Northern Technical University

First Cycle – Bachelor's Degree (B.Sc.) – Power Mechanics

Northern Technical University

Engineering Technical College/ Mosul

Department of Power Mechanics Engineering Techniques

بكلوريوس – هندسة تقنيات ميكانيك القوى –

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1. Overview

This catalogue is about the courses (modules) given by the program of Power Mechanics Techniques Engineering to gain the Bachelor of Technical Engineering degree. The program delivers (42) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة تقنيات ميكانيك القوى للحصول على درجة البكالوريوس في الهندسة التقنية. يقدم البرنامج (42) مادة دراسية بإجمالي (6000) ساعة حمل للطالب و(240) اجمالي الوحدات الاوربية (ECTS) ويعتمد تقديم المقررات على عملية بولونيا.

2. Undergraduate Courses 2024-2025

Module 1

Code	Course/Module Title	ECTS	Semester
NTU 101	English Language	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	33	17
Description			
This module will be used to develop problem solving skills mainly speaking, reading, writing and listening skills and to understand English language as a foreign language through the application of many techniques. It is also important to understand the general principles of English language. This course deals with the basic concepts of learning the main rules of English grammar and English vocabularies. It is mainly the basic subject for writing and speaking English well. The module is to understand how to build a correct English sentence. It contains various grammatical rules and different vocabularies with using typical examples to explain the structure and the meaning of any word or expression. The module is valid and reliable to deal with many recognizable situations and how to use English in different contexts associating with life experiences.			

Module 2

Code	Course/Module Title	ECTS	Semester
PM 100	Mechanics Engineering / Static	8	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
3	2	78	122
Description			
Statics, is a fundamental branch of Engineering Mechanics that deals with the analysis and prediction of the behavior of objects at rest or in equilibrium. It provides the foundation for understanding the principles of forces, moments, and their effects on structures and systems. This branch is primarily concerned with the study of particles and rigid bodies under the action of forces and moments. One of the main objectives of this module is to enable engineers to calculate and predict the behavior of structures and systems under different loading conditions. This includes understanding the concepts of force vectors, moments, and couples, as well as the methods for resolving and combining these forces to determine their resultant effects. Through theoretical study, problem-solving, and practical applications, the students develop critical skills in analyzing and solving engineering problems. They learn to apply mathematical principles, physics, and engineering concepts to determine the forces and moments in structures and systems, and to ensure their stability and safety.			

Module 3

Code	Course/Module Title	ECTS	Semester
TECM 100	Mathematics Principles	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	2	93	58

Description

Mathematics offers a potent and common language. When presenting mathematical ideas, arguments, and conclusions both orally and in writing, students are expected to employ acceptable mathematical terminology and a variety of representational techniques.
Students should be able to:

1. employ proper mathematical language (notation, symbols, and terminology) in both spoken and written explanations in order to achieve the goals of mathematics.
2. Present information using the proper mathematical representations.
3. choose between various mathematical representational styles.
4. Express thorough, clear, and simple mathematical arguments.
5. utilizes a logical structure to arrange information.

Module 4

Code	Course/Module Title	ECTS	Semester
PM 101	Electrical technology	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	87

Description

Electrical technology encompasses the study of electrical systems, circuits, devices, and their applications. It focuses on understanding the principles and theories behind electricity, electrical power generation, transmission, and distribution. This field involves the design, installation, maintenance, and troubleshooting of electrical systems in various industries, such as power generation, manufacturing, telecommunications, and transportation. Electrical technology professionals work with electrical equipment, control systems, and renewable energy technologies. They are skilled in analyzing electrical circuits, performing measurements, and ensuring safety and compliance with electrical codes and standards. A strong foundation in electrical technology enables individuals to contribute to the development and advancement of electrical systems, energy efficiency, and the integration of new technologies in the field.

Module 5

Code	Course/Module Title	ECTS	Semester
PM 102	Workshops	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
0	6	93	57

Description

The workshop in an engineering college provides students with a valuable opportunity to acquire knowledge and practical skills in specific engineering fields. The workshop aims to enhance the application of theoretical concepts learned in classrooms and provides an interactive learning environment. It includes instructional sessions, hands-on exercises, problem-solving, and practical application projects. Students collaborate in teams to achieve specific goals and develop effective projects. The workshop promotes communication and collaboration among students, encourages critical thinking, and problem-solving in an engineering simulation environment. The workshop is a valuable chance for students to develop their technical and practical skills and enhance their engineering capabilities for the future.

Module 6

Code	Course/Module Title	ECTS	Semester
NTU 100	Democracy and Human Rights	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	33	17

Description

مادة حقوق الانسان والديمقراطية تقدم فهما شاملا للمفاهيم والمبادئ الاساسية لحقوق الانسان والنظم الديمقراطية. تركز المادة على دراسة القيم والمبادئ التي تحكم حقوق الانسان وحمايتها، بالاضافة إلى فهم أهمية الديمقراطية في تنظيم الحكم وضمان مشاركة المواطنين في صنع القرارات. يتناول المقرر مواضيع مثل المساواة، وحرية التعبير، وحقوق المرأة والطفل، وحقوق الاقليات، وحقوق العمال واللاجئين، وأسس ومؤسسات الديمقراطية. تهدف المادة إلى تعزيز الوعي القانوني والاخلاقي بين الطلبة، وتمكينهم من فهم أهمية حقوق الإنسان والمشاركة الديمقراطية في بناء مجتمع عادل ومتقدم.

Module 7

Code	Course/Module Title	ECTS	Semester
PM 103	Thermodynamics principle	8	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	4	93	107
Description			
In this thermodynamics module, students will explore the foundational concepts that form the basis of this field of study. They will examine energy interactions in thermal systems and measure relevant properties. Key concepts covered include force, energy, work, thermal equilibrium, and temperature. The workshop aims to develop a clear understanding of thermodynamics and its application in engineering. Students will also learn about the practical implications of thermodynamics, such as the laws of heat transfer and their applications in engine cycles. Additionally, they will explore the functioning of refrigerators and heat pumps based on the reversed Carnot cycle, which requires external work to transfer heat from a lower temperature body to a higher temperature body.			

Module 8

Code	Course/Module Title	ECTS	Semester
NTU 102	Computer	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	12
Description			
Statics, is a fundamental branch of Engineering Mechanics that deals with the analysis and prediction of the behavior of objects at rest or in equilibrium. It provides the foundation for understanding the principles of forces, moments, and their effects on structures and systems. This branch of engineering mechanics is primarily concerned with the study of particles and rigid bodies under the action of forces and moments. One of the main objectives of Engineering Mechanics/Statics is to enable engineers to calculate and predict the behavior of structures and systems under different loading conditions. This includes understanding the concepts of force vectors, moments, and couples, as well as the methods for resolving and combining these forces to determine their resultant effects. Through theoretical study, problem-solving, and practical applications, the students develop critical skills in analyzing and solving engineering problems. They learn to apply mathematical principles, physics, and engineering concepts to determine the forces and moments in structures and systems, and to ensure their stability and safety.			

Module 9

Code	Course/Module Title	ECTS	Semester
NTU 103	Arabic Language	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	33	17
Description			
يهدف هذا المقرر إلى تنمية معرفة الطالب باللغة العربية وتعزيز تقديره لها من خلال النحو والبلاغة والتعبير الأدبي. يعمل على تنمية مهارات القراءة والفهم والكتابة السليمة والتواصل الشفهي الفعال. يتعلم الطالب الاستخدام الصحيح للغة وفهم النصوص الحديثة والقديمة وتقدير الجوانب الجمالية للأدب. كما يعزز المقرر المهارات التحليلية والتعبيرية وينمي التفكير النقدي ويصقل الأسلوب في الكتابة والخطابة. ومن خلال دمج الوعي الثقافي والكفاءة اللغوية، يُعِد هذا المقرر الطالب للنجاح الأكاديمي والتميز المهني في مجال التواصل.			

Module 10

Code	Course/Module Title	ECTS	Semester
PM 104	Mechanical Engineering /Dynamic	8	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
3	2	78	122
Description			
Dynamics is a branch of Engineering Mechanics that focuses on the study of objects in motion and the forces that cause that motion. It builds upon the principles of statics and expands them to analyze the behavior of objects subjected to acceleration, velocity, and displacement. This field is concerned with understanding and predicting the motion of particles and rigid bodies, as well as the forces and energy associated with their motion. The primary goal of Engineering Mechanics/Dynamics is to provide engineers with a comprehensive understanding of how objects move and interact under the influence of forces and moments. By studying dynamics, engineers can design and analyze systems such as machines, vehicles, and structures to ensure their optimal performance, efficiency, and safety. In this subject, students explore various topics, including the kinematics and kinetics of particles and rigid bodies. Kinematics deals with the description of motion, focusing on concepts such as displacement, velocity, and acceleration. Kinetics, on the other hand, focuses on the forces and torques acting on objects, leading to their motion.			

Module 11

Code	Course/Module Title	ECTS	Semester
PM 105	Engineering Drawing	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
0	4	63	112

Description

This course description provides a necessary summary of the most important characteristics of the course as follows:
Definition of engineering drawing orders and its uses - the concept of engineering programs in engineering drawing and their fields - engineering drawing tools. Types of engineering lines and their uses, exercises + function. Drawing geometric shapes on computer) rectangular, parallelepiped, square, the circle (exercises + function. Dimensions and how to put them on the drawing. Principles of projection in engineering drawing (simple shapes). Cartesian projection on three levels. uncomplicated shapes, medium complexity, Complex geometric shapes

Module 12

Code	Course/Module Title	ECTS	Semester
PM 106	Occupational Safety	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	32	18

Description

This module introduces first-year students to the fundamental principles and practices of occupational safety in engineering and technical workplaces. It emphasizes the importance of creating a safe working environment, identifying hazards, and applying preventive measures to reduce risks. Topics include safety regulations, accident causes, personal protective equipment, fire safety, electrical hazards, machine and tool safety, and safe handling of materials. Students will also study emergency procedures, first aid basics, and workplace ergonomics. The course aims to instill awareness, responsibility, and professional ethics regarding safety at work. By completing this module, students will gain essential knowledge and skills to protect themselves and others, preparing them for further technical training and professional practice in power mechanics engineering.

Module 13

Code	Course/Module Title	ECTS	Semester
PM 200	Refrigeration & Air Conditioning Principles	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	2	123	77

Description

The Refrigeration and Air Conditioning Principles module provides students with a comprehensive understanding of the principles, components, and applications of refrigeration and air conditioning systems. This module combines theoretical knowledge with practical skills. Throughout the module, students delve into the fundamental principles of thermodynamics, heat transfer, and psychometrics, which form the basis of refrigeration and air conditioning processes. They learn about the various components involved in these systems, including compressors, condensers, evaporators, expansion devices, and controls, and understand their functions and interactions. Hands-on activities and laboratory sessions enable students to calculate and analyze different air conditioning processes and refrigeration systems. The module encourages the students to communicate effectively and work collaboratively in teams, simulating real-world scenarios they may encounter in the field.

Module 14

Code	Course/Module Title	ECTS	Semester
TECM 200	Mathematics	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	2	93	57

Description

This module introduces students to mathematics as a universal language for expressing ideas, reasoning, and problem-solving in science and engineering. It develops students' ability to use appropriate mathematical language, notation, and symbols in oral and written communication. Emphasis is placed on different forms of mathematical representation, logical structuring of information, and coherent reasoning. Students will explore algebraic structures, symbolic thinking, and the theory of modules, while also analyzing mathematical models related to science and technology. Through problem-solving, discussions, and structured practice, learners enhance their analytical skills, critical thinking, and precision in communication. The course equips students with the foundation to apply mathematics effectively across technical disciplines, ensuring academic success and supporting professional growth in engineering contexts.

Module 15

Code	Course/Module Title	ECTS	Semester
PM 201	Fluid Mechanics	8	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	4	123	77

Description

Fluid Mechanics, the branch of science that deals with the study of fluids (liquids and gasses) in a state of rest or motion, is an important subject of Civil, Mechanical and Chemical Engineering. Its various branches are fluid statics, fluid kinematics and fluid dynamics.

A substance that flows is called a fluid. All liquid and gaseous substances are considered to be fluids. Water, oil, and others are very important in our day-to-day life as they are used for various applications. For instance, water is used for generation of electricity in hydroelectric power plants and thermal power plants, water is also used as the coolant in nuclear power plants, oil is used for the lubrication of automobiles etc.

Fluid Mechanics is the branch of science that studies the behavior of fluids when they are in state of motion or rest. Whether the fluid is at rest or motion, it is subjected to different forces and different climatic conditions and it behaves in these conditions as per its physical properties. Fluid mechanics deals with three aspects of the fluid: static, kinematics, and dynamics aspects.

Module 16

Code	Course/Module Title	ECTS	Semester
PM 202	Mechanical Drawing	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
0	4	63	37

Description

The course on Mechanical Drafting provides comprehensive training on various aspects of drafting and design in mechanical engineering. It covers topics such as the use of AutoCAD system for mechanical drafting, screw threads, bolts, nuts, keys, pin and cotter joints, riveting joints, welding symbols, gear drawings, assembly drawings, detail drawings, and coupling, bearing, and pipe joints. The course includes practical examples and exercises that allow students to gain hands-on experience in drawing each component. By completing this course, students can enhance their knowledge and skills in mechanical engineering drafting, enabling them to create accurate and detailed drawings for various mechanical components and systems.

Module 17

Code	Course/Module Title	ECTS	Semester
NTU 200	Crimes of the Baath Party in Iraq	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	33	17
Description			
This module examines the crimes committed by the Ba'ath regime in Iraq, focusing on their political, social, and humanitarian consequences. It provides students with a comprehensive understanding of the regime's historical background, policies, and human rights violations. Through the analysis of testimonies, documents, and scholarly sources, students will explore the nature, scope, and impact of these crimes on individuals and communities. The module emphasizes critical evaluation of sources, legal and ethical perspectives, and the long-term consequences of authoritarian rule. By comparing the Ba'ath regime with other authoritarian systems, students will develop awareness of justice, accountability, and transitional justice mechanisms. Teaching methods include lectures, case studies, discussions, debates, and reflective writing to foster critical thinking and informed analysis.			

Module 18

Code	Course/Module Title	ECTS	Semester
NTU 201	English Language	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	32	18
Description			
The objective of this subject is to reinforce grammar concepts and tenses, expand vocabulary, enhance speaking and writing skills, and consolidate and apply learned language abilities. Through a comprehensive review, students will strengthen their understanding of grammar rules and verb tenses, while also broadening their vocabulary range. Speaking practice will focus on improving fluency, pronunciation, and confidence in real-life communication, while writing exercises will develop clarity, coherence, organization, and accuracy. Listening and reading activities will further enrich comprehension and critical thinking. Ultimately, this module aims to equip students with the ability to effectively communicate in English in both academic and professional contexts, and to demonstrate their knowledge and progress through active participation, continuous assessment, and a final exam.			

Module 19

Code	Course/Module Title	ECTS	Semester
PM 203	Strength of Materials	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	87

Description

The field of strength of materials, also known as mechanics of materials, focuses on analyzing the stresses and strains experienced by structural components like beams, columns, and shafts. Engineers use different techniques to determine how these structures will respond to loads and potential failure modes. This analysis takes into consideration material properties, including yield strength, ultimate strength, Young's modulus, and Poisson's ratio. By understanding these properties, engineers can predict the behavior of a structure and design it to withstand the expected forces and stresses. Strength of materials is essential in ensuring the structural integrity and safety of engineering projects.

Module 20

Code	Course/Module Title	ECTS	Semester
PM 204	Engineering Materials	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	87

Description

Engineering materials are essential for diverse applications, chosen for their physical and chemical properties. They are classified into metals, ceramics, polymers, composites, and specialized materials. Metals, such as steel, aluminum, and titanium, offer strength, ductility, and conductivity. Ceramics, including alumina and silicon carbide, are hard, heat-resistant, and corrosion-resistant. Polymers like polyethylene and PVC are lightweight, flexible, and easily shaped. Composites, such as fiberglass and carbon fiber, combine materials to achieve high strength with low weight. Specialized materials include semiconductors, superconductors, and biomaterials for advanced technologies. Understanding these materials enables engineers to select the most suitable options, ensuring performance, efficiency, and innovation in engineering projects.

Module 21

Code	Course/Module Title	ECTS	Semester
PM 205	Thermodynamics	7	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	4	123	52

Description

Thermodynamics is a branch of physics that deals with the study of energy and its transformations in various systems. It focuses on understanding the behavior of heat, work, and energy flow. Thermodynamics encompasses fundamental principles such as the laws of thermodynamics, which describe the relationships between energy, heat, and work. It explores concepts like temperature, pressure, entropy, and equilibrium. Thermodynamic principles find applications in various fields, including engineering, chemistry, and environmental science. By analyzing thermodynamic processes and systems, scientists and engineers can optimize energy utilization, design efficient engines and power plants, and understand the behavior of substances under different conditions

Module 22

Code	Course/Module Title	ECTS	Semester
PM 206	Electrical Machines	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	63	87

Description

The Electrical Machines module introduces students to the fundamental principles and applications of electrical circuits, machines, and power systems. It provides a solid foundation in electrical calculations for both AC and DC circuits, covering essential concepts such as voltage, current, resistance, and power. Students will apply this knowledge to the analysis of electrical circuits and the operation of machines, including motors and generators. The module also addresses the fundamentals of power systems, including generation, transmission, and distribution. Through active participation, problem-solving activities, and hands-on laboratory work, students will develop both theoretical understanding and practical skills, enabling them to analyze, maintain, and apply electrical machines effectively within the broader field of electrical and electronic engineering.

Module 23

Code	Course/Module Title	ECTS	Semester
NTU 202	Computer	3	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	2	32	18
Description			
The computer module provides students with a comprehensive understanding of how information is transmitted and received across various media. It introduces fundamental concepts such as signals, modulation, bandwidth, and noise, while also covering analog and digital communication systems. Students will develop analytical and problem-solving skills for designing and evaluating communication circuits and systems, and prepare for advanced topics including wireless communication, data networks, and information theory. Practical learning is emphasized through laboratory work and simulations that reflect real-world communication technologies. In addition, students will strengthen their verbal, non-verbal, and digital communication skills, adapt to diverse professional contexts, and learn to resolve communication barriers. The module equips students with essential theoretical and practical knowledge for careers in telecommunications, networking, and electronics.			

Module 24

Code	Course/Module Title	ECTS	Semester
NTU 203	Arabic Language	2	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	0	32	18
Description			
العربية لغة غنية ومتنوعة يتحدث بها ملايين الأشخاص حول العالم. وهي اللغة الرسمية لأكثر من 20 دولة، وتتمتع بأهمية ثقافية وتاريخية كبيرة. بفضل أبجديتها الفريدة وقواعدها المعقدة وخطها الجميل، تقدم العربية رحلة لغوية ممتعة وفريدة. سواء كنت مهتماً بتعلمها لأسباب أكاديمية أو مهنية أو شخصية، فإن تعلم اللغة العربية يفتح أبواباً لفهم الثقافة والأدب والمجتمع العربي. من التحيات الأساسية إلى مهارات المحادثة المتقدمة، يمنح إتقان العربية فرصاً للتواصل والسفر وآفاقاً مهنية واسعة. استمتع بجمال اللغة العربية وأنت تبدأ رحلة اكتشاف لغوي وانغماس ثقافي.			

Contact

Program Manager:

Dr. Ammar Hassan Suhail | Ph.D. in Thermal Technical Engineering | Lecturer.

Email: ammarsuhail@ntu.edu.iq

Mobile no.: 07736973363

Program Coordinator:

Ahmed Hani Ghanim | M.Sc. in Mechanical Engineering | Assist. Lecturer.

Email: ahmed.hanigh@ntu.edu.iq

Mobile no.: 07703896133