomaterial subject .The students Learn Synthetic Biomaterials , testing methods and most application in human body as drug deliver, people, often need replacements or compensatory action due to fracture and excessive strain. These aspects will provide opportunities for actually understanding the importance of biomaterials application as implant part of Prosthetics &amp; internal Orthotics</p>			

**Module 20**

Code	Course/Module Title	ECTS	Semester
MATH220	Math IV	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	58	67
Description			
<p>This module aims to enhance students' problem-solving skills and deepen their understanding of matrices. It covers topics such as determinants, adjoint, transpose, and inverse of matrices. Additionally, the course focuses on explaining and solving sets of linear equations using matrix methods. It also introduces the basic concept of complex numbers. Vector analysis and vector operations are clarified as important components of the course. Lastly, the course provides an</p>			

explanation of Fourier series for functions. By the end of the course, students should have improved problem-solving abilities, a solid grasp of matrices and their operations, an understanding of complex numbers, proficiency in vector analysis, and knowledge of Fourier series for functions. By exploring these topics, students can solve sets of linear equations using matrix methods. Also, the students have a good background in the field of complex number, vector analysis. Upon completion of the course, students can expect to have enhanced problem-solving skills, a comprehensive understanding of matrices and their operations, proficiency in complex numbers, adeptness in vector analysis, and familiarity with Fourier series for functions.

### Module 21

Code	Course/Module Title	ECTS	Semester
POER221	Biomechanics	4	4
Class (hr./w)	Lect./Lab./Prac./Tutor	SSWL (hr./sem)	USWL (hr./w)
4	-	58	42
Description			
<p>This module deals with introduction to biomechanics, the kinematic concepts for analyzing human motion and kinetic concepts for analyzing human motion. Describe the scope of scientific inquiry addressed by biomechanists. Recognize the kinematics concepts and reference geometry. List the various terms associated qualitative analysis. Identify the mechanical loads on human body. List and identify tools for measuring kinetics quantities. Describe bone stress theory and discuss bone types. Identify joint architecture, joint stability and flexibility.</p>			

### Module 22

Code	Course/Module Title	ECTS	Semester
POER222	Electronics	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	86	39
Description			
<p>This module is develop problem solving skills and understanding of circuit theory through the application of techniques, understand voltage, current and power from a given circuit, deals with the basic concept of electrical circuits, And understanding the electrical and electronic circuits, To understand Kirchhoff's current and voltage Laws problems, Who to use mesh analysis, To understand Diodes and Transistors perform. and deals with the basic concept of Electronic filters.</p>			

**Module 23**

Code	Course/Module Title	ECTS	Semester
POER223	Prostheses I	8	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	6	128	72
Description			
<p>This module deals with lower limb amputation related to patients. The module begins with the knowledge about the level of amputation and proper prosthesis for each level and learning the components of the prosthesis such as socket, suspension, adapters, pipe and foot and modeling human body biomechanics for patients and study the analysis the gait cycle for each level of prosthesis. By exploring these topics, students are encouraged to go beyond the typical understanding of prosthesis and some aspects related to amputees biomechanics. These aspects will provide opportunities for actually using principle of prosthesis to prepare optimum design of prosthesis and orthosis device , as well as to provide skills for patient care and rehabilitation.</p>			

**Module 24**

Code	Course/Module Title	ECTS	Semester
POER224	Elective I	4	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	58	42
Description			
<p>Physiology:</p> <p>This module- Study and proper body functions and study of health, safety and care and Knowing the causes of diseases, their pathogenesis and prevention. And Principles and indications of surgical and therapeutic interventions, principles of pharmacology, toxicology and anesthesia. And Learn about public health issues, common diseases, and the epidemiology of diseases Contribute to academic and applied research in every field.</p>			

**Module 25**

Code	Course/Module Title	ECTS	Semester
POER310	Automatic Control	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	86	64
Description			
<p>This module learn basic concepts of control and measurements, learn transient response according to time domain analysis, developing professional capabilities of students, find out types, patterns, assembly units and residential complexes, according to their surrounding environment relationship, design feedback system, checklist performance of system with and without PID controller, and understanding measuring problems and how to solve it in future.</p>			

**Module 26**

Code	Course/Module Title	ECTS	Semester
POER311	Prostheses II	8	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	6	128	72
Description			
<p>This module deals with upper limb amputation related to patients. The module begins with the knowledge about the level of amputation and proper prosthesis for each level and learning the components of the prosthesis such as socket, suspension, adapters, pipe and hand and modeling human body biomechanics for patients and study the analysis of movement for each level of prosthesis. By exploring these topics, students are encouraged to go beyond the typical understanding of prosthesis and some aspects related to amputees biomechanics. These aspects will provide opportunities for actually using principle of prosthesis to prepare optimum design of prosthesis and orthosis devices, as well as to provide skills for patient care and rehabilitation.</p>			

**Module 27**

Code	Course/Module Title	ECTS	Semester
POER312	Pathology	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	58	42
Description			

Introducing students to the mechanism of disease occurrence at the cellular level and how the cell responds to pathogens by means of adaptation and reform and Studying the causes and pathogenesis of various diseases at the level of each organ. The body separately and its reflection on the function of the affected organ and other organs associated with it Systemic pathology

### Module 28

Code	Course/Module Title	ECTS	Semester
CREQ310	Statistics	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	58	42
Description			
<p>Statistics is the art of using data to make numerical conjectures about problems. Descriptive statistics is the art of summarizing data. Topics include: histograms, the average, the standard deviation, the normal curve, correlation. Much statistical reasoning depends on the theory of probability. Topics include: chance models, expected value, standard error, probability histograms, convergence to the normal curve. Statistical inference is the art of making valid generalizations from samples. Topics include: estimation, measurement error, tests of statistical significance.</p> <p>This course aims introduce statistics and its applications for engineering student. The objective is intended for students to solve some practical by statistical methods. It will help students develop skills in thinking and analyzing problems from a probabilistic and statistical point of view.</p>			

### Module 29

Code	Course/Module Title	ECTS	Semester
POER313	Rehabilitation	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	58	42
Description			
<p>This module Helping students to know the methods of teaching and learning that help them achieve the intended learning outcomes in theory. Helping students to know the assessment methods used to ensure that students obtain the learning outcomes targeted. Helping students to know the relationship of the program and its study elements (courses or subjects) with Certificate awarded and future job qualifications. The program's Marathi objectives ;1 - Helping students apply what they have learned from practical materials inside and outside the university setting.2 - Helping students apply what they have learned from theoretical subjects inside and outside the university setting.3 - Helping students apply their ideas and talents inside and outside the university setting</p>			

**Module 30**

Code	Course/Module Title	ECTS	Semester
POER314	CAD/CAM System	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	58	42
Description			
<p>This module deals with the design and automate manufacturing technique based on mathematical equations to describe programmed manufacturing architecture and mechanisms. In addition to encouraging students to innovate and develop new ideas or modify previous ideas in their field of specialization, in order to learn about modern technologies for design and manufacturing processes. finally, it can be summarized the aim of this module as to develop problem-solving skills by identifying the mathematical description of geometric profile so as to learn how to programmatically represent geometric shapes based on mathematical equations, identify the methods used in determining the modeling of geometric shapes, identify the mechanisms used in reverse engineering to describe geometric shapes. Finally learn about automated manufacturing mechanisms.</p>			

**Module 31**

Code	Course/Module Title	ECTS	Semester
POER320	Orthoses II	8	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	6	128	72
Description			
<p>This module aims to understand types of deformity of spinal , indication of use spinal orthosis, to understand types of spinal orthosis ,to identify the procedure of manufacturing spinal orthosis ,Design the orthoses using mathematical models ,and Study the types of stress generates in orthosis. Also provide the student with the practical experience and skill required to manufacture spine supports of all kinds</p>			

**Module 32**

Code	Course/Module Title	ECTS	Semester
POER325	Elective II	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	58	42

Description
<p>1- Manufacturing Processes:</p> <p>This module deals with classifying the basic manufacturing processes, highlighting the tools, jigs, fixtures and materials used in manufacturing various parts, going through pattern making, molding, casting, plastic technology, cutting, milling, drilling, grinding, powder metallurgy, lamina manufacturing, flexible manufacturing systems, additive manufacturing and heat treatment. By exploring these topics, students are encouraged to understand and select the proper sequence of operations to get the final product. In addition, the students are aware of the special precautions of industrial safety. These aspects will provide opportunities for students for actually manufacturing various prosthetics and orthotics using basic and advanced manufacturing processes in an engineering point of view.</p> <p>2- Assistive Devices:</p> <p>This course aims to provide knowledge about the basic principles and concepts applied in rehabilitation engineering design and to understand the clinical problems for which rehabilitation engineering and assistive technology are used.</p>

### Module 33

Code	Course/Module Title	ECTS	Semester
POER321	Anatomy & Physiology of Nervous System	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	58	42
Description			
<p>This module include learning of anatomy and physiology .It consists of learning the Physiology of Nerve and Muscle Cells ,Excitable Tissue, Resting Membrane Potential of Nerves .it considers the Nerve Action Potential and the Protein Synthesis and Axoplasmic Transport as well as the Excitation and Conduction functions.The Electrical Phenomena and Ionic Fluxes Relation between Muscle Length and Tension ,Relation of Velocity of Contraction to Load are indicated in details .</p> <p>By exploring these topics, students are encouraged to understand the effect of problems in nerves system on patient These aspects will provide opportunities for students for actually manufacturing various prosthetics and orthotics with comfort and using the nerves signal for smart prosthesis.</p>			

### Module 34

Code	Course/Module Title	ECTS	Semester
POER322	Numerical Analysis	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	1	72	53



Description
<p>This module focuses on enhancing problem-solving skills and developing an understanding of Taylor series. It covers different types of numerical differentiation and provides explanations and solutions for root finding and numerical integration problems. The course also delves into solving sets of linear and non-linear system of equations, introducing the basic concepts involved. Additionally, it clarifies the concept of least square curve fitting and explores interpolation and its methods. Furthermore, the course explains and solves numerical solutions for first-order ordinary differential equations. By the end of the course, students should have improved problem-solving abilities, a solid grasp of Taylor series, proficiency in numerical methods for differentiation and integration, knowledge of root finding techniques, an understanding of curve fitting, familiarity with interpolation methods, and the ability to solve numerical solutions for first-order ordinary differential equations. This course enhances problem-solving skills and understanding of Taylor series, covering numerical differentiation, root finding, numerical integration, solving linear and non-linear equations, least square curve fitting, interpolation methods, and numerical solutions for first-order ordinary differential equations. Upon completion of the course, students can expect to have enhanced problem-solving skills, a comprehensive understanding of Taylor series, proficiency in numerical differentiation and integration methods, familiarity with root finding techniques, a clear grasp of curve fitting concepts, knowledge of interpolation methods, and the ability to solve numerical solutions for first-order ordinary differential equations.</p>

### Module 35

Code	Course/Module Title	ECTS	Semester
POER323	Analytical Biomechanics	5	6
Class (hr/w)	Lect./Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	72	53
Description			
<p>This module deals with analysis of human movements related to daily activities. The module begins with the analysis of the dynamics of translational and rotational motion of human joints and body segments and modeling human body kinematic and kinetic using Newton second law and angular momentum concepts, lump and rigid body analysis are considered. Some experiments will be conducted to justify the theory. By exploring these topics, students are encouraged to go beyond the typical understanding of biomechanics of human body and some aspects related to amputees biomechanics. These aspects will provide opportunities for actually using biomechanics concepts to prepare optimum design of prosthesis and orthosis devices, as well as to provide skills for patient care and rehabilitation.</p>			

### Module 36

Code	Course/Module Title	ECTS	Semester
POER324	Computer Application	4	6
Class (hr./w)	Lect./Lab./Prac./Tutor	SSWL (hr./sem)	USWL (hr./w)
1	3	58	42

Description
In this topic, we will cover how to assign materials to your models and evaluate mass properties for existing 3D models. This will include finding the mass and the volume of a 3D model. We will also cover how to introduce a new coordinate system to our model. The use SOLIDWORKS assemblies, allow us to mix multiple parts together to create a single artifact. In this topic, we will cover basic SOLIDWORKS assemblies, and in particular, standard mates. A finite element analysis is a complex process that approximates a physical phenomenon. An analysis can take in consideration many different physical conditions like force, pressure, temperature, heat and vibration. Based on the analysis results, changes can be made to the original design's geometry and/or material to improve part's performance. To develop problem solving skills and understanding of sketches, drawing, mates and simulations. This course deals with the basic concept of SOLIDWORKS and simulation. Identify the basic steps in static simulation. Explain the boundary conditions for various cases. Identify the basic steps in steady state thermal simulation. Explain verification, validation and mesh analysis.

### Module 37

Code	Course/Module Title	ECTS	Semester
UREQ410	Professional Ethics	2	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	30	20
Description			
This module This module deals with the basic principles of professional ethics. The course starts with defining ethics and its importance in work and the most important available for the work to be in accordance with the principles of Assurance quality. Then it is concerned with the ethics of engineers and explains the most important codes of ethics adopted by many organizations such as the ABET ,IEEE and ISPO It also gives the most important conditions for the ethics of scientific research. By exploring these topics, students are encouraged to go beyond the typical understanding of ethics in prosthetic and orthotics engineering s . These aspects will provide opportunities for actually using ethics in practical work and in academic researches			

### Module 38

Code	Course/Module Title	ECTS	Semester
POER410	Prosthetic Clinical Practice	8	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	6	114	86
Description			
This unit deals with knowing what clinical prostheses are and what are the goals of the clinical stage, in addition to knowing what are the duties of each of the limb technicians and the physiotherapist, in addition to histopathology and amputation surgery, and how to postsurgical management, explaining			

the components of the prostheses, and it will also be to identify levels of amputation, Clinical Decision-Making for Prosthetics will also be addressed and recognized. Amputation in children will also be explained, in addition to the method of dealing with patients. In addition, seminars will be held on various topics in order to identify and discuss topics related to this subject, to increase students' awareness and knowledge and increase the student's cognitive impact.

### Module 39

Code	Course/Module Title	ECTS	Semester
POER411	Mechanical Design	6	7
Class (hr./w)	Lect./Lab./Prac./Tutor	SSWL (hr./sem)	USWL (hr./w)
2	5	100	50
Description			
<p>Indicative content includes the following: design of variable stresses in machine parts, pressure vessels, screwed joints, springs. Fundamentals of finite element method and application to Ansys. Design of active above knee prosthesis. To develop problem solving skills and understanding of designing parts regarding static and dynamic loading. To understand fatigue, screw, and springs from design point of view. This course deals with the basic concept of mechanical part design and prosthetic design. This is the basic subject for all prosthetics engineers. Recognize how fatigue affect the life of mechanical parts. List the various terms associated with fatigue, screw, and springs. Summarize what is meant by a combined loading design. Discuss the theories of fatigue. Describe factor of safety theoretically and numerically. Define finite element method.</p>			

### Module 40

Code	Course/Module Title	ECTS	Semester
POER412	Robotics and Smart Prosthesis	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	72	53
Description			
<p>This module is an introduction to the field of robotics which concentrated on the articulated manipulator to deal with robotic prosthesis and orthosis. It covers the fundamentals of kinematics of robot manipulators, actuating and sensing. The course deals with homogeneous transformations, forward and inverse kinematics of robotic manipulators, and differential kinematic equations. It also presents the fundamental principles of proximity, tactile, and force sensing. Students are expected to have a background in linear algebra, calculus, and basic physics. By exploring these topics, students are encouraged to go beyond the typical understanding of smart prostheses and orthosis and some aspects related to sensors and actuators that are used in these applications. These aspects will provide opportunities for actually using robotics concepts to design robotic prostheses and orthosis.</p>			

**Module 41**

Code	Course/Module Title	ECTS	Semester
POER413	Elective III	3	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	44	31
Description			
<p>1- Composite materials: This unit deals with knowing what composite materials are and what their types are according to the reinforcement and according to the base material because of its importance due to its direct contact with the patient. Various topics of importance will be addressed such as polymeric composite materials and the mixing base, in addition to knowing natural composite materials and medical composite materials and their applications, in addition to learning about nanocomposite materials. In addition, seminars will be held on various topics in order to identify and discuss topics related to this subject, to increase students' awareness and knowledge and increase the student's cognitive impact.</p> <p>2- Nanotechnology: This module gives information about nanotechnology , scale with nano ,the properties of nanomaterial ,Advantech and disadvatech and most application .the students Know most devices Nano technology deals with material and methods of analysis , manufacturing of nanomaterial with properties and application . These aspects will provide opportunities for actually understanding the importance of nano technology and indicate the biomaterial with Nano size applications in orthotics and prosthetic engineering field .the important Quantum physics in this field.</p>			

**Module 42**

Code	Course/Module Title	ECTS	Semester
CREQ410	Project I	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	6	84	66
Description			
College requirement.			

**Module 43**

Code	Course/Module Title	ECTS	Semester
POER420	Research Methods in Health	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	72	53
Description			
<p>This module deals with medical researches and the most experimental design used in this field, it contains the methods of analyzing primary and secondary data and statistical tests and their hypothesis to explore the main altitudes and conclusions. Many applications on prosthetic and orthotic researches are considered . By exploring these topics, students are encouraged to go beyond the typical understanding of the principles of researches in health especially for amputees. These aspects will provide opportunities for using statistical concepts to prepare health researches which are the only way to test qualities and non-measured quantities such as pain, comfort, opinion and so on.</p>			

**Module 44**

Code	Course/Module Title	ECTS	Semester
POER421	Orthotic Clinical Practice	8	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	6	114	86
Description			
<p>This module This course aims to teach students how to diagnose deformities in the lower and upper extremities, identify their causes and symptoms, how to deal and evaluate patients clinically, in addition to how to manufacture prostheses clinically in health centers .The student also acquires the practical experience and skill required to manufacture orthosis of all types</p>			

**Module 45**

Code	Course/Module Title	ECTS	Semester
POER422	Elective IV	3	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	44	31
Description			
<p>1- Bone Implant: This module provides an introductory overview of the various implant materials identify the types of implant and design and distinguish between different material properties and application of implant</p>			

.the students understand that medical implants (hip replacements, bone, or dental knee, scaffold ....) that is need to integrate with surrounding tissues. Learn the modern method of implant design and general properties. Understanding the basic of ossiontergration for implant. These aspects will provide opportunities for actually understanding the importance of implant bone term for understanding the parts and model of AK and OK implant prosthesis.

#### Module 46

Code	Course/Module Title	ECTS	Semester
POER423	Elective V	3	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	0	44	31
Description			
<p>Ocular prosthesis and implants:            The aim of this module is to provide comprehensive training and education in the field of ocular prosthetics. This module focuses on equipping students with the knowledge and skills necessary to create and fit custom ocular prostheses for individuals who have lost an eye. The module covers various aspects, including ocular anatomy, impression techniques, fabrication processes, and patient care. By the end of the module, students are expected to be proficient in the art and science of ocular prosthetics, enabling them to offer personalized and realistic solutions to patients in need. The ultimate goal is to improve the quality of life for individuals with ocular defects by restoring their visual appearance and boosting their self-confidence.</p>			

#### Module 47

Code	Course/Module Title	ECTS	Semester
POER424	Advance Manufacturing	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	86	39
Description			
<p>This module of this course is to teach students advanced manufacturing mechanisms, including the additive manufacturing mechanism. Also, to learning about the materials used in this technique, as well as the determinants and advantages of these modern manufacturing methods. Where the student will be Introduced the modern methods of manufacturing processes, also, will be get educating on additive manufacturing techniques, identify the features and determinants of additive manufacturing technology. Finally, Determine the materials used in the additive manufacturing.</p>			

### Module 48

Code	Course/Module Title	ECTS	Semester
CREQ420	Project II	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	6	84	66
Description			
College requirement.			

### Contact

Program Manager:

Ahmed Abdulsameea Alduroobi | Ph.D. in Production Engineering | Professor

Email: [ahmed.alduroobi@nahrainuniv.edu.iq](mailto:ahmed.alduroobi@nahrainuniv.edu.iq)

Mobile no.: +9647700702072

Program Coordinator:

Fahad Mohanad Kadhim | Ph.D in Mechanical Engineering | Lecturer

Email: [fahad.mohanad@nahrainuniv.edu.iq](mailto:fahad.mohanad@nahrainuniv.edu.iq)

Mobile no.:+964 7709383048

---