



Program Matrix

Faculty		Engineering									
Program		Mechanical and Mechatronic Engineering									
Award		Bachelor of Engineering in Mechanical and Mechatronic Engineering									
Credit Hours		133									
Academic Year		Cohort 2026/2027 Onwards									
Year	Semester 1					Semester 2					Semester 3
	Course Code	Course Name	Pre-requisite	Core/ Elective	Credit Hours	Course Code	Course Name	Pre-requisite	Core/ Elective	Credit Hours	
1	CHEM1020	General Chemistry	None	Core	4	ELEC1100	Principles of Electrical Circuits	MATH1010	Core	4	The student is allowed to register 2 courses (not exceeding 9 credit hours)
	COMP1500	Introduction to Programming	IC3M2	Core	4	ENGG1010	Applied Mechanics	MATH1010	Core	4	
	ENGG1013	Engineering Drawing and Computer Drafting	None	Core	2	ENGG1023	Engineering Materials	None	Core	4	
	MATH1010	Calculus I	SET3	Core	4	MATH1200	Calculus II	MATH1010	Core	4	
	UNIR1100	Communication Skills (1)	None	Core	3	UNIR1003	Oman the State and People	IC3M1A	Core	2	
2	MECH2118	Manufacturing Processes	ENGG1023	Core	4	METR2000	Fundamentals of Mechatronics	None	Core	4	The student is allowed to register 2 courses (not exceeding 9 credit hours)
	ELEC2113	Instrumentation & Measurement	ELEC1100	Core	4	MECH2108	Mechanical Drawing & Design Fundamentals	ENGG1013	Core	4	
	MECH2308	Strength of Materials	ENGG1010	Core	4	MECH2413	Fundamentals of Fluid Mechanics	None	Core	4	
	MATH2200	Differential Equations and Statistics	MATH1200	Core	4	UNIR2001	Entrepreneurship	None	Core	2	



	UNIR1002	Arabic Language Skills	SET 1A	Core	2	UNIR2100	Communication Skills (2)	UNIR1100	Core	3	
	Diploma Internship										
3	METR3200	Control Systems Engineering	None	Core	4	METR3013	Programmable Logic Controllers and Automation	None	Core	4	The student is allowed to register 2 courses (not exceeding 9 credit hours)
	MECH3800	Non-destructive testing & Metrology	None	Core	4	MECH3313	Advanced Machine Design & Finite Elements	None	Core	4	
	MECH3408	Heat Transfer	None	Core	4	MECH3508	Thermodynamics	None	Core	4	
	ENGG3700	Numerical Analysis and Optimization	MATH2200	Core	4	UNIR3100	Communication Skills (3)	UNIR2100	Core	3	
	Bachelor Internship										
4	MECH4213	Robot Dynamics and Mechanical Vibrations	None	Core	4	MECH4513	Refrigeration & Heat Engines	MECH3508	Core	4	The student is allowed to register 2 courses (not exceeding 9 credit hours)
	MECH4913	Design Project A	None	Core	4	MECH4914	Design Project B	None	Core	4	
	METR4913	Computer Vision and Image Processing	None	Core	4	MECH4012	Advanced Manufacturing Technology	MECH2118	Core	4	
	ENGG4801A	Final Year Project (A)	75% of Level 3 courses	Core	4	ENGG4801B	Final Year Project (B)	ENGG4801A	Core	4	
Bachelor Award: Internship course (or an equivalent) is a mandatory requirement for students exiting at Bachelor level (and haven't completed it at Diploma level). The internship course is non-credit-bearing and must be successfully completed to fulfill program requirements.											

Level 1

CHEM1020:

This introductory course in general chemistry covers the fundamental principles of chemistry, including the conversion of units, naming compounds, and writing chemical formulas. Students will learn how to balance chemical equations and apply stoichiometry to solve problems related to chemical reactions. The course also introduces the concepts of molarity and molality for solution concentration calculations. Throughout, emphasis is placed on developing a strong foundation in the mathematical and theoretical aspects of chemistry, providing students with the skills necessary for further study in chemistry and related fields.

COMP1500:

This course introduces students to C++ programming for solving a well-defined engineering problem through algorithmic and structured coding. Students will gain practical experience in developing programs using variables, selection, loops, arrays, functions, and mathematical expressions. Emphasis is placed on hands-on computer lab activities that enhance problem-solving skills, and program design. The course provides a strong foundation for applying C++ in engineering and computational applications.

ENGG1013:

The course covers a broad range of engineering drawings utilizing free-hand sketching, engineering drawing, and computer-aided drafting and solid modelling. The fundamental principles of orthographic projection as well as the topics of dimensioning, sectional views, isometric and perspective pictorial views. In addition, Computer Aided Drafting is also covered and practiced using AutoCAD.

MATH1010:

This course covers basic mathematics, including functions, limits, derivatives, integration, complex numbers, vectors, and applicable methods. Furthermore, this course also includes theories and applications of integration, derivatives, complex numbers, and vectors.

UNIR1100:

In this course, students learn to employ reading strategies while reading faculty related texts, use paraphrasing techniques, produce a short project proposal and make a poster presentation related to their specialization.

ELEC1100:

This course introduces students to a wide range of DC electrical circuit analysis techniques, which will provide the necessary foundation for electrical engineering courses. In this course, students apply Kirchhoff's laws, and nodal and mesh analysis techniques to solve electrical circuit parameters. Students will also be taught how to use important theorems such as superposition, Thevenin, and Norton in circuit analysis. In addition, it teaches the student to calculate the quantities of alternating current AC signals. It introduces the course to the analysis of alternating current circuits which include resistors, inductors, and capacitors.

ENGG1010:

This course is designed primarily for all engineering students. It provides comprehensive knowledge and insight into the study of Mechanics. Topics to be covered include Vectors, operations with forces, resultants of coplanar force systems. Equilibrium and coplanar force systems. Newton's laws of motion and their applications, Friction and its applications. Kinetic energy. Kinematics of a particle, composition and resolution of velocities and accelerations, relative velocity and acceleration, representation by vectors. Plane Kinematics of rigid body, angular velocity diagrams applied to simple mechanisms.

ENGG1023:

This course covers a broad range of fundamental principles of material sciences and its key role in the selection and utilization of materials for various engineering applications. Course topics include crystal structure and defects, mechanical and electrical properties, phase diagram, corrosion



and materials processing. Overall, engineering materials is an important course that lays the foundation for several other courses in engineering and provides students with essential knowledge for their higher levels.

MATH1200:

This course offers a foundational study of basic linear algebra and vector calculus, with emphasis on mathematical methods and techniques that are broadly applicable across various scientific and engineering fields. Students will develop a strong understanding of core mathematical concepts and gain the ability to apply these tools to solve problems from a wide range of real-world applications. The course also includes an introduction to series topics, enhancing analytical skills, and mathematical reasoning.

UNIR1003:

يشتمل هذا المقرر على نطاق عريض من المعارف والمهارات والقيم التي تعزز وعي الطلبة بهوية المجتمع العماني وقيمته، وفهم دور المتغيرات التراثية والتاريخية والديمقراطية والثقافية والمؤسسية في تشكيل الهوية العمانية وتحديد سماتها. ويركز المقرر على التنظيم الإداري للدولة، ومنطلقات النهضة العمانية المعاصرة ومؤشراتها من خلال تسليط الضوء على فكر حضرة صاحب الجلالة السلطان هيثم بن طارق المعظم، ويركز المقرر أيضا على تعزيز قيم الانتماء والولاء والمواطنة وعلاقتها بحقوق الإنسان، والتعريف بعلاقة السلطنة بمحيطها الخليجي والعربي والإقليمي والدولي بما في ذلك المواثيق الدولية، بالإضافة إلى تسليط الضوء على الأمن الفكري والتحديات المعاصرة، ودور مؤسسات الدولة المدنية والعسكرية في خدمة الوطن.

Level 2

MECH2118:

This course offers an in-depth understanding of manufacturing processes and material properties. It covers fundamental concepts in metal casting (including sand, die, and precision casting), metal forming (such as forging, rolling, drawing, and extrusion), sheet metal work, heat treatment, welding, brazing, and soldering. Students will develop technical skills in metal cutting operations, including turning, shaping, planning, drilling, milling, and grinding. Additionally, the course emphasizes the importance of Professional Practices and Ethics essential for building a successful career in the field.

ELEC2113:

This course includes a significant knowledge of measurement and instrumentation systems. In this course, the students will understand the scope of the transducer and sensors operation, the data Acquisition system, and signal processing. In addition, it will improve the students' understanding of the construction and application of the indicating meters. It allows the student to develop a skill to solve problems related to instrumentation systems and data acquisition systems.

MECH2308:

This course describes the relationship between stress and strain in deformable solids. Analysis is applied to axially loaded members, circular shafts, beams and columns. Statically indeterminate systems, properties of structural materials, Stress analysis, principal stresses, Mohr's Circle and combined loading are included. Thin wall cylinder analysis, torsion, beam bending and transfer shear in beam are also covered.

MATH2200:

This course aims to introduce four major topics to engineering students namely: 1st order and 2nd order basic differential equations, Laplace Transform and partial differential equations (PDEs), descriptive statistics and data presentation, and probability concepts.

UNIR1002:

يتناول هذا المقرر عددا من القضايا النحوية والصرفية والإملائية والبلاغية التي تسهم في إكساب المهارات اللغوية. هذه القضايا تتعلق بأقسام الكلام، وأنواع الإعراب، والجملة الاسمية، والجملة الفعلية، ومكملات الجملة، والخبر والإنشاء. ويعقب هذا القضايا نصوص تطبيقية مختارة، مع التركيز على تنمية المهارات اللغوية الأساسية (الاستماع، والقراءة، والكتابة، والتحدث).

METR2000:

The "Fundamentals of Mechatronics" course introduces the principles and applications of mechatronic systems, integrating mechanical, electronic, and computational elements. Topics include hydraulic and pneumatic systems, sensors, actuators, and motors such as stepper, DC, and servo motors. The course explores CNC machines, basic programming for turning and milling operations, and microcontrollers for system interfacing. It

covers control and communication systems, signal conversion (ADC/DAC), and the role of artificial intelligence and robotics in automation. Through theoretical knowledge and practical activities, students will develop essential skills for analyzing, designing, and implementing mechatronic systems in real-world applications.

MECH2108:

This course provides principles of technical and assembly drawings of various mechanical components and elementary design concepts. The first part covers mechanical drawing and the second deals with the basic design aspects of mechanical components and assemblies. Topics included are part and assembly drawings of various mechanical components and basic design concepts of various mechanical components such as thread fasteners, power screws, flexible drives, springs, couplings, gears and bearings.

MECH2413:

This is an introductory course on the fundamentals of fluid mechanics and their applications to engineering problems. The lessons that covered in this course include dimensional analysis, viscosity, shear stress and shear strain, pressure, conservation of mass, ideal and viscous fluid in a pipe, pumps and net positive suction head.

UNIR2001:

This course is an introductory course in entrepreneurship and innovation. The course aims to expose undergraduate students of various academic backgrounds to business venturing and entrepreneurial activity. The course focuses on boosting the concept of entrepreneurship which leads the small businesses. Students will apply themselves through developing their own business ideas and assessing them using knowledge and skills acquired during the course.

UNIR2100:

The aim of this English for Academic Purposes (EAP) course is to introduce students to topics from various disciplines of Engineering, Computer & Information Technology and Business, as offered in the faculties, using authentic reading texts and videos. The course also aims to enhance students' Academic English skills with a particular focus on academic reading and writing. In addition, the course focuses on developing academic and technical vocabulary, core grammatical structures, and summarizing skills.

Level 3

METR3200:

This course provides the students with specialized knowledge of control systems, modeling of electrical and mechanical systems, and generating the control system transfer function by using block diagram reduction. Also, the course will demonstrate a command of the open and closed-loop control, transient analysis, steady-state analysis, and root locus concepts. In addition, the course will develop a broad range of cognitive and technical skills to solve problems related to control system engineering.

MECH3800:

The course provides knowledge of specialized inspection techniques in non-destructive testing (NDT) such as Eddy current (ECT), Magnetic particle (MPT), Penetrant (PT), X-ray radiography (RT), Ultrasonic (UT) flaw detection etc. The course also focusses on statistical quality control methods applied to industries, linear, angular and mechanical measurement (Metrology) techniques. The students' professional advancement in the industries would be aided by this course.

MECH3408:

The course aims to provide the student with the background necessary to understand fundamentals of heat transfer and its applications so that they are able to solve heat transfer calculations and design equipment for industrial applications.

ENGG3700:

This course introduces the student to the use of numerical methods for solving engineering problems with the aid of a digital computer. The course

contains numerical methods for solving non-linear equations, optimization, curve fitting and interpolation, integration of data and functions, and solving ordinary and partial differential equations. MATLAB will be used as the programming language.

METR3013:

This course equips students with a comprehensive understanding of Programmable Logic Controllers (PLCs) and their role in industrial automation systems. It emphasizes experiential learning through a balance of theoretical concepts and hands-on practical sessions. Students will develop skills in ladder logic programming, interfacing techniques, and troubleshooting PLC systems. The course also integrates the latest advancements in automation, including Industry 4.0, IoT, and SCADA systems, fostering a forward-looking perspective on the challenges and innovations in automation. The outcome-based approach ensures learners gain technical competence, problem-solving skills, and the ability to implement automation solutions in real-world applications.

MECH3313:

The course deals with specialized knowledge of design of mechanical elements, prediction of mechanical response and failure mechanism of machine components and structures. Computer modelling of stresses using the Finite Element Analysis (FEA) and assessment of criteria to analyze stresses and predict failure. The lectures on the FEM will introduce the mathematical theory and focus on issues in modelling and on the interpretation of results and findings. The lectures on mechanical design will consider the design of mechanical elements and issues such as concepts of stress concentration, and application of fracture mechanics to evaluate components failures resulting from static and variable- fatigue loading.

MECH3508:

This course introduces scientific concepts pertaining to the conversion of energy between various forms such as heat, work, and internal energy. Based on the four basic thermodynamic laws (zeroth, first, second, and third), the physical science of heat and temperature, as well as their relationships to energy, entropy and work, are analyzed. These thermodynamic principles are applied to various real-world systems such as gas and vapor power thermal systems.

MECH3900:

A compulsory, non-credit-bearing, Pass/Fail workplace placement of a minimum of 8 weeks (200 hours), normally undertaken at Level 3 or Level 4, in accordance with the University's Mandatory Internship Framework. Students are placed with an approved host organisation under the guidance of an Industry Mentor/Supervisor and a Faculty Internship Coordinator. They are required to complete an Internship Readiness Programme before placement. Assessment combines employer evaluation, a written internship report, a reflective portfolio/logbook, and a presentation/viva. It demonstrates achievement of the Oman Qualifications Framework (OQF) competencies and Sohar University Graduate Attributes, including communication, IT, numeracy, creativity and problem-solving, teamwork, ethical responsibility, and critical judgment and decision-making skills. Students who have completed the 100-hour Diploma-level Internship are only required to complete the remaining 100 hours at Bachelor level.

UNIR3100:

The purpose of the course is to enhance students' performance-based competence, and equip them with the necessary academic research writing skills required to undertake an independent research project. It further develops academic writing skills including paraphrasing, summarizing, synthesizing, direct quotation and APA style citation.

MECH4213:

This course provides the students with specialized knowledge of control systems, modeling of electrical and mechanical systems, and generating the control system transfer function by using block diagram reduction. Also, the course will demonstrate a command of the open and closed-loop control, transient analysis, steady-state analysis, and root locus concepts. In addition, the course will develop a broad range of cognitive and technical skills to solve problems related to control system engineering.

Level 4

MECH4913:

This course is divided into two key sections. The first part offers comprehensive coverage of specialized robotics topics, including industrial automation, introduction to robotics, robot sensors, vision systems, end effectors, drives, actuators, robot kinematics and dynamics, and coordinate transformation. The second part focuses on advanced mechanical vibrations, covering free and forced vibrations, damped and undamped systems, vibration isolation, and multi-degree-of-freedom vibration systems.

METR4913:

This course aims to prepare students to design mechanical and/or mechatronic systems. The mechanical or mechatronic system comprises individual elements that must work together synergistically. It must reliably and economically do specified functions. Engineers at this level of the program must use their acquired technical knowledge, learning ability, and conceptual skills to assess the requirements, select or invent components, and combine and size them to satisfy the intended function. The management would receive the final product from the designer and deliver it to the market or the customer accurately and convincingly.

METR4913:

This course will introduce students to vision sensors, computer vision systems and digital image processing .It also introduces the areas of artificial intelligence that relate to fundamental issues and techniques of computer vision and image processing. Emphasis will be on physical ,mathematical , image-processing ,pattern recognition, and feature extraction aspects of vision. The course will have a proper Lab activity to enable students to understand the breadth and depth of the lecture materials.

ENGG4801A:

Students from the four engineering disciplines, Chemical, Civil, Mechanical and Mechatronic, and Electrical and Computer Engineering, undertake a two-part Final Year Project consisting of ENGG4801A (the initial phase) and ENGG4801B (the final phase). These supervised projects allow students to investigate practical engineering problems and apply the knowledge and skills gained throughout their studies. ENGG4801A provides the foundation for the research sequence. In this phase, students identify a problem, review relevant literature, define research objectives, and outline suitable research methods. They also conduct preliminary analyses and planning as required for their project. Alongside technical tasks, students develop skills in teamwork, communication, ethics, creativity, and independent learning. The phase concludes with the submission of the ENGG4801A report and an oral presentation that meets academic requirements.

MECH4513:

This course develops an advanced knowledge of heat engines, refrigeration systems and air conditioning applications. The course mainly focuses on thermodynamic cycles, performance analysis of Internal and external combustion engines, refrigeration and air-conditioning applications including aircraft refrigeration systems, vapor compression and absorption refrigeration systems, cascade refrigeration systems etc. The course also gives special thrust to psychometrics, various air-conditioning processes, cooling and heating load calculations for designing an air conditioning system.

MECH4914:

Design Project B is a capstone design course that focuses on various project management tools and detailed design of a mechanical/ Mechatronic/thermal system. The students will apply their knowledge and skills to design a mechanical or mechatronic system and to determine the economic, environmental, and ethical aspects of the proposed design. They will work in teams, prepare written and technical reports.

MECH4012:

This course provides an in-depth exploration of modern manufacturing technologies, blending traditional principles with cutting-edge advancements to prepare students for the evolving landscape of industrial engineering. Emphasizing the integration of automation, digital technologies, and

precision machining, the course covers topics such as Computer-Integrated Manufacturing (CIM), Industry 4.0, and smart manufacturing systems. Students will gain comprehensive knowledge of cutting tool technologies, mechanics of single-point and multi-point cutting tools, and advanced CNC machining techniques, including shop turn and shop mill programming. The course also delves into rapid prototyping technologies, fundamentals of additive manufacturing, and assembly line optimization. In addition, students will explore non-traditional machining methods, including thermal, electrochemical, and mechanical energy-based processes, equipping them with skills to address complex manufacturing challenges. With a focus on research, problem-solving, and practical applications, this course bridges the gap between theory and industry practice, preparing students to innovate and excel in the field of advanced manufacturing.

ENGG4801B:

ENGG4801B builds on the groundwork established in ENGG4801A by focusing on the complete execution of the research plan. Students conduct experiments, collect and analyze data, and interpret their findings through structured results, discussions, and evidence-based conclusions. Beyond the technical outputs, ENGG4801B fosters creativity, ethical practice, teamwork, and entrepreneurial awareness by encouraging students to link their research outcomes to real-world engineering applications. By the end of the sequence, students gain deep research capabilities and the confidence to tackle complex engineering challenges, contribute to innovation, and continue growing professionally. They produce the ENGG4801B report and deliver oral presentations aligned with academic expectations.

Internship Course:

This course provides students with the opportunity to apply the knowledge and skills acquired during their studies in a workplace environment, enhance their career readiness, and develop their professional and practical competencies in alignment with the program learning outcomes and labour market requirements. The course is a compulsory component of the academic program, where applicable, depending on the nature of the program. It is governed by the University's approved policies and procedures and is supervised by academic staff in collaboration with the host training organisations. The specific requirements, duration, and assessment methods vary according to the academic program.