German Jordanian University

School of Applied Technical Sciences

Department of Mechanical and Maintenance Engineering

Bachelor of Science in Mechanical and Maintenance Engineering

Study Plan

2020

I. Program Objectives

The objective of the Mechanical and Maintenance Engineering program at GJU is to prepare graduated for careers in industry or further studies in Mechanical or Maintenance Engineering and related disciplines.

Mechanical and Maintenance Engineering graduates will have:

- Ample knowledge in the theory, principles, tools and processes in the field of mechanical and maintenance engineering including; analysis, management, quality assurance, and reliability.
- A strong background in the design and the structure of mechanical, thermal, and power systems.
- A strong practical experience obtained through hands-on learning methodologies.
- Effective communication, interpersonal, and critical thinking skills, a spirit of curiosity and conduct reflecting professionalism and engineering ethics.

II. Learning Outcomes

Upon completion of the Mechanical and Maintenance Engineering Program, graduates will be able to achieve the following outcomes:

a) The ability to understand and analyze many of the common mechanical systems such as HVAC systems, hydraulic and pneumatic systems, power plants and many more.
b) The ability to apply maintenance engineering principles to analyze and manage the maintenance tasks for different mechanical systems.
c) The ability to implement reliability and quality control programs in the different fields of maintenance systems.
d) The ability to participate productively on maintenance project teams involving participants from different specializations.
e) The ability to design and analyze different mechanical systems including the design and fabrication of mechanical replacement components.
f) Effective communication skills through oral and written reports and software documentation evaluated by both peers and managers.
g) The ability to elicit, analyze and specify maintenance requirements through productive working relationships with project stakeholders.
h) The knowledge required to understand the need for and the ability to perform in lifelong learning.

III. Assessment of Learning Outcomes

a) The ability to understand and analyze many of the common mechanical systems such as HVAC systems, hydraulic and pneumatic systems, power plants and many more.

Assessment Methods:

- Performance in applied mechanical engineering modules and Capstone projects.
- Alumni surveys.
- Students' evaluation.
- Students' portfolios.

b) The ability to apply maintenance engineering principles to analyze and manage the maintenance tasks for different mechanical systems.

Assessment Methods:

- Exams.
- Performance in laboratory work.
- Capstone projects.
- Alumni surveys.
- Students' evaluation.

c) The ability to implement reliability and quality control programs in the different fields of maintenance systems.

Assessment Methods:

- Performance in applied maintenance engineering modules.
- Alumni surveys
- Students' evaluation.
- Students' portfolios.

d) The ability to participate productively on maintenance project teams involving participants from different specializations.

Assessment Methods:

- Participation in teams of Capstone projects.
- Final year project.
- Alumni surveys.

e) The ability to design and analyze different mechanical systems including the design and fabrication of mechanical replacement components.

Assessment Methods:

- Performance in Machine Design and Manufacturing Processes modules.
- Final year project.
- Alumni surveys.

f) Effective communication skills through oral and written reports and software documentation evaluated by both peers and managers.

Assessment Methods:

- Project reports and project presentations.
- Final year project.
- Alumni surveys.

g) The ability to elicit, analyze and specify maintenance requirements through productive working relationships with project stakeholders.

Assessment Methods:

- Project reports and project presentations.
- Final year project.
- Alumni surveys.

h) The knowledge required to understand the need for and the ability to perform in lifelong learning.

Assessment Methods:

- Alumni surveys.

IV. Framework for B.Sc. Degree (Semester Credits)

Classification	Credit Hours			ECTS		
	Compulsory	Elective	Total	Compulsory	Elective	Total
University Requirements	21	6	27	31	6	37
School Requirements	43	-	43	72	--	72
Program Requirements	92	12	104	171	20	191
Total	**156**	**18**	**174**	**274**	**26**	**300**

1. University Requirements: (27 credit hours)

1.1. Compulsory: (21 credit hours)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
ARB099	Arabic 99[a]	0	0	3	-	-
ARB100	Arabic	3	3	3	-	ARB099
ENGL098	English I[a]	0	0	3	-	-
ENGL099	English II[a]	0	0	3	-	ENGL098
ENGL101	English III	1	3	3	-	ENGL099
ENGL102	English IV	1	3	3	-	ENGL101
ENGL201	English V	2	3	3	-	ENGL102
ENGL202	English VI	2	3	3	-	ENGL201
GERL101	German I	3	6	9	-	-
GERL102	German II	3	6	9	-	GERL101
MILS100	Military Science	3	2	3	-	-
NE101	National Education	3	2	3	-	-
	Total	**21**	**31**	**48**	**-**	

1.2. Elective: (6 Credit Hours) (two modules out of the following)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
BE302	Business Entrepreneurship	3	3	3	3	ENGL101:English III
DES101	Arts' Appreciation	3	3	3	-	ENGL101:English III, ARB099:Arabic 99
EI101	Leadership and Emotional Intelligence	3	3	3	-	ENGL101:English III
IC101	Intercultural Communications	3	3	3	-	ENGL101:English III
PE101	Sports and Health	3	3	3	-	ARB099:Arabic 99
SE301	Social Entrepreneurship and Enterprises	3	3	3	-	ENGL101:English III
SFTS101	Soft Skills	3	3	3	-	ENGL101:English III
TW303	Technical and Workplace Writing	3	3	3	3	ENGL102:English IV
	Total	**6**	**6**	**6**	**-**	

[a] Not required for students who pass placement test.

2. School Requirements: (43 credit hours)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
IE0121	Probability and Statistics	3	5	3	-	MATH101
IE0141	Engineering Workshop	1	2	-	3	-
IE0281	Technical Writing and Engineering Ethics	2	3	2	-	ENGL201
IE0361	Engineering Economics	3	5	3	-	IE0121
ME0111	Computer Aided Engineering Drawing	2	4	-	6	CS116
CHEM103	General Chemistry	3	5	3	-	-
CS116	Computing Fundamentals	3	6	3	-	-
CS1160	Computing Fundamentals Lab	1	0	-	3	Coreq: CS116
GERL201	German III	3	4	6	-	GERL102
GERL202	German Language IV	3	6	6	-	GERL201
MATH099	Pre-MATH[a]	0	0	3	-	-
MATH101	Calculus I	3	5	3	-	MATH099
MATH102	Calculus II	3	5	3	-	MATH101
MATH203	Applied Mathematics for Engineers	3	5	3	-	MATH102
MATH205	Differential Equations	3	5	3	-	MATH102
PHYS103	Physics I	3	5	3	-	-
PHYS104	Physics II	3	5	3	-	PHYS103
PHYS106	General Physics Lab	1	2	-	3	PHYS103, Coreq: PHYS104
	Total	**43**	**72**	**47**	**15**	

3. Program Requirements (104 credit hours)

3.1. Program Requirements (Compulsory): (86 credit hours)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
MECH0211	Fundamentals of Mechanical Design	2	3	-	6	ME0111
MECH0213	Mechanics of Materials	3	6	3	-	CEE201
MECH0214	Mechanics of Materials Lab	1	0	-	3	Coreq: MECH0213
MECH0215	Dynamics	3	5	3	-	CEE201
MECH0221	Thermodynamics	3	5	3	-	MATH102
MECH0222	Fluid Mechanics	3	5	3	-	CEE201
MECH0321	Thermofluids Lab	1	2	-	3	MECH0221, Coreq: MECH0222
MECH0331	Theory of Machines	3	5	3	-	MATH203, MECH0215
MECH0332	Machine Design	3	6	3	-	MECH0211,MECH0213
MECH0333	Machine Design Lab	1	0	-	3	Coreq: MECH0332
MECH0341	Power and Refrigeration Cycles	3	5	3	-	MECH0221
MECH0342	Thermal Systems Lab I	1	2	-	3	MECH0341, ENE321
MECH0361	Computer Aided Mathematics for MECH	2	3	-	6	MATH203, MATH205
MECH0391	Field Training	-	6	160 hours		Dept. approval
MECH0491	International Internship	12	30	20 weeks		MECH0391, Dept. approval
MECH0531	Mechanical Vibrations	3	6	3	-	MECH0215, MECH0361
MECH0532	Mechanical Vibrations Lab	1	0	-	3	Coreq: MECH0531
MECH0541	Heating Ventilation & Air Conditioning	3	5	3	-	MECH0341, ENE321
MECH0542	Thermal Systems Lab II	1	2	-	3	MECH0342
MECH0543	Internal Combustion Engines	3	5	3	-	MECH0341
MECH0544	Building Services	3	5	3	-	MECH0222, ME0212, ENE321
MECH0591	Graduation Project I	1	2	-	3	MECH0491, min 132 CH
MECH0592	Graduation Project II	3	6	-	9	MECH0591
IE0348	Materials and Manufacturing Engineering	3	5	3	-	IE0141, CHEM103
ME0212	Electrical Circuits and Machines	3	5	3	-	PHYS104
ME0344	Control Systems I	3	5	3	-	MATH205, MECH0215
ME0346	Instrumentation & Measurements	2	5	2	-	MATH205, ME0212
ME0347	Instrumentation & Measurements Lab	1	0	-	3	Coreq: ME0346
BM371	Numerical Methods for Engineers	3	5	2	3	CS116, MATH203, MATH205
BM3710	Numerical Methods for Engineers Lab	0	0	-	3	Coreq: BM371
CEE201	Statics	3	5	3	-	PHYS103, MATH101
ENE321	Heat Transfer	3	5	3	-	MECH0221, MECH0222,MATH205
GERL301	German Language V	3	6	9	-	GERL202
GERL302	German Language VI	3	6	9	-	GERL301
	Total	**86**	**161**	**70**	**48**	

3.2. Program Requirements (Applied Track Compulsory): (6 credit hours)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
MECH0533	Applied Mechanical Design	3	5	3	-	MECH0332
MECH0545	Applied Thermal Systems	3	5	3	-	MECH0341
	Total	**6**	**10**	**6**	**0**	

3.3. Program Requirements (Maintenance Track Compulsory): (6 credit hours)

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
MECH0551	Reliability & Quality Control	3	5	3	-	IE0121
MECH0552	Management of Maintenance Systems	3	5	3	-	IE0361
	Total	**6**	**10**	**6**	**0**	

3.4. Program Requirements (Electives[b]): (12 credit hours)

A minimum of 12 credit hours of engineering coursework are required.

Module ID	Module Title	Credit Hours	ECTS	Contact Hours		Prerequisite
				Lecture	Lab	
MECH0401	Finite Element Method	3	5	3	-	Dept. Approval
MECH0402	Multi-Body Dynamics	3	5	3	-	Dept. Approval
MECH0403	Machine Dynamics	3	5	3	-	Dept. Approval
MECH0404	Advanced Heat Transfer	3	5	3	-	Dept. Approval
MECH0405	Turbomachinery	3	5	3	-	Dept. Approval
MECH0406	Renewable Energy	3	5	3	-	Dept. Approval
MECH0407	Reverse Engineering	3	5	3	-	Dept. Approval
MECH0408	Automotive Maintenance	3	5	3	-	Dept. Approval
MECH0409	Aircraft Maintenance	3	5	3	-	Dept. Approval
MECH0410	Building Maintenance	3	5	3	-	Dept. Approval
MECH0411	Safety & Loss Prevention	3	5	3	-	Dept. Approval
MECH0413	Maintenance Costing	3	5	3	-	Dept. Approval
MECH0414	Modern Maintenance Management Systems	3	5	3	-	Dept. Approval
MECH0493	Special Topics in Applied Mechanical Engineering	3	5	3	-	Dept. Approval
MECH0494	Special Topics in Thermal Engineering	3	5	3	-	Dept. Approval
MECH0495	Special Topics in Maintenance Engineering	3	5	3	-	Dept. Approval
MECH0496	Special Topics I	1	-	1	-	Dept. Approval
MECH0497	Special Topics II	2	-	2	-	Dept. Approval
IE0415	Human Resource Management	3	5	3	-	Dept. Approval
ME0417	Micro-Electromechanical Systems	3	5	3	-	Dept. Approval
ME0522	Hydraulics and Pneumatics	3	5	2	3	Dept. Approval
ME0548	Control Systems II	3	5	3	-	Dept. Approval
ME0551	Robotics	3	5	3	-	Dept. Approval
ME0577	Automation and Industry 4.0	3	5	2	3	Dept. Approval
ENE432	Power Plants Engineering	3	5	3	-	Dept. Approval
ENE537	Energy Efficiency, management & laws	3	5	3	-	Dept. Approval
MGT328	Project Management	3	5	3	-	Dept. Approval

[b] IE0483 International Internship is prerequisite to all elective courses if registered in Jordan.

V. Module Identification Convention

Example: MECH0321

Program: MECH is the code of Mechanical and Maintenance Engineering
Version: The first number (0) represents a reference number to the study plan
Level: The second number (3) represents the level of the module in the study plan
Field: The third number (2) represents the group number of the module
Sequence: The fourth number (1) represents a unique serial number of the module in its group

Groups

Field	Module ID	Module Title
Group 1: Basic Mechanics	MECH0211	Fundamentals of Mechanical Design
	CEE201	Statics
	MECH0213	Mechanics of Materials
	MECH0214	Mechanics of Materials Lab
	MECH0215	Dynamics
	MECH0216	Statics and Strength of Materials
Group 2: Basic Thermal Science	MECH0221	Thermodynamics
	MECH0222	Fluid Mechanics
	MECH0223	Thermofluids
	MECH0321	Thermofluids Lab
Group 3: Applied Mechanics & Mechanical Design	MECH0331	Theory of Machines
	MECH0332	Machine Design
	MECH0333	Machine Design Lab
	IE0348	Materials and Manufacturing Engineering
	MECH0531	Mechanical Vibrations
	MECH0532	Mechanical Vibrations Lab
	MECH0533	Applied Mechanical Design
Group 4: Applied Thermal Science	MECH0341	Power and Refrigeration Cycles
	MECH0342	Thermal Systems Lab I
	MECH0541	Heating Ventilation & Air Conditioning
	MECH0542	Thermal Systems Lab II
	MECH0543	Internal Combustion Engines
	MECH0544	Building Services
	MECH0545	Applied Thermal Systems
Group 5: Maintenance Management	MECH0551	Reliability & Quality Control
	MECH0552	Management of Maintenance Systems
Group 6: Electrical & Computer Science	MECH0361	Computer Aided Mathematics for MECH
	ME0212	Electrical Circuits and Machines
	ME0346	Instrumentation & Measurements
	ME0347	Instrumentation & Measurements Lab
Group 9: Practical & Special Topics	MECH0391	Field Training
	MECH0491	International Internship
	MECH0493	Special Topics in Applied Mechanical Engineering
	MECH0494	Special Topics in Thermal Engineering
	MECH0495	Special Topics in Maintenance Engineering

	MECH0496	Special Topics I
	MECH0497	Special Topics II
	MECH0591	Graduation Project I
	MECH0592	Graduation Project II

VI. Study Plan[c] Guide for the Bachelor Degree in Mechanical and Maintenance Engineering

First Year					
First Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL101	English III	1	3	ENGL099	-
CHEM103	General Chemistry	3	5	-	-
CS116	Computing Fundamentals	3	6	-	-
CS1160	Computing Fundamentals Lab	1	0	-	CS116
GERL101	German I	3	6	-	-
MATH101	Calculus I	3	5	MATH099	-
PHYS103	Physics I	3	5	-	-
	Total	**17**	**30**		

First Year					
Second Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
IE0121	Probability and Statistics	3	5	MATH101	-
ME0111	Computer Aided Engineering Drawing	2	4	CS116	-
ENGL102	English IV	1	3	ENGL101	-
GERL102	German II	3	6	GERL101	-
MATH102	Calculus II	3	5	MATH101	-
PHYS104	Physics II	3	5	PHYS103	-
PHYS106	General Physics Lab	1	2	PHYS103	PHYS104
	Total	**16**	**30**		

[c] The following study plan guide assumes having passed all placement tests.

Second Year					
First Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0211	Fundamentals of Mechanical Design	2	3	ME0111	-
MECH0221	Thermodynamics	3	5	MATH102	-
ME0212	Electrical Circuits and Machines	3	5	PHYS104	-
CEE201	Statics	3	5	PHYS103, MATH101	-
GERL201	German III	3	4	GERL102	-
MATH205	Differential Equations	3	5	MATH102	-
ENGL201	English V	2	3	ENGL102	-
	Total	**18**	**30**		

Second Year					
Second Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0213	Mechanics of Materials	3	6	CEE201	-
MECH0214	Mechanics of Materials Lab	1	0	-	MECH0213
MECH0215	Dynamics	3	5	CEE201	-
GERL202	German IV	3	6	GERL201	-
MATH203	Applied Math for Engineers	3	5	MATH102	-
ENGL202	English VI	2	3	ENGL201	-
MECH0341	Power and Refrigeration Cycles	3	5	MECH0221	-
	Total	**18**	**30**		

Third Year					
First Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0222	Fluid Mechanics	3	5	CEE201	-
MECH0321	Thermofluids Lab	1	2	MECH0221	MECH0222
MECH0361	Computer Aided Mathematics for MECH	2	3	MATH203, MATH205	-
MECH0391	Field Training	0	6	Dept. approval	-
GERL301	German V	3	6	GERL202	-
IE0348	Materials and Manufacturing Engineering	3	5	IE0141, CHEM103	-
MILS100	Military Science	3	2	-	-
IE0141	Engineering Workshop	1	2	-	-
	Total	**17**	**31**		

Third Year					
Second Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0331	Theory of Machines	3	5	MATH203, MECH0215	-
MECH0332	Machine Design	3	6	MECH0211, MECH0213	-
MECH0333	Machine Design Lab	1	0	-	MECH0332
ENE321	Heat Transfer	3	5	MECH0221, MECH0222, MATH205	-
BM371	Numerical Methods for Engineers	3	5	CS116, MATH203, MATH205	-
BM3710	Numerical Methods for Engineers Lab	0	0	-	BM371
GERL302	German VI	3	6	GERL301	-
NE101	National Education	3	2	-	-
	Total	**19**	**29**		

Fourth Year					
First Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
ME0346	Instrumentation & Measurements	2	5	MATH205, ME0212	-
ME0347	Instrumentation & Measurements Lab	1	0	-	ME0346
ME0344	Control Systems I	3	5	MATH205, MECH0215	-
-	Technical Elective	3	5	-	-
-	Technical Elective	3	5	-	-
-	Technical Elective	3	5	-	-
-	Technical Elective	3	5	-	-
	Total	**18**	**30**		

Fourth Year					
Second Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0491	International Internship[d]	12	30	MECH0391, DEP. APPROV	-
	Total	**12**	**30**		

German Year prerequisites are:

1. All regulations related to the “German Year” set by the University
2. Passing the following four modules:
   - MECH0341 Power and Refrigeration Cycles
   - MECH0331 Theory of Machines
   - MECH0332 Machine Design
   - ENE321 Heat Transfer

[d] Courses attended and/or passed during International Training are not transferable.

Fifth Year					
First Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0531	Mechanical Vibrations	3	6	MECH0215, MECH0361	-
MECH0532	Mechanical Vibrations Lab	1	0	-	MECH0531
MECH0544	Building Services	3	5	MECH0222, ME0212, ENE321	-
MECH0591	Graduation Project I	1	2	MECH0491, and min of 132 CH	-
MECH0533 or MECH0551	Applied Mechanical Design (For Applied track) Reliability & Quality Control (For Maintenance track)	3 3	5 5	MECH0332 IE0121	
IE0361	Engineering Economics	3	5	IE0121	-
-	University Elective	3	3	-	-
MECH0342	Thermal Systems Lab I	1	2	MECH0341, ENE321	-
ARB100	Arabic	3	3	ARB099	-
	Total	**21**	**31**		

Fifth Year					
Second Semester					
Module ID	**Module Title**	**Cr. Hr.**	**ECTS**	**Prerequisites**	**Co-requisite**
MECH0541	Heating Ventilation & Air Conditioning	3	5	MECH0341, ENE321	-
MECH0543	Internal Combustion Engines	3	5	MECH0341	-
MECH0545 or MECH0552	Applied Thermal Systems (For Applied track) Management of Maintenance Systems (For Maintenance track)	3 3	5 5	MECH0341 IE0361	
MECH0592	Graduation Project II	3	6	MECH0591	-
IE0281	Technical Writing and Engineering Ethics	2	3	ENGL201	-
-	University Elective	3	3	-	-
MECH0542	Thermal Systems Lab II	1	2	MECH0342	-
	Total	**18**	**29**		

VII. Module Descriptions

Bachelor

Course Title	Course Code
Fundamentals of Mechanical Design	MECH211

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	2
Elective Module		**Spring Semester**		**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
20% Classwork and quizzes
25% Midterm exam
15% Term project
40% Final exam

Responsible Lecturer(s)

Dr. Ala Hijazi

Course	Mode of Delivery	Contact Time	Self-Study
Fundamentals of Mechanical Design	Blended learning	60	30

Duration of Study:
One semester.

Allocation of Credit Hours:

- Presence time in lab and classwork exercises 12 weeks * 5 hours = 60 hours;
- Preparation of term project: 20 hours;
- Preparation of midterm exam and final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Apply design concepts when designing mechanical systems or components.
- Apply the engineering standards and best practices in engineering drawing.
- Assign tolerances, surface finish, limits and fits for mechanical components.
- Recognize the different elements used for making non-permanent joints.
- Recognize the different permanent joining methods and standard welding symbols.
- Recognize the function, terminology, and common standards associated with the different types of mechanical elements.
- Use SolidWorks for making assemblies and producing professional engineering working drawings.
- Use the different mechanical elements' toolboxes in SolidWorks.

Course Contents:

- Introduction to mechanical design principles;
- Fundamentals of mechanical engineering working drawings and their standards (views, sections, assembly drawings, exploded views, bill of materials);
- Dimensional and geometrical tolerances;
- Limits and fits;
- Surface finish;
- Structural profiles;
- Welding and welding symbols;

- Introduction to various types of mechanical elements in terms of function, terminology, geometry and common standards (mechanical fasteners, power screws, springs, shafts and associated components, bearings and seals, gears, belts, roller chains, wire robes, couplings and mechanical joints);
- SolidWorks software package is used in this course (part modelling, assembly, drafting, basic mechanism analysis, standard toolboxes and element libraries).

Planned Learning Activities and Teaching Methods:

- SolidWorks exercises in class and at home;
- Modelling a mechanical system and preparing professional technical drawings.

Recommended or Required Reading:

- Giesecke et al.; Technical Drawing with Engineering Graphics;15th Edition; Pearson; 2016.
- Budynas & Nisbett; Shigley's Mechanical Engineering Design; 11th Edition; McGraw-Hill; 2020.
- Sclater; Mechanisms and Mechanical Devices Sourcebook; 5th Eddition; McGraw-Hill; 2011.
- The SolidWorks exercise sheets, videos and other course related material available on the course webpage.

Usability of the Module:

The competences acquired in this module are essential for the students before tanking subsequent modules related to mechanical engineering design. The module also provides students with some professional skills useful for field engineering work.

Prerequisites and Co-requisites:

ME 111: Engineering Drawing (Prerequisites)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Mechanics of Materials	MECH0213

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	4
Elective Module		**Spring Semester**		**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
Course:
50% 1st and 2nd exams
10% Quizzes and/or homework
40% Final exam
Lab:
20% Midterm exam
30% In-lab reports
10% Post-lab report
40% Final exam

Responsible Lecturer(s)

Dr. Ahmad Almuhtady

Course	Mode of Delivery	Contact Time	Self-Study
Mechanics of Materials	Blended learning	45	90
Mechanics of Materials Lab	Blended learning	36	9

Duration of Study:
One semester.

Allocation of Workload Hours:

- In class lectures, exercises, and software programming 15 weeks * 3 hours = 45 hours
- Self-study of pre-recorded video lectures and exercises 12 weeks * 1 hours = 12 hours
- Exercises and self-study at home 15 weeks * 3 hours = 45 hours
- Term project and presentation preparation = 24 hours
- Preparation for the course final exam = 9 hours
- In lab experimental work 12 weeks* 3 hours = 36 hours
- Lab reports preparation 12 weeks* 0.5 hours = 6 hours
- Preparation for the lab final exam = 3 hours

Learning Outcomes:
By the end of this module, the student will be able to:

- Define the fundamental concepts of stress and strain.
- Define the characteristics and calculate the magnitude of selected mechanical properties of materials.
- Relate and classify the stress and the strain experienced by a member to the loads, geometry, and materials properties.
- Apply the formal theory of solid mechanics to calculate forces, deflections, moments, stresses, and strains in a wide variety of structural members subjected to tension, compression, torsion, bending, both individually and in combination.
- Analyse principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element.

- Utilize basic properties of materials such as elastic moduli and Poisson's ratio to appropriately to solve problems related to isotropic elasticity.
- Decide which criterion controls in multicriteria problems usually either to determine maximum allowable loading or minimum allowable geometry.
- Combine the effects of several loadings under the principle of superposition.
- Experiment with various standardized tests in mechanics such as tension and compression tests, hardness test, etc.
- Relate the theoretical concepts learned through the course to the findings of practical experiments designed to explain and measure them.
- Discover the heat treatment impact on the microstructure.

Course Contents:
The course covers strength of materials in depth including the following topics: basic concepts in strength of materials; direct stress; strain; axial deformation and thermal stress; torsion; transverse shearing forces; bending moments in beams and stress due to bending; shearing stresses in beams; combined stresses and pressure vessels; stress transformations; deflection of beams; columns. The lab is comprised of a series of practical experiments that target the understanding and measurements of the theoretical concepts learned throughout the course. Mainly the to be conducted experiments include: Tension test; compression test; torsion test; hardness test; impact test; fatigue test; Creep test; deflection of beams; buckling of columns; strain measurements; pressure vessels; heat treatment and microstructure.

Planned Learning Activities and Teaching Methods

- Lectures with intensive discussions;
- Exercises in class and at home;
- Real case simulations;
- Writing short in-Lab reports and full post Lab report;
- Performing scientific experiments in group work.

Recommended or Required Reading:

- Hibbeler, Russell C., Mechanics of Materials in SI Units, 10th Edition, Pearson Prentice Hall, 2018, ISBN 9781292178202.
- Beer, F., Johnston, E., DeWolf, J., and Mazurek, D., Mechanics of Materials, 8th Edition, McGraw Hill, 2019. ISBN-10: 1260113272.
- Riley, W. F., Sturges, L. D., and Morris, D. H., Mechanics of Materials, 6th Edition, Wiley, 2006, ISBN-13: 9780471705116.

Usability of the Module:
It is an important module in the Basic Mechanics field in the Mechanical and maintenance Engineering Program. This module is a prerequisite for another important module in the program which is MECH0332 (Machine Design).

Prerequisites and Co-requisites:
CEE201: Statics (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Dynamics	MECH215

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-semester**		**Remedial**	

Examination

Portfolio:
30% Mid-term exam
30% Quizzes
40% Final exam

Responsible Lecturer(s)

Dr. Bashar Hammad

Course	Mode of Delivery	Contact Time	Self-Study
Dynamics	Face-to face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures and exercises = 45 hours;
- Exercises and self-reading at home: 50 hours;
- Preparation of quizzes and quizzes: 15 hours;
- Preparation of midterm exam and midterm exam: 15 hours;
- Preparation of final exam and final exam: 25 hours.

Learning Outcomes:

By the end of this module, the student will be able to:

- Define basics concepts of kinematics and kinetics of particles and rigid bodies.
- Apply Newton’s Second Law, Principle of Work and Energy, and Principle of Impulse and Momentum to solve dynamic problems.
- Utilize the appropriate techniques and coordinates systems to solve dynamic problems.
- Understand a variety of vibration problems (free, forced, undamped, and damped) for Single Degree of Freedom and some basic applications of vibration.
- Identify, formulate and solve dynamic problems.

Course Contents:

The course contains the following topics: Kinematics and kinetics of particles, planar kinematics and kinetics of a rigid bodies, Newton's Law, principles of work and energy, principles of impulse and momentum, free and forced vibration of single degree of freedom systems, harmonic excitation. The course covers also rectangular, normal-tangential and polar coordinate systems in addition to rectilinear and curvilinear motion of particles. Rotation, absolute motion and relative velocity and acceleration of rigid bodies are discussed in this course.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home.

Recommended or Required Reading:

- J. L. Meriam, L. G. Kraige, and J. N. Bolton: Engineering Mechanics: Dynamics, 9th edition, 2018.
- R.C. Hibbeler: Engineering Mechanics: Dynamics, 14th Edition, 2015.
- R.C. Hibbeler: Engineering Mechanics: Statics, 14th Edition, 2015
- More resources available in MyGJU.

Usability of the Module:

The basic concepts in this course are required in other courses in Mechanical and Mechatronics Engineering programs. These courses are Control System I (ME0344), Theory of Machines (ME0331) and Mechanical Vibrations (ME05321). In addition, this course is required as part of the study plan for Civil and Energy Engineering programs.

Prerequisites and Co-requisites:

CEE201: Statics (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Statics and Strength of Materials	MECH0216

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
40% First and second exams
10% Quizzes
10% Team project or exercise
40% Final exam

Responsible Lecturer(s)

Dr. Ahmad Almuhtady

Course	Mode of Delivery	Contact Time	Self-Study
Statics and Strength of Materials	Blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and writing team project = 3 hours (per student);
- Preparation of first and second exam = 25 hours;
- Day to Day Studying, Exercises and self-reading at home (includes preparation for Quizzes): 60 hours;
- Preparation of final exam and final exam: 17 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Define force vectors in 2-D and 3-D problems in Cartesian and other representations and find the moment of any force in 2-D or 3-D problems.
- Model particles and rigid bodies equilibrium problems through creation of free body diagram, identifying equations of equilibrium and solving them.
- Analyze internal loadings of a loaded member.
- Determine geometric properties.
- Define the fundamental concepts of stress and strain.
- Define the characteristics and calculate the magnitude of selected mechanical properties of materials
- Relate and classify the stress and the strain experienced by a member to the loads, geometry, and materials properties.
- Apply the formal theory of solid mechanics to calculate forces, deflections, moments, stresses, and strains in a wide variety of structural members subjected to tension, compression, bending.
- Analyze principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element.
- Utilize basic properties of materials such as elastic moduli and Poisson's ratio to appropriately to solve problems related to isotropic elasticity.
- Utilize appropriate materials in design considering engineering properties, cost and weight.

Course Contents:
The course covers the core of the applied mechanics (statics) in addition to an introduction to the strength of materials, including the followings: Vector mechanics of forces and moments and resultants, equilibrium of particles and rigid bodies in two and three dimensions, internal loadings, geometric properties, stress and strain, mechanical properties of materials, axial load, bending, transverse shear, design of beams, column buckling.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Real case simulations;
- Team work approach to tackle project or exercise.

Recommended or Required Reading:

- Engineering Mechanics-Statics, Hibbeler, R.C.,14th Edition, Pearson Prentice Hall, 2016, ISBN 9781292089331
- Mechanics of Materials in SI Units, Hibbeler, R.C.,10th Edition, Pearson Prentice Hall, 2016, ISBN 9781292178202, ISBN: 1292178205
- Mechanics of Materials, 6th Edition, Beer, Johnston, DeWolf, and Mazurek, McGraw Hill, 2011. ISBN-10: 0073380288
- Mechanics of Materials, 6th Edition, Riley, Sturges and Morris, Wiley, 2006, ISBN-13: 9780471705116.

Usability of the Module:
This module is a require module for the bachelors in Industrial Engineering and Mechatronics and Artificial Intelligence Engineering. The module is a prerequisite to the modules *MECH0215: Dynamics*, *ME0417: Micro-Electromechanical Systems, ME0418: Nano Systems, MECH0332: Machine Design,* and *IE0243: Materials Science and Engineering Lab*.

Prerequisites and Co-requisites:

- PHYS103: Physics 1 (prerequisite)
- MATH102: Calculus II (prerequisite)

Language of Instruction
English

Recommended Optional Program Components
None

Bachelor

Course Title	Course Code
Thermodynamics	MECH0221

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Mid-term exam
20% Quizzes
10% Participation, short case study
40% Final exam

Responsible Lecturer(s)

Eng. Shuruq Shawish

Course	Mode of Delivery	Contact Time	Self-Study
Thermodynamics	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 week * 3 hours = 45 hours;
- Exercises and self-reading at home: 50 hours;
- Preparation of quizzes and quizzes:15 hours;
- Preparation of midterm and midterm: 20 hours;
- Preparation of final exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Define the basic concepts of thermodynamics such as: closed and open systems, state, state postulate, heat, work, process, and cycle.
- Find the thermodynamic properties of real substances, such as steam, refrigerant 134-a and ideal gases from either tabular data or equations of state.
- Demonstrate the concept of energy conservation (first law), the concept of quality (second law) and implement it in developing energy balance for real-life problems.
- Apply both the first and second laws to determine heat transfer, work, and property changes during processes occurring in both closed and open systems.
- Apply 1st law and 2nd law analysis on heat engines, refrigerators and heat pumps.
- Define the concept of entropy and the entropy generation principle as well as calculate the isentropic efficiency for various steady flow devices.

Course Contents:
Students get acquainted with the fundamentals of Thermodynamic concepts and definitions, states, properties, systems, control volume; processes, cycles, and units; pure substances, equation of states, table of properties; work and heat; the first law, internal energy and enthalpy; conservation of mass; steady-state flow and unsteady-flow processes; the second law, heat engines and refrigerators, reversible processes, Carnot cycle; entropy, Clausius inequality, principle of the increase of entropy, efficiencies.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Problem solving during the lectures and at home;
- Extensive tutorials during lectures and office hours.

Recommended or Required Reading:

- Cengel, Y. and Boles, M. Thermodynamics: An Engineering Approach. Ninth Edition, 2019, McGraw-Hill.
- Borgnakke, C. and Sonntag, R. Fundamentals of Thermodynamics. Tenth Edition, 2019, John Wiley and Sons.
- Moran, M., Shapiro, H., Boettner, D., and Bailey, M. Fundamentals of Engineering Thermodynamics. Ninth Edition, 2018, John Wiley and Sons.

Usability of the Module:

The competences acquired from this module will be very useful for other modules like Power and Refrigeration Cycles module (MECH0341) as well as Internal Combustion Engines module (MECH0543). Also, this course is used in Energy Engineering Program.

Prerequisites and Co-requisites:

MATH102: Calculus II (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components;

None

Bachelor

Course Title	Course Code
Fluid Mechanics	MECH0222

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

20% Midterm Exam
20% Project
20% Homework
40% Final Exam

Responsible Lecturer(s)

Dr Rafat Al-Waked
Dr. Aiman Alshare

Course	Mode of Delivery	Contact Time	Self-Study
Fluid Mechanics	Blended learning	45	105

Duration of Study:
The Fluid Mechanics course is covered over the span of one semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours.
- Project works: 45 hours;
- Exercises and self-reading at home: 30 hours;
- Preparation of midterm exam and midterm exam: 10 hours;
- Preparation of final exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Define basic concepts of fluid mechanics and related governing equations.
- Distinguish laminar and turbulent flows in pipes and related analyses of fully developed flow.
- Analyse forces exerted by a fluid at rest on plane or curved submerged surfaces.
- Solve for major and minor losses associated with pipe flow in piping networks equation to determine turbine power output and pumping power requirements.
- Utilize computers and related software to assess performance and design of simple piping system.

Course Contents:
This course introduces students to main concepts, principles and approaches used in engineering fluid statics and engineering fluid dynamics. The main course objectives are to teach students to recognize and define fundamental concepts of engineering fluid mechanics; use these fundamental concepts into suitable engineering problems; as well as develop and asses the unifying approach embodied in the integral control volume form of the basic equations started in Thermodynamics courses. Topics to be covered in this course include: properties of fluids, pressure and fluid statics, buoyancy, the use and applications of mass, Bernoulli, and energy equations, momentum analysis of flow systems, Internal incompressible viscous flow, laminar/turbulent flow, flow in pipes including pressure drop calculations, dimensional analysis, similitude and modelling, open channel flow and fluid kinematics.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting real life project in group work.

Recommended or Required Reading:

- John M. Cimbala and Yunus A. Cengel. “Fluid Mechanics: Fundamentals and Applications,” 4th Edition, McGraw-Hill, 2018.
- Frank M. White. “Fluid Mechanics,” 8th Edition, McGraw-Hill, 2016.
- David A. Chin. “Fluid Mechanics for Engineers,” 1st Edition, Pearson, 2018.
- Donald F. Elger, Barbara A. Lebret, Clayton T. Crowe and John A. Roberson. “Engineering Fluid Mechanics,” 11th Edition, Wiley, 2016.
- Marcel Escudier. “Introduction to Engineering Fluid Mechanics,” 1st Edition, Oxford University Press, 2017.
- Philip M. Gerhart, Andrew L. Gerhart and John I. Hochsyein. “Fundamentals of Fluid Mechanics,” 8th Edition, Wiley, 2016.
- John W. Mitchell. “Fox and McDonald's Introduction to Fluid Mechanics,” 10th Edition, Wiley, 2020.

Usability of the Module:

Engineering fluid mechanics is a fundamental course that could be applied to a wide range of applications such as: aerodynamics of building structures, cars and/or planes, heat exchangers, pumping systems, microfluidics systems, flows in artificial organs and open channels flow. Student could apply knowledge gained from this course onto other courses studied in the mechanical and maintenance engineering programs including: heat transfer, HVAC, internal combustion engines, building services and applied thermal systems. Other programs could benefit from this course such as: civil engineering biomedical engineering and energy engineering programs.

Prerequisites and Co-requisites:

CEE201: Statics (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Thermofluids	MECH0223

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

50% Two written midterm exams
10% Quizzes and presentation
40% Written final exam

Responsible Lecturer(s)

Dr. Wahib Owhaib

Course	Mode of Delivery	Contact Time	Self-Study
Thermofluids	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Attending in class lectures: 45 hours;
- Self-study for module: 70 hours;
- Preparation for midterm exams: 20 hours;
- Preparation for final exam: 15 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Show the importance of Thermofluids science and explain basic concepts of thermodynamics.
- Determine properties of real substances, such as water and refrigerant 134-a, and ideal gases from either tabular data or equation of state.
- Analyse processes involving ideal gases and real substances as working fluids in both closed systems and open systems or control volumes to determine process diagrams, apply the first law of thermodynamics to perform energy balances, and determine heat and work transfers.
- Demonstrate the fundamental concepts of fluid flow, with consideration of both ideal (inviscid) and real (viscous) flow.
- Apply Bernoulli and energy equations in a variety of applications.
- Analyse ideal fluid flow in one dimension using the continuum concepts of conservation of mass, momentum and energy.
- Explain characteristics of flow inside pipes and demonstrate pressure drop correlations.
- Utilise major and minor losses to determine pressure drop and pumping power required in piping systems.
- Classify mechanisms of heat transfer (conduction, convection and radiation).
- Illustrate steady heat conduction.

Course Contents:

The module demonstrates basic aspects of thermodynamic systems, fluid mechanics, and heat transfer mechanisms. The module focuses on the following aspects:

- Basic concepts of thermodynamics such as system, state, process, cycle, energy, and energy conversion efficiencies. Properties of pure substances, procedures for determine thermodynamics properties, ideal gas equation of state. Applying first law of thermodynamics on closed systems and steady flow devices such as nozzles, compressors, turbines, throttling valves and heat exchangers. Second law of thermodynamics, the Carnot cycle heat engines, refrigerators and heat pumps.
- Basic concepts of fluid mechanics, including viscosity, surface tension and capillary effect. Fluid statics, including buoyancy. Bernoulli and energy equations. Momentum equation. Flow in pipes, including laminar and turbulent flow and major and minor losses.
- Mechanisms of heat transfer conduction, convection and radiation. Steady heat conduction.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class;
- Quizzes and presentation.

Recommended or Required Reading:

- Cengel, Y.,Cimbala J., Turner, R., Fundamentals of Thermal-Fluid Sciences, SI Units, Fifth edition, 2017, McGraw Hill.
- Borgnakke, C., Sonntag, R. E., Fundamentals of Thermodynamics, Tenth edition, 2019, Wiley.
- Bergman, T. L., Lavine, A. S., Incropera, F. P., DeWitt, D. P., fundamentals of Heat and Mass Transfer, Eighth edition, 2017, Wiley.
- Fox, R. W., McDonalds, A. T., Pritchard, P. J., Mitchell, J. W., Fluid Mechanics, Ninth edition, 2016, Wiley.

Usability of the Module:
The module is particularly designed for non-mechanical engineering students. The field of Thermofluids is related to a wide range of engineering applications, including renewable energy, automotive, hydraulics and pneumatics, and manufacturing. The module is a pre-requisite to the following modules Thermofluids Lab (MECH0321) and Hydraulics and Pneumatics (ME0522)

Prerequisites and Co-requisites:
MATH205: Differential Equations (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Thermofluids Lab	MECH0321

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	1
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

30% In-Lab Reports
20% Written midterm exams
10% Lab attendance
40% Written final exam

Responsible Lecturer(s)

Wahib Owhaib, Aiman AL-Share, Shorouq Shaweesh

Course	Mode of Delivery	Contact Time	Self-Study
Thermofluids Lab	Blended learning	40	20

Duration of Study:
One semester.

Allocation of Workload Hours:

- Attending in lab sections and performing in lab reports: 35 hours;
- Preparation for midterm exams: 10 hours;
- Preparation for final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the fundamentals of fluid mechanics and heat transfer.
- Recognise bases of experiments design, setup, and instrumentations attached.
- Identify applications related to the fluid and thermal science principles included in the lab experiments.
- Understand a variety of modern experimental and diagnostic techniques, and the principles behind these techniques.
- Demonstrate practices in making engineering judgments, estimates and assessing the reliability of measurements data.

Course Contents:
The lab includes experiments covering the topics in the field of Thermofluids sciences: centrifugal pump test, determination of nozzle efficiency, nozzle jet reaction – specific thrust, compressor constant speed characteristics, dimensional analysis – introduction to scaling. Lab experiments also cover drag force in wind tunnel, lift force in wind tunnel, thermal radiation (lambert's laws), thermal radiation (Stefan Boltzmann law), adiabatic gas law, conservation of Energy and thermodynamics 1st law and determination of Coefficient of performance.

Planned Learning Activities and Teaching Methods:

- Lab experiments demonstrations with intensive discussions;
- In-lab exercises;

- Quizzes and presentations.

Recommended or Required Reading:

- Lab manual including in lab sheets.
- Cengel, Y.,Cimbala J., Turner, R., Fundamentals of Thermal-Fluid Sciences, SI Units, Fifth edition, 2017, McGraw Hill.
- Borgnakke, C., Sonntag, R. E., Fundamentals of Thermodynamics, Tenth edition, 2019, Wiley.
- Bergman, T. L., Lavine, A. S., Incropera, F. P., DeWitt, D. P., fundamentals of Heat and Mass Transfer, Eighth edition, 2017, Wiley.
- Fox, R. W., McDonalds, A. T., Pritchard, P. J., Mitchell, J. W., Fluid Mechanics, Ninth edition, 2016, Wiley.

Usability of the Module:

This module is covering selected topics in the field of fluid mechanics, heat transfer, and thermodynamics. The course provides the basis for experiments design skills, measurements, and instrumentation, processing experimental data, identifies measurement uncertainties, discusses experiments results and conclusions. The lab module is suitable for non-mechanical engineering students at the School of Applied Technical Sciences including Mechatronics Engineering students.

Prerequisites and Co-requisites:

- MECH0221: Thermodynamics (prerequisite) for Mechanical and Maintenance Engineering students
- MECH0223: Thermofluids (prerequisite) for Mechatronics Engineering students
- MECH0222: Fluid Mechanics (co-requisite) for Mechanical Engineering students

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Theory of Machines	MECH331

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
10% Quizzes
50% Two midterm exams
40% Theory final exam

Responsible Lecturer(s)

Dr. Ma'en Sari

Course	Mode of Delivery	Contact Time	Self-Study
Theory of Machines	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Self-study for module: 35 hours;
- Preparation for midterm exams: 35 hours;
- Preparation for final exam: 35 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Identify mechanisms and predict their motion.
- Calculate the degrees of freedom of mechanisms using Gruebler's and Kutzbach's equations.
- Design and analyze mechanisms to fulfill motion generation and quick return requirements.
- Determine the positions, velocities and accelerations of links and points on mechanisms.
- Derive SVAJ functions to fulfill cam design specifications.
- Calculate dynamic joint forces of mechanisms.
- Balance simple rotating objects and pin-jointed fourbar linkages.

Course Contents:
Theory of Machines and Mechanisms is a study of linear and angular displacements, velocities, accelerations of points and bodies, and the static and dynamic forces required for the proper design of mechanical linkages, cams systems. The course covers both static force analysis of mechanisms and dynamic analysis of linkages, Mechanisms and applications, vector method of analysis of plane mechanisms, mobility and linkages, cams, position, velocity, and acceleration analysis in mechanisms; static and dynamic balancing and balancing machines, flywheels, and reciprocating engines.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;

- Exercises with discussion in class.

Recommended or Required Reading:

- Robert L. Norton, Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines", 6/e, McGraw-Hill, 2019, ISBN: 0073529354.
- K. J. Waldron and G. L. Kinzel, Kinematics, Dynamics, and Design of Machinery", 3/e, Wiley, 2016, ISBN: 1118933282.
- J. Uicker, G. Pennock, and J. Shigley, Theory of Machines and Mechanisms, 5th Ed, Oxford University Press, 2016, UK, ISBN: 9780190264482.

Usability of the Module:

The theory of machines is an essential step in the design, synthesis, and the analysis of different mechanisms and applications. The course serves Mechanical Engineering and Mechatronics Engineering, students. It may also be offered and of benefit to practicing engineers.

Prerequisites and Co-requisites:

- TME 214: Dynamics and Vibrations (prerequisite)
- ME111: Computer Aided Engineering Drawing (AutoCAD) (prerequisite)
- MATH203: Applied Mathematics for Engineers (prerequisite)

Language of Instruction:

English with occasional Arabic explanations

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Machine Design	MECH0332

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	4
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
7.5% Quizzes
37.5% Two midterm exams
15% Lab assignments
10% Lab assessment
30% Theory final exam

Responsible Lecturer(s)

Dr. Ala Hijazi
Dr. Ma'en Sari

Course	Mode of Delivery	Contact Time	Self-Study
Machine Design	Face-to-face	45	85
Machine Design Lab	Blended learning	36	14

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Presence time in labs: 36 hours;
- Prelab preparation: 5 hours;
- Exercises and self-study at home: 45 hours;
- Preparation for midterm exams: 25 hours;
- Preparation for lab assessment: 9 hours;
- Preparation for final exam: 15 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the general considerations and the iterative concept in mechanical design.
- Apply different methods to determine the deflections of structures.
- Apply static failure criteria and fatigue failure criteria in the analysis of machine components under various loading conditions.
- Design and analyze shafts with different geometrical features under various loading conditions.
- Analyze non-permanent joints (bolts, screws, etc.) and permanent joints (welded) under various loading conditions.
- Successfully use a 3D CAD design software such as SOLIDWORKS to draw different mechanical parts and conduct stress and deflections analysis.

Course Contents:

The students will be familiarized with some concepts and definitions and then general considerations & procedure of machine design: stress analysis, combined loading, generalized Hooke's Law, buckling analysis, stress concentration, general principles of machine design, static strength and failure theories, fatigue strength and failure theories. Finally, the students will be introduced to the basic design principles of some machine elements and their selection; shafts, power screws, bolts, and welding.
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Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- Exercises in class and in the lab.

Recommended or Required Reading

- Richard. G. Budynas, and J. Keith Nisbett, Shigley's Mechanical Engineering Design, 11th edition, McGraw-Hill Book Company, New York, 2019.
- M.F. Spotts and T.E. Shoup and L.E. Hornberger Design of Machine Elements, 8th edition, Prentice-Hall, Inc., Upper Saddler River, New Jersey, 2004.
- Robert L. Norton, Machine Design, An integrated Approach, 6th edition, Prentice-Hall, Upper Saddler River, New Jersey, 2019.

Usability of the Module:

Machine design is an essential step in the design of mechanical structures, machines, and mechanisms. The course serves Mechanical Engineering and Mechatronics Engineering. It may also be offered and of benefit to practicing engineers.

Prerequisites and Co-requisites:

- TME 213: Mechanics of Materials (prerequisite)
- IE325: Manufacturing Processes (prerequisite)

Language of Instruction:

English with occasional Arabic explanations.

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Power and Refrigeration Cycles	MECH0341

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-semester**		**Remedial**	

Examination

30% Written midterm exam
30% Projects, presentations and quizzes
40% Written final exam

Responsible Lecturer(s)

Dr. Wahib Owhaib

Course	Mode of Delivery	Contact Time	Self-Study
Power and Refrigeration Cycles	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Attending in class lectures: 45 hours;
- Self-study for module including project work and quizzes: 70 hoursM
- Preparation for midterm exams: 15 hours;
- Preparation for final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Examine isentropic processes and develop the property relations for these processes, and the isentropic efficiencies for steady flow devices.
- Define exergy, reversible work, and the second law efficiency.
- Evaluate the performance of gas power cycles and analyse closed and open gas power cycles.
- Solve problems based on Otto, Diesel, Stirling, Ericsson, and Brayton cycles.
- Analyse vapour power cycles and the concepts of cogeneration.
- Evaluate approaches to increase the thermal efficiency of the Rankine cycle.
- Analyse reheat, regenerative, and combined cycles.
- Explain the processes of vapour compression cycles, and operation of refrigeration and heat pump systems.
- Evaluate the performance of vapour compression cycles and analyse the factors affecting this performance.
- Determine the properties of ideal gas mixtures and real gas mixtures.
- Define and relate the relative humidity, dew point, saturation temperature, and wet-bulb temperature.
- Use the psychrometric chart to determine the properties of atmospheric air and analyse various air conditioning processes.
- Describe the concept of energy quality, the statements of the second law, and the Carnot principle.
- Apply energy balances to reacting systems and calculate the enthalpy of combustion and the heating value of fuels.

Course Contents:
The module includes applying the first and second law of thermodynamics to various basic and improved cycles. Cycles include ideal gas power cycles with air standard assumptions and actual, including basics of Carnot cycle, Otto cycle, Diesel cycle, Stirling and Eircsson cycles as well as Brayton cycles, with regeneration, reheating and intercooling. Jet-propulsion cycles. In addition, steam power cycles both ideal and real including simple Rankine cycle, reheat Rankine cycle, regenerative Rankine cycle, cogeneration, and combined gas-steam power cycles are covered. Furthermore, vapour compression refrigeration cycles; refrigerators and heat pumps, reversed the Carnot cycle including ideal and actual cycles. The module also includes a review of Exergy and second law analysis, the behaviour of gas mixtures, gas vapour mixtures and air conditioning and fuels and combustion.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Site visit to thermal power plant site in Jordan;
- Exercises in class and at home;
- Project work including presenting findings.

Recommended or Required Reading:

- Cengel Y. and Boles, M. Thermodynamics: An Engineering Approach – SI units, ninth edition, 2019, McGraw-Hill.
- Borgnakke, C., Sonntag, R. E., Fundamentals of Thermodynamics, Tenth edition, 2019, Wiley.
- Moran, M., Shapiro, H., Boettner, D., and Bailey, M. Fundamentals of Engineering Thermodynamics. Ninth Edition, 2018, John Wiley and Sons.

Usability of the Module:
This model is a continuation of Thermodynamics module where students demonstrate principles of thermodynamics and in the current module; they apply these principles on thermodynamics cycles. The module is a pre-requisite to the German Year where students shall spend one year in Germany allocated to one-semester courses at the German host university in addition to 24 weeks of industrial training. In addition, the module is also a pre-requisite to the following modules; Heating Ventilation & Air Conditioning (MECH0541), Internal Combustion Engines (MECH0543) and Applied Thermal Systems (MECH0545).

Prerequisites and Co-requisites:
MECH0221: Thermodynamics (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Thermal Systems Lab I	MECH0342

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	1
Elective Module		**Spring Semester**		**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Midterm Exam
50% Lab work
40% Final Exam

Responsible Lecturer(s)

Dr. Rafat Al-Waked

Course	Mode of Delivery	Contact Time	Self-Study
Thermal Systems Lab I	Blended learning	30	30

Duration of Study:
The Thermal Systems Lab I course is covered over the span of one semester.

Allocation of Workload Hours:

- Presence time in Laboratory and experimental work 12 weeks * 2.5 hours = 30 hours;
- Report writing: 18 hours;
- Preparation of midterm exam and midterm exam: 4 hours;
- Preparation of final exam and final exam: 8 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand how different thermal measuring devices work.
- Know the main components of a steam power plant and perform a full energy balance on a miniature steam power plant.
- Investigate the state of air when it undergoes sensible heating and cooling with dehumidification processes.
- Determine the combined effect of heat transmission and the thermal conductivity of different building materials.
- Differentiate between film and dropwise condensation process as function of working temperature and pressure drop.
- Examine the behaviour of the refrigerating cycle under variable loads and speeds.

Course Contents:
Thermal systems are systems that consists of multipart coupled components with thermal parts at the core of them. This course provides students with hands on experience to conduct experimental analysis in the fields of thermodynamics, fluid mechanics and heat transfer. Students learn how to manually or using data logger recording/measuring temperature, pressure, flowrate and heat flux at various points in a given thermal system. They learn how to calculate performance and power requirements of a refrigeration cycle, heat flux and overall heat transfer coefficient of a heat exchanger, contact resistance and how to determine the thermal conductivity of various materials. Topics such as film boiling are studied to demonstrate thermal decomposition while fluid mechanical problems in combustors and combustion chemistry across various practical systems are also practiced. Evaluations of heat transfer and fluid flow processes are addressed in the following experiments: heat

pumps, evaporators, condensers, expansion devices, design and integration of thermal systems, conduction and convection processes, air conditioning, combustion, gas analyser, heat exchangers, steam power plants, calorimeters, etc.

Planned Learning Activities and Teaching Methods:

- Hands on laboratory experiments;
- Conducting experimental works;
- Writing technical reports.

Recommended or Required Reading:

- Department of Mechanical Engineering, "Thermal Systems Laboratory Manual," 1st Edition, GJU University, 2021.
- John M. Cimbala and Yunus A. Cengel. "Fluid Mechanics: Fundamentals and Applications," 4th Edition, McGraw-Hill, 2018.
- Adrian Bejan and Allan D. Kraus. "Heat Transfer Handbook," 1st Edition, Willey, 2003.
- Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey. "Fundamentals of Engineering Thermodynamics," 9th Edition, Willey, 2018.

Usability of the Module:

The thermal systems laboratory is an opportunity for students to apply their knowledge of thermodynamics, fluid mechanics, and heat transfer to working equipment such as heat exchangers that re-enforces what they have learned in prior engineering courses. The experiments promote a hands-on and team-work oriented experience that introduces students to fundamentals pertaining to the measurement process, data reduction, and interpretation of the measured results. Improvement of communication skills, both written and oral, are strongly emphasized in lab reports and oral presentations. This is accomplished by hands-on, small-group laboratory experiences involving industrial-type equipment and data acquisition systems for each experiment, Student could apply knowledge gained from this course onto other courses studied in the mechanical and maintenance engineering programs including: applied thermal systems and thermal systems Lab II. Other programs could benefit from this course such as energy engineering programs.

Prerequisites and Co-requisites:

- MECH0341: Power and Refrigeration Cycles (prerequisite);
- ENE321: Heat transfer (prerequisite).

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Computer Aided Mathematics for MECH	MECH0361

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	2
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

20% In class assignments
20% Mid-term exams
20% Term projects
40% Final exam (30% written exam + 10% project presentation)

Responsible Lecturer(s)

Prof. Ziyad Masoud
Dr. Maen Sari
Dr. Bashar Hammad

Course	Mode of Delivery	Contact Time	Self-Study
Computer Aided Mathematics for MECH	Blended learning	49	41

Duration of Study:
One semester.

Allocation of Credit Hours:

- In lab lectures, exercises, and software programming: 12 weeks * 4 hours = 48 hours;
- Term projects presentation: 1 hour;
- Term projects work and development: 32 hours;
- Presentation preparation of term projects: 3 hours;
- Preparation for the final exam: 6 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand mathematical models of practical engineering problems;
- Develop logical steps of the solution procedure;
- Solve mathematical equations symbolically using a Symbolic Math software;
- Convert mathematical models to standard numerical mathematical models;
- Convert logical steps of solution to a numerical programming language;
- Demonstrate the ability to program and debug computer programmed language;
- Generate, present, and interpret both numerical and graphical results.

Course Contents:
Introduction to various software tools used in industry, including numerical and symbolic mathematical analysis software. Application of these software packages to engineering problems such as command line programming, numerical methods, data analysis and visualization, data acquisition, instrumentation, system simulation and control design, discrete event simulation.

Planned Learning Activities and Teaching Methods:

- In lab lectures on programming logic and software;

- In lab exercises;
- Project on real world cases;
- Term project report writing and presentation.

Recommended or Required Reading:

- Ramin S. Esfandiari, Numerical Methods for Engineers and Scientists Using MATLAB, 2nd Edition, 2017, CRC Press.
- Bruce Torrence, Eve A. Torrence, The Student's Introduction to Mathematica and the Wolfram Language, 3rd Edition, 2019, Cambridge University Press.
- Frank Garvan, The Maple Book, 2nd Edition, 2021, CRC Press.

Usability of the Module:

The course represents a basic mathematical and analytical tool for applied engineering courses, engineering research, and senior graduation projects. The course serves most engineering disciplines especially Mechanical Engineering, Mechatronics Engineering, Energy Engineering, Civil Engineering, and Biomedical Engineering students. It may also be offered and of benefit to practicing engineers.

Prerequisites and Co-requisites:

- MATH203: Applied Mathematics for Engineers (prerequisite)
- MATH205: Differential Equations (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Field Training	MECH0382

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

Pass-fail module

Responsible Lecturer(s)

Course	Mode of Delivery	Contact Time	Self-Study
Field Training	Face-to-face		160 hrs.

Duration of Study:
One semester.

Allocation of Workload Hours:

- Sending applications, communication with companies and other formalities: 10 hours;
- Internship at a local or regional/international approved company: 160 hours;
- Writing final report: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Work in a professional environment;
- Work in a team and communicate with professionals;
- Apply concepts in the field of study to real life examples;
- Connect classroom theory with real-life industry experience and vice versa.

Module Contents:
Training at a local or regional/international approved company. The training must cover any topic or multiple areas of the respective field of study.

Planned Learning Activities and Teaching Methods:

- Application and communication with companies;
- Practical internship.

Recommended or Required Reading:
None extra; however, recommended literature from the modules relevant to the context of the internship.

Usability of the Module:
This module is a fundamental module for all engineering students. It is a prerequisite to the International Internship planned in the 8th semester of studies. It gives the students a first impression of the professional

environment he is preparing for during his studies, giving the opportunity to link theory and practice, respectively knowledge and experience.

Prerequisites and Co-requisites:
Department approval (prerequisites)

Language of Instruction
None specified

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Renewable Energy	MECH0406

Compulsory Module		**Year of Study**	4	**Semester Hours**	3
Elective Module	X	**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-Program**		**Remedial**	

Examination

Portfolio:
30% Mid-term exam
30% Projects
40% Final exam

Responsible Lecturer(s)

Dr. Bashar Hammad

Course	Mode of Delivery	Contact Time	Self-Study
Renewable Energy	Face-to-face; blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures and exercises: 45 hours;
- Exercises and self-reading at home: 50 hours;
- Preparation of projects: 15 hours;
- Preparation of midterm exam and midterm exam: 15 hours;
- Preparation of final exam and final exam: 25 hours.

Learning Outcomes:

By the end of this module, the student will be able to:

- Describe different components of a variety of RE systems.
- Design photovoltaic systems (grid-connected and stand-alone).
- Calculate some aspects of wind systems such as the most frequent wind velocity, velocity contributing the maximum energy, and energy density.
- Apply the fundamentals of renewable energy and applications.

Course Contents:
The main aim of this course is to cover topics in photovoltaic systems, wind, hydropower, geothermal systems and solar thermal. In each topic, main components and theory are explained. Furthermore, design concepts for photovoltaic and wind systems are discussed. Economics feasibility of these systems is addressed.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home.

Recommended or Required Reading:

- Godfrey Boyle, Renewable Energy: Power for a Sustainable Future, Oxford University Press, 3rd Edition, 2012.
- Vasilis Fthenakis and Paul A. Lynn, Electricity from Sunlight: Photovoltaic-System Integration and Sustainability, Wiley, 2nd Edition, 2018.
- Mathew Sathyajith, Wind Energy: Fundamentals, Resource Analysis and Economics, Springer, 2006.
- Vaughn Nelson, Introduction to Renewable Energy, CRC Press, Taylor & Francis Group, 2011.
- Bent Sorensen, Renewable Energy: Physics, Engineering, Environmental Impacts, Economics & Planning, Academic Press; 5th Edition, 2017.
- John A. Duffie, William A. Beckman and Nathan Blair, Solar Engineering of Thermal Processes, Photovoltaics and Wind, Wiley, 5th Edition, 2020.
- James F. Manwell, Jon G. McGowan and Anthony L. Rogers Wind Energy Explained: Theory, Design and Application, Wiley, 2nd Edition, 2010.

Usability of the Module:

The content in this elective module can open new frontiers for students looking for a job after graduation. The track of Renewable Energy attracts more people in the local, regional and global markets. Students from Mechanical, Mechatronics and Energy Engineering program can benefit from this module.

Prerequisites and Co-requisites:

MECH0341: Power and Refrigeration Cycles (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Field Training	MECH0491

Compulsory Module	X	**Year of Study**	4	**Semester Hours**	
Elective Module		**Spring Semester**	X	**Workload**	900
Optional Module		**Winter Semester**	X	**ECTS**	30
Pre-university		**Pre-program**		**Remedial**	

Examination

Pass-fail module

Responsible Lecturer(s)

Course	Mode of Delivery	Contact Time	Self-Study
Field Training	Face-to-face		900 hrs.

Duration of Study:
One semester.

Allocation of Workload Hours:

- Sending applications, communication with companies and other formalities: 60 hours;
- Full-time internship 40 hr/week * 20 weeks = 800 hours;
- Writing final report: 40 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Represent oneself in a professional curriculum vitae and successfully undergo job interviews;
- Work in an international professional environment;
- Work in a team and communicate with professionals;
- Apply concepts in the field of study to real life examples and vice versa.

Module Contents:
Training at a German/International approved company. The training must cover any topic or multiple areas of the respective field of study. The training must be approved by the Office of Industrial Links (OIL) at GJU and the respective Exchange Coordinator.

Planned Learning Activities and Teaching Methods:

- Writing a job application, a CV and communicate with companies;
- Practical internship.

Recommended or Required Reading:
None extra; however, recommended literature from the modules relevant to the context of the internship.

Usability of the Module:

This module is a fundamental module for all engineering students. It is planned for the second semester of the German Year. In the study plan of B.Sc. in Industrial Engineering it is a prerequisite for IE0584 Graduation Project I.

Prerequisites and Co-requisites:

- MECH0391 Field Training (prerequisites)
- Department approval (prerequisites)

Language of Instruction:
None

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Special Topics in Maintenance Engineering “Spare Parts and Storage Management”	MECH0495

Compulsory Module		**Year of Study**	5	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
25% First exam
25% Second exam
10% Quizzes and homework
40% Final exam

Responsible Lecturer(s)

Dr. Sameer Al-Dahidi

Course	Mode of Delivery	Contact Time	Self-Study
Spare Parts and Storage Management	Face-to-face; blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures and exercises: 15 weeks * 3 hours = 45 hours;
- Preparation of quizzes and homework: 25 hours;
- Preparation of first, second, and final exams and exams: 80 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Explain the significance of maintenance spare parts management on the overall plant availability and the maintenance investment costs.
- Illustrate the concepts of spare parts identification, classification, forecasting, inventory analysis, inventory control systems, and inventory management.
- Define, explain, develop, compare, and evaluate various forecasting techniques and inventory control systems for maintenance spare parts.
- Define a systematic approach to the effective management of maintenance spare parts.

Course Contents:
Spare parts and storage management aims to provide the right spare parts, at the right quantity, to the right locations, at the right time, with the right level of quality, with a minimum total cost to the industrial plant in the presence of conflicting objectives of various business units. Maintenance spare parts' effective management is a critical contributor to equipment operating performance and the maintenance investment cost. Thus, this course is designed to helping students gain knowledge regarding various aspects of spare parts management: the systematic actions while managing spare parts, forecasting of spare parts needed for equipment maintenance, identification and classification of spare parts, inventory analysis, and the spare parts inventory control systems. Students should build, analyze, and assess a basic spare parts inventory system at the end of this course.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises from real-industrial applications in class and at home.

Recommended or Required Reading:

- D. A. Collier and J. R. Evans, Operations and Supply Chain Management, Cengage Learning, 2nd Edition, 2020, ISBN 978-0357131695.
- P. Slater, Spare Parts Inventory Management: A Complete Guide to Sparesology, Industrial Press, Inc., 1st Edition, 2016, ISBN 978-0831136086.
- P. Gopalakrishnan and A. K. Banerji, Maintenance and Spare Parts Management, PHI Learning Private Limited, 2nd Edition, 2013, ISBN 978-8120347397.

Usability of the Module:

This course is related to the Maintenance Engineering Track of the 5th year students enrolled in the Mechanical and Maintenance Engineering Department at German Jordanian University. The course is suitable for students in other engineering disciplines. Effective spare parts and storage management would, indeed, supports the upstream maintenance activities and, consequently, maximizes the plants' availability and safety while minimizing the associated maintenance costs.

Prerequisites and Co-requisites:

IE0361: Engineering Economics (prerequisite)

Language of Instruction:

English with occasional Arabic explanations (or if German professors available, English with German)

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Mechanical Vibrations	MECH0531

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	4
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Midterm exams
15% Lab reports and midterm exam
15% Term project
40% Final exam (30% written exam + 10% practical exam)

Responsible Lecturer(s)

Prof. Ziyad Masoud
Dr. Maen Sari
Eng. Ahmad Kattan

Course	Mode of Delivery	Contact Time	Self-Study
Mechanical Vibrations	Blended learning	45	90
Mechanical Vibrations Lab	Bended learning	36	9

Duration of Study:
One semester.

Allocation of Workload Hours:

- In class lectures, exercises, and software programming: 15 weeks * 3 hours = 45 hours;
- Self-study of pre-recorded video lectures and exercises: 12 weeks * 1 hours = 12 hours;
- Exercises and self-study at home: 15 weeks * 3 hours = 45 hours;
- Term project and presentation preparation: 24 hours;
- Preparation for the course final exam: 9 hours;
- In lab experimental work: 12 weeks* 3 hours: 36 hours;
- Lab reports preparation: 12 weeks* 0.5 hours: 6 hours;
- Preparation for the lab final exam: 3 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Demonstrate the ability to derive mathematical models for single degree of freedom and multi-degrees of freedom systems.
- Solve mathematical models for the undamped and damped responses of free, harmonically excited, and arbitrary excited vibration systems.
- Analyze and understand the vibration behavior of single degree of freedom and multi-degrees of freedom systems.
- Acquire and analyze experimental data and identify systems characteristics.
- Interpret the natural response and forced response of vibration systems.
- Identify the natural frequencies and mode shapes of multi-degrees of freedom systems.
- Demonstrate understanding of vibration behavior of basic continuous systems.

Course Contents:

Fundamentals of vibration, free and forced vibrations of undamped and viscously damped single degree of freedom systems, vibration under general forcing conditions, free vibration eigenvalue problem, free and forced vibrations of two and multi-degrees of freedom systems, and determination of natural frequencies and mode shapes of discrete and one-dimensional continuous systems.

Planned Learning Activities and Teaching Methods:

- In class and online lectures, exercises, and software programming;
- Exercises and self-study at home;
- Project on real world case;
- In-lab experiments and demonstrations;
- Technical report writing and presentation.

Recommended or Required Reading:

- D.J. Inman, Engineering Vibration, 4th edition, Prentice Hall, 2013.
- S.S. Rao, Mechanical Vibrations, 5th edition, Prentice Hall, 2010.
- R.J. Anderson, Introduction to Mechanical Vibrations, 1st edition, Wiley, 2020.

Usability of the Module:

Vibration analysis is an essential step in the design of dynamic mechanical systems. It is also an important tool for health monitoring of mechanical systems and civil structures. The course serves Mechanical Engineering, Mechatronics Engineering, and Civil Engineering students. It may also be offered and of benefit to practicing engineers.

Prerequisites and Co-requisites:

- MECH0215: Dynamics (Prerequisite)
- MATH205: Differential Equations (Prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Applied Mechanical Design	MECH0533

Compulsory Module	X	**Year of Study**	4	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% midterm exam
10% team presentation
20% team design project
40% final exam

Responsible Lecturer(s)

Dr. Ala Hijazi

Course	Mode of Delivery	Contact Time	Self-Study
Applied Mechanical Design	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Credit Hours:

- Presence time in lectures, exercises and presentations 15 weeks * 3 hours = 45 hours;
- Preparation and writing the design project: 40 hours (per student);
- Preparation of presentation: 5 hours (per student);
- Daily studying, exercises and self-reading at home: 40 hours;
- Preparation of midterm exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Analyze and design mechanical springs.
- Analyze loading on shafts and select the proper bearings (rolling-contact or sliding-contact) and evaluate their performance.
- Evaluate the suitability of gears (spur, helical and bevel) under various operating conditions according to the standard procedure.
- Analyze and select flexible drives, flywheels, brakes and clutches.
- Work in a team and implement standard design procedures to perform complete design projects.
- Communicate the implemented design ideas through technical reports and oral presentations.

Course Contents:
This course is a continuation to the Machine Design course. Students will be introduced to the analysis and design concepts of various types of machine elements that include mechanical springs, bearings (journal and anti-friction); spur, helical and bevel gears; flexible drives and flywheels; clutches and brakes.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;

- Real case simulations;
- Presenting technical content in group work;
- Designing a mechanical system and preparing technical report in group work.

Recommended or Required Reading:

- Budynas & Nisbett; Shigley's Mechanical Engineering Design; 11th Edition; McGraw-Hill; 2020.
- Jiang; Analysis and Design of Machine Elements; 3rd Edition; McGraw-Hill; 2019.
- Lecture notes and other course related materials available on the course webpage.

Usability of the Module:

This module along with the previous mechanical design modules provide the students with the skills necessary in the professional life to design complete mechanical systems.

Prerequisites and Co-requisites:

MECH 331: Theory of Machines (prerequisite)
MECH 332: Machine Design (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components

None

Bachelor

Course Title	Course Code
Heating, Ventilating, and Air Conditioning (HVAC)	MECH0541

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Midterm exam
30% Project
20% Homework
40% Final exam

Responsible Lecturer(s)

Dr Rafat Al-Waked

Course	Mode of Delivery	Contact Time	Self-Study
Heating, Ventilating, and Air Conditioning (HVAC)	Blended learning	45	105

Duration of Study:
The HVAC course is covered over the span of one semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Project works: 45 hours;
- Exercises and self-reading at home: 30 hours;
- Preparation of midterm exam and midterm exam: 10 hours;
- Preparation of final exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- List the main elements and/or types of HVAC systems.
- Outline the key elements of the designing process of HVAC systems.
- Evaluate moist air properties in relation to HVAC application via mathematical formulations and/or psychometric chart.
- Estimate the required heating and/or cooling loads of buildings with different functions.
- Select the appropriate duct and pipe sizes for the given HVAC application.
- Use computers and related software to assess performance and design of simple HVAC system.

Course Contents:
This course discusses the impact of HVAC on society, global energy awareness, and energy efficient design in addition to technological concerns. These discussions emphasize analysis and problem solving skills as well as the critical thinking abilities required in the design and selection of HVAC equipment. The main course objectives are to teach students to:

- Recognize and define the basics of HVAC, including comfort, indoor air quality, and equipment.
- Develop the skills necessary to be able to design an HVAC system.

The course is an application of thermodynamics, fluid mechanics, and heat transfer to the design and selection of HVAC equipment. It covers psychometrics, HVAC components, piping and duct layouts, pumps, and fans in a

lecture format. The subject matter of this course includes an overview of various HVAC systems with an emphasis on cooling applications.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting real life project in group work.

Recommended or Required Reading:

- Faye C. McQuiston, Jerald D. Parker and Jeffrey D. Spitler. “Heating, Ventilating, and Air Conditioning: Analysis and Design,” 6th Edition, Wiley, 2005.
- ASHRAE, “2021 ASHRAE Handbook—Fundamentals,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2021.
- ASHRAE, “2020 ASHRAE Handbook— HVAC Systems and Equipment,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2020.
- ASHRAE, “2019 ASHRAE Handbook— HVAC Applications,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2019.
- ASHRAE, “2018 ASHRAE Handbook—Refrigeration,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2018.

Usability of the Module:

HVAC systems are vital for comfortable and healthy facility indoor environments. The role of HVAC engineer allows him to communicate directly with clients, work with engineering colleagues, technicians, design brand new systems, and create estimates. This course tends to develop the student knowledge of the principles of heating, ventilating, air-conditioning and refrigeration systems found in occupied facility applications. The teamwork-oriented project of the course aims at simulating real life scenario where students will learn project and time managements. Students can apply knowledge gained from this course onto other courses studied in the Mechanical and Maintenance Engineering Program including: Applied Thermal Systems (MECH0545) and Building Services (MECH0544). Other programs could benefit from this course such as Energy Engineering Programs.

Prerequisites and Co-requisites:

- ENE321: Heat Transfer (prerequisite)
- MECH0341: Power and Refrigeration Cycles (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Thermal Systems Lab II	MECH0542

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	1
Elective Module		**Summer Semester**		**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2

Examination

Midterm Exam (10%)
Lab work (50%)
Final Exam (40%).

Responsible Lecturer(s)

Dr. Aiman Alshare

Course	Mode of Delivery	Contact Time	Self-Study
Thermal Systems Lab II	Blended learning	30	30

Duration of Study:
The Thermal Systems Lab II course is covered in a single semester.

Allocation of Credit Hours:

- Presence time in Laboratory and experimental work 12 weeks * 2.5 hours = 30 hours
- Report writing: 18 hours
- Preparation of midterm exam and midterm exam: 4 hours
- Preparation of final exam and final exam: 8 hours

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the working principles of various thermal systems mode of operation and performance parameters.
- Analyse slow combustion processes of pure hydrogen and fast reactions of stoichiometric mixture of oxy-hydrogen using high speed cameras.
- Investigate air conditioning systems with vapor compression cycle by measurement of the temperature and pressure at each stage in the cycle and understand the performance electricity cost in the system.
- Analyse the basic operation of a Baryton cycle depicting the gas turbine mobile power generation of a jet engine for propulsion of aircrafts.
- Performance evaluation of a single cylinder internal combustion engine of spark ignition and compression ignition types
- Examine and characterize pilot scale radiator and radiating floor heating system for residential dwelling
- Measurements of emission gases and particulars of automobile exhaust system

Course Contents:
This practical course provides students an opportunity for hand on experience with the applications relevant to the concepts of thermodynamics, fluid mechanics and heat transfer. More advanced concepts, devices and experimental setups such as combustion, recirculating air conditioning, turbo jet engine test, single cylinder internal combustion engine, residential heating systems, locomotion exhaust analyse.

Planned Learning Activities and Teaching Methods:

- Hands on Laboratory experiments.
- Conducting experimental works.
- Writing technical reports.

Recommended or Required Reading:

- Claire Soares. “Gas Turbines: A Handbook of Air, Land and Sea Applications” 2ed Edition, Elsevier, 2014.
- Adrian Bejan and Allan D. Kraus. “A Heat Transfer Textbook,” 5th Edition, Phlogiston Press, 2020.
- Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey. “Fundamentals of Engineering Thermodynamics,” 9tht Edition, Willey, 2018.

Usability of the Module:

The thermal systems laboratory is an opportunity for students to apply their knowledge of thermodynamics, fluid mechanics, and heat transfer in studying the performance of thermal system of scaled down industrial-size equipment and data acquisition systems for each experiment,. The experiments are designed for a hands-on and students groups oriented experience. It strengthens and refines students abilities in experimental measurement, data reduction, and physical interpretation of the results. Written and oral communications skills are sharpened by emphasized on oral presentations and written documenting reports. Energy engineering program could benefit from this module.

Prerequisites and Co-requisites:

- MECH0342: Thermal systems I (Pre-requisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Internal Combustion Engines	MECH0543

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Midterm exam
30% Quizzes
40% Final exam

Responsible Lecturer(s)

Dr. Aiman Alshare

Course	Mode of Delivery	Contact Time	Self-Study
Internal Combustion Engines	Blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures and exercises = 45 hours;
- Exercises and self-reading at home: 50 hours;
- Preparation of quizzes and quizzes: 15 hours;
- Preparation of midterm exam and midterm exam: 15 hours;
- Preparation of final exam and final exam: 25 hours.

Learning Outcomes:

By the end of this module, the student will be able to:

- Understand and define internal combustion terminology, parts and components.
- Classify and categorize internal combustion types.
- Analyse the performance of internal combustion engines and evaluate its parameters.
- Characterize fuels, combustion chemistry and fuel figures.
- Discuss engine lubrication and lubricant figures.

Course Contents:
The module covers: engine types and their operation, operating parameters, thermochemistry of fuel-air mixtures, ideal models of engine cycles, supercharging and turbocharging, spark ignition engines, compression ignition engines, pollutant formation and control, engine heat transfer.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home.

Recommended or Required Reading:

- J. B. Heywood: Internal Combustion Engine Fundamentals, 3rd edition, 2020.
- W. W. Pulkrabek: Engineering Fundamentals of Internal Combustion Engine, 2nd edition, 2003.
- A. T. Kirkpatrick: Introduction to Internal Combustion Engine, 1st edition, 2020
- Lecture notes and more resources available on MyGJU.

Usability of the Module:
The concept in this course is required as part of the applied thermal science group.

Prerequisites and Co-requisites:
TME0341: Power and Refrigeration Cycle

Language of Instruction:

English

Recommended Optional Program Components:
None

Bachelor

Course Title	Course Code
Building Services	MECH0544

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Midterm exam
30% Project
20% Homework
40% Final exam

Responsible Lecturer(s)

Dr Rafat Al-Waked

Course	Mode of Delivery	Contact Time	Self-Study
Building Services	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Project works: 45 hours;
- Exercises and self-reading at home: 30 hours;
- Preparation of midterm exam and midterm exam: 10 hours;
- Preparation of final exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Recognise the need for building services and the role of building services engineer.
- Understand the importance of healthy building services systems and its impact to the life-cycle-cost.
- Utilise Jordanian codes, standards, and guidelines for the design and installation of building services systems.
- Describe alternative energy conservation measures in terms of energy management, energy codes and cost assessment.

Course Contents:
Building services is "the practice of the art and science of engineering for achieving optimal integrated building systems incorporating environmental control and safety provisions for the comfort and wellbeing of the occupants of the built environment". This course covers the various aspects of mechanical, electrical and plumbing (MEP) services provided to a building. It consists of the following topics: built environment; energy economics; water supplies; waste systems; drainage systems; lighting; gas installation; electrical installations; room acoustics; fire protection; plant and service areas.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting real life project in group work.

Recommended or Required Reading:

- Chadderton, David V., “Building Services Engineering,” 4th Edition, Spon Press-Taylor & Francis Group., 2004.
- Fred Hall and Roger Greeno, “Building Services Handbook,” 9th Edition, Routledge - Taylor & Francis Group., 2017.
- ASHRAE, “2021 ASHRAE Handbook—Fundamentals,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2021.
- ASHRAE, “2020 ASHRAE Handbook— HVAC Systems and Equipment,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2020.
- ASHRAE, “2019 ASHRAE Handbook— HVAC Applications,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2019.
- ASHRAE, “2018 ASHRAE Handbook—Refrigeration,” Atlanta: American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. 2018.

Usability of the Module:

The role of building services engineers is continuously changing and moving towards achieving low-carbon buildings. In this course, students will demonstrate the importance of sustainable design of building services on impacting energy efficiency. Student could apply knowledge gained from this course onto other courses studied in the mechanical and maintenance engineering programs including: applied thermal systems and HVAC. Other programs could benefit from this course such as energy engineering programs.

Prerequisites and Co-requisites:

- MECH0222: Fluid Mechanics (prerequisite)
- ME0212: Electrical Circuits and Machines (prerequisite)
- ENE321: Heat Transfers (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Applied Thermal Systems	MECH0545

Compulsory Module		**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module	X	**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
25% Mid-Term exam
10% Quizzes
25% Team project
40% Final exam

Responsible Lecturer(s)

TBD

Course	Mode of Delivery	Contact Time	Self-Study
Applied Thermal Systems	Blended learning	45	105

Bachelor

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and writing team project: 40 hours (per student);
- Preparation of midterm exam: 10 hours;
- Day-to-day studying, exercises and self-reading at home (includes preparation for quizzes): 40 hours;
- Preparation of final exam and final exam: 15 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Relate the students' (gained from previous courses) knowledge of thermodynamics, heat transfer and fluid mechanics in the design of integrated thermal systems.
- Explain the operating principles of several key thermal systems or components such as pumps, chillers, heat pumps, boilers and furnaces, cooling towers, compressors, and heat exchangers.
- Apply thermodynamics laws, heat transfer and fluid mechanics equations to model these thermal systems and components.
- Survey and Compare various existing models of these thermal systems and components.
- Analyse the most important affecting factors in a successful economic operation of these systems and components.
- Choose optimum components and integrate them to design an integrated thermal systems with desired output.

Course Contents:
This course provides tools to design energy efficient, cost effective and reliable equipment/systems at optimum conditions. Systems analysis applied to pumps, chillers, heat pumps, compressors, evaporators, condensers, expansion devices, cooling towers, boilers and furnaces, design and integration of thermal

systems, modelling and simulation and of thermal system, economic analysis, and optimization of thermal systems designs.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Real case simulations and experiments;
- Writing team project in group work.

Recommended or Required Reading:

Selected topics from the following Textbooks:

- Y. Jaluria, Design and Optimization of Thermal Systems: with MATLAB Applications, 3rd Edition, CRC Press, 2019.
- S.G. Penoncello, Thermal Energy Systems: Design and Analysis, 2nd edition, CRC Press, 2018.
- W.S. Janna, Design of Fluid Thermal Systems, 4th Edition, Cengage Learning, 2014.

Usability of the Module:

This module is mandatory for all students who select Applied Track in the final year in Mechanical and Maintenance Engineering Program. It is an advanced module in Design, Analysis, Simulation and Optimization of Thermal Systems.

Prerequisites and Co-requisites:

- MECH0341: Power and Refrigeration Cycles
- ENE321: Heat Transfer

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Reliability and Quality Control	MECH0551

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
35% Midterm exam
15% Course project (report and presentation)
10% Quizzes and homework
40% Final exam

Responsible Lecturer(s)

Dr. Sameer Al-Dahidi

Course	Mode of Delivery	Contact Time	Self-Study
Reliability and Quality Control	Face-to-face	45	105

Duration of Study:
The duration of this course is one semester.

Allocation of Wprload Hours:

- Presence time in lectures and exercises: 15 weeks * 3 hours = 45 hours;
- Preparation of quizzes and homework: 10 hours;
- Preparation of report and presentation: 30 hours;
- Preparation of mid-term and final exams and exams: 65 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Outline the importance of the reliability of industrial components and systems across multiple industries.
- Define the concepts of reliability and common reliability functions, parameters, and methods of their modelling and prediction.
- Demonstrate an understanding of the relationship between the time to failure distribution, the probability density function, the reliability/unreliability function, and the hazard rate and explain the Bathtub curve.
- Define, explain, analyze, and estimate reliability and its performance parameters for industrial components and various systems design configurations using reliability block diagrams and identify improvement opportunities.
- Inspect different failures across multiple-industries and their impacts on the overall system reliability.
- Identify the importance of statistical distributions for modelling failure data and the physical meanings of model parameters.
- Illustrate the ways for failure prevention and understand the Design For Reliability Process in enhancing the reliability of components & systems.
- Explain traditional and modern definitions of quality and discuss the importance of reliability on the component's quality.

Course Contents:

Reliability is one of the most important quality characteristics of systems, structures, and components. The scope of this course is to provide the students with the fundamental concepts and the necessary knowledge and skills related to reliability engineering of industrial systems, structures, and components. Specifically, this course contains FIVE main parts: Part I introduces an overview of the course and illustrates its context; Part II defines the reliability and its importance, explains the factors associated with the reliability, discusses the life model distributions and how to estimate the reliability of an industrial component, describes the typical behavior of failure rate of a component (bathtub curve), introduces some reliability models and reliability measures and statistics; Part III evolves from that of Part II and presents the estimation of the reliability of a system composed by several components connected in different design configurations (series, parallel, mixed series and parallel, complex, stand-by); Part IV discusses the parametric and non-parametric reliability models, the life tests and accelerated life tests carried out to collect the failure occurrences data of an industrial component. It also covers the techniques used to estimate the component's failure rates. All of these aspects will be, then, confined within Part V that is dedicated to failure prevention through the Design For Reliability [DFR] to improve the overall system reliability, as well as to introduce maintenance intervention approaches and quality definition and its control methods. The course will be supported with examples taken from real-industrial applications, e.g., oil and gas, nuclear, automotive, etc. Besides, hands-on exercise sessions for some topics will be performed to allow the students to develop their skills.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises from real-industrial applications in class and at home;
- Writing and presenting reports alone or in group work as part of a class project.

Recommended or Required Reading:

- Elsayed A. Elsayed, Reliability Engineering, Wiley, 3rd Edition, 2021, ISBN 978-1119665892.
- B. S. Dhillon, Reliability, Maintainability, and Safety for Engineers, CRC Press, 1st Edition, 2020, ISBN 978-0367352653.
- P. O'Connor and A. Kleyner, Practical Reliability Engineerin, Wiley, 5th Edition, 2012, ISBN 978-0470979815.
- E. Zio, An Introduction to the Basics of Reliability and Risk Analysis, Volume 13 of Series on Quality, Reliability and Engineering Statistics, World Scientific, 2007, ISBN 978-9812706393.

Usability of the Module:

This course falls within the maintenance engineering track of the 5th year students enrolled in the Mechanical and Maintenance Engineering Department at German Jordanian University. The course is suitable for students in other engineering disciplines. In the same track, the course of Management of Maintenance Systems covers the fundamental concepts and necessary knowledge and skills related to RAMS, maintenance intervention approaches and decision-making strategies, risk assessment techniques, as well as maintenance costing, scheduling, and logistics support (spare parts management) of industrial structures, systems, and components.

Prerequisites and Co-requisites:

IE0121: Probability and Statistics (prerequisite)

Language of Instruction:

English with occasional Arabic explanations (or if German professors available English with German)

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Management of Maintenance Systems	MECH0552

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**		**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Mid-term exam
20% Course project (report and presentation)
10% Quizzes and homework
40% fFnal exam

Responsible Lecturer(s)

Dr. Sameer Al-Dahidi

Course	Mode of Delivery	Contact Time	Self-Study
Management of Maintenance Systems	Blended learning	45	105

Duration of Study:
The duration of this course is one semester.

Allocation of Workload Hours:

- Presence time in lectures and exercises: 15 weeks * 3 hours = 45 hours
- Preparation of quizzes and homework: 10 hours
- Preparation of report and presentation: 35 hours
- Preparation of mid-term and final exams and exams: 60 hours

Learning Outcomes:
By the end of this module, the student will be able to:

- Outline the importance of the maintenance function within industries.
- Define and evaluate the reliability, availability, maintainability, and safety performance parameters of industrial structures, systems, and components.
- Name, compare, apply, assess, and plan various maintenance intervention approaches (corrective, scheduled, condition-based, and predictive) and maintenance decision-making strategies (reliability-centered maintenance, risk-based maintenance, and computerized maintenance management systems).
- Explain, develop, analyze, and evaluate various risk assessment techniques (fault and event tree analysis, failure modes, effects, and criticality analysis, as well as hazard operability analysis).
- Illustrate and categorize the costs associated with maintenance interventions.
- Explain the significance of maintenance spare parts management on the overall plant availability and the maintenance investment costs.
- Define a systematic approach to the effective management of maintenance spare parts (identification, classification, forecasting, inventory analysis, and the spare parts inventory control systems).

Course Contents:

The scope of this course is to provide the students with the fundamental concepts and the necessary knowledge and skills related to the: i) Reliability, Availability, Maintainability, and Safety [RAMS] of industrial structures, systems, and components, ii) maintenance intervention approaches (i.e., corrective, scheduled, condition-based and predictive), iii) maintenance decision-making strategies (i.e., Reliability-Centered Maintenance [RCM], Risk-Based Maintenance [RBM], and Computerized Maintenance Management Systems [CMMS]) commonly used in the industry, and iv) techniques for risk assessment (i.e., Fault and Event Tree Analysis [F&ETA], Failure Modes, Effects and Criticality Analysis [FMECA], HAZard and Operability [HAZOP] study) and the ways of establishing and running them effectively. The course will also cover the cost estimation and scheduling of maintenance activities and the key performance parameters defined for monitoring the maintenance activities. Lastly, the logistics of maintenance spare parts will also be addressed, i.e., identification, classification, forecasting, inventory analysis, and the spare parts inventory control systems. All of these aspects will be, then, confined within the Maintenance Engineering and Management notion. The course will be supported with examples taken from real-industrial applications, e.g., oil and gas, nuclear, automotive, etc. Besides, hands-on exercise sessions for some topics will be performed to allow the students to develop their skills.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises from real-industrial applications in class and at home;
- Writing and presenting reports alone or in group work as part of a class project.

Recommended or Required Reading:

- D. A. Collier and J. R. Evans, Operations and Supply Chain Management, Cengage Learning, 2nd Edition, 2020, ISBN 978-0357131695.
- Elsayed A. Elsayed, Reliability Engineering, Wiley, 3rd Edition, 2021, ISBN 978-1119665892.
- J. M. T. Farinha, Asset Maintenance Engineering Methodologies, CRC Press, 1st Edition, 2020, ISBN 978-0367571764.
- J. R. Mahato, Handbook for Mechanical Maintenance Engineers, I K International Publishing House Pvt. Ltd, 1st Edition, 2019, ISBN 978-9385909580.
- M. Basson, RCM3: Risk-Based Reliability Centered Maintenance, Industrial Press, Inc., 3rd Edition, 2019, ISBN 978-0831136321.
- P. Gopalakrishnan and A. K. Banerji, Maintenance and Spare Parts Management, PHI Learning Private Limited, 2nd Edition, 2013, ISBN 978-8120347397.
- E. Zio, An Introduction to the Basics of Reliability and Risk Analysis, Volume 13 of Series on Quality, Reliability and Engineering Statistics, World Scientific, 2007, ISBN 978-9812706393.

Usability of the Module:
This course falls within the maintenance engineering track of the 5th year students enrolled in the Mechanical and Maintenance Engineering Department at German Jordanian University. The course is suitable for students in other engineering disciplines. In the same track, the course of Reliability and Quality Control covers the fundamental concepts and necessary knowledge and skills related to reliability engineering of industrial structures, systems, and components. Reliability is one of the aspects that should be taken into account in selecting and executing the maintenance decision-making strategies.

Prerequisites and Co-requisites:
IE0361: Engineering Economics (prerequisite)

Language of Instruction:

English with occasional Arabic explanations (or if German professors available, English with German)

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Graduation Project I	MECH0591

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	1
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
60% In-term progress presentations
40% Proposal Report

Responsible Lecturer(s)

All Mechanical Engineering Department faculty members

Course	Mode of Delivery	Contact Time	Self-Study
Graduation Project I	Blended learning	15	45

Duration of Study:
One Semester.

Allocation of Workload Hours:

- Presence time in meetings: 15 hours;
- Literature review and problem statement definition: 25 hours;
- Preparation and writing project report: 20 hours;

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand an existing system and assess it for potential problems and improvements.
- Define the various mechanical engineering topics that can be used in real life projects.
- Demonstrate the various methods of collecting scientific, engineering and market data on a particular problem.
- Identify a process for research, literature review and documenting project findings.
- Formally construct a problem statement to be solved as a graduation project

Module Contents:
This is a no-lecture project course that will allow students to apply knowledge gained throughout their course of undergraduate study on a real-life problem or opportunity. It is typically a teamwork project with up to three students. Instructor with students select a project topic and get the project completed through guiding them in searching relevant literature, collecting and analysing data, preparing and presenting results, and writing reports.

Planned Learning Activities and Teaching Methods:

- Meetings to present the students with detailed instructions and requirements;
- Student-engaged discussions and presentations of progress;
- Assignments;
- Teamwork;
- Continuous evaluation and feedback on progress;
- Writing and presenting project reports.

Recommended or Required Reading:

- SATS guidelines for the preparation of graduation reports. http://www.gju.edu.jo/content/regulations-and-forms-6068.
- Turabian, K.L., 2013. A manual for writers of research papers, theses, and dissertations: Chicago style for students and researchers. University of Chicago Press.
- Morgan, K., Spajic, S., 2015. Technical Writing Process, 1st Edition. Better on Paper Publications.

Usability of the Module:
This module acts as a preparation step for the bachelor thesis module, Graduation Project II (ME0592), where the preliminary work for the project occurs prior to truly embarking on the project itself.

Prerequisites and Co-requisites:
MECH0491: International Internship (Prerequisites) and a minimum of 132 CH

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Graduation Project II	MECH0592

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
40% In-term presentations and report updates
60% Thesis report and defence

Responsible Lecturer(s)

All Mechanical Engineering Department faculty members

Course	Mode of Delivery	Contact Time	Self-Study
Graduation Project II	Blended learning	30	150

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in meetings with advisor: 30 hours;
- Preparation for weekly meetings: 15 hours;
- Presence time in labs/plants collecting data: 45 hours;
- Data analysis and comparing results to existing literature: 45 hours;;
- Completion of graduation project report: 30 hours
- Preparation of project defence: 15 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Define the various mechanical engineering topics that can be used in real life projects.
- Construct needed plans and time schedule for a long-term project to resolve a real-life problem.
- Contrast and analyse collected data in order to select the best solutions and tools during project analysis phase.
- Assess the different tools and approaches that can be used by the targeted organization to improve performance.
- Design final solutions based on project finings.

Module Contents:
This is a no-lecture project course that will allow students to apply knowledge gained throughout their course of undergraduate study on a real-life problem or opportunity. It is typically a teamwork project with up to three students. Instructor and students select a project topic and get the project completed through guiding them in searching relevant literature, collecting and analysing data, preparing and presenting results, and writing reports.

Planned Learning Activities and Teaching Methods:

- Meetings to present the students with detailed instructions and requirements;
- Student-engaged discussions and presentations of progress;

- Assignments;
- Teamwork;
- Continuous evaluation and feedback on progress;
- Writing and presenting project reports.

Recommended or Required Reading:

- SATS guidelines for the preparation of graduation reports. http://www.gju.edu.jo/content/regulations-and-forms-6068.
- Turabian, K.L., 2013. A manual for writers of research papers, theses, and dissertations: Chicago style for students and researchers. University of Chicago Press.
- Morgan, K., Spajic, S., 2015. Technical Writing Process, 1st Edition. Better on Paper Publications.

Usability of the Module:
The module prepares the student to embark on real new projects whether in the workforce or in graduate school.

Prerequisites and Co-requisites:
MECH0591: Graduation Project I (prerequisites)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Numerical Methods for Engineers and Lab	BM371

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	4
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Mid-term exam
30% Application of numerical methods using relevant software packages
40% Portfolio assessment

Responsible Lecturer(s)

Dr. Eyad Hamad

Course	Mode of Delivery	Contact Time	Self-Study
Numerical Methods for Engineers	Blended learning	30	50
Numerical Methods for Engineers lab	Blended learning	30	40

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 30 hours;
- Presence time in Lab: 30 hours;
- Guided, task driven and monitored (weekly) self-study for module (part of portfolio): 25 hours;
- Prelab preparation (mandatory part of portfolio):40 hours;
- Preparation of Portfolio: 23 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Write algorithms such as MATLAB programs for Numerical Methods and Engineering problems.
- Construct interpolation polynomials and find the inverse polynomial.
- Compute numerical differentiation and integration for a given function and solve the numerical solutions of ordinary and partial differential equations.
- Approximate errors for power series and roots of equations by applying bracketing/open methods.
- Solve the system of linear equations using conventional and special properties matrix operations.
- Construct the simplex method to solve linear programming problems.

Module Contents:
This module on Numerical Methods for Engineers introduces the theory and application of numerical methods to approximate mathematical processes (such as reconstruction of a function, evaluation of an integral) or solutions of problems that arise in science and engineering. Such approximations are needed since the analytical methods are either unachievable or the problem under consideration cannot be solved exactly or analytically. Justifications for why and how these approximation techniques are provided with emphasis on accuracy and efficiency of the developed methods.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Methods application using relevant software.

Recommended or Required Reading:

- Steven Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th edition. 2018.
- Steven C. Chapra, and Raymond P. Canale, Numerical Methods for Engineers, 8th edition. 2021.
- Michael R. King, Nipa A. Mody, Numerical and Statistical Methods for Bioengineering, 1st edition, 2010.

Usability of the Module:

The course offers a firm basis for further study on Numerical Analysis for science and engineering students. This module is compulsory for biomedical engineering and is a prerequisite for BM471 Biomedical Modeling and Simulation and BM472 Computer-Aided Design& Prototyping. It is part of the following programs: Pharmaceutical & Chemical Engineering, Mechatronics and Artificial Intelligence Engineering, Industrial Engineering, Mechanical and Maintenance Engineering, Computer Engineering, as well as Electrical and Communication Engineering.

Prerequisites and Co-requisites:

- MATH203: Applied Mathematics for Engineers (prerequisites)
- MATH205: Differential Equations (prerequisites)
- CS116: Computing Fundamentals (prerequisites)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Course Title	Course Code
Statics	CEE201

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

25% Homework, classwork, and quizzes
35% Midterm exam
40% Final exam

Responsible Lecturer(s)

Dr. Dima A. Malkawi (coordinator)
Dr. Emhaidy Gharaibeh
Dr. Raed Al-Saleh

Course	Mode of Delivery	Contact Time	Self-Study
Statics	Face-to face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and Homework: 35 hours;
- Exercises and self-reading at home: 35 hours;
- Preparation of midterm exam and final exam: 35 hours;

Learning Outcomes:
By the end of this module, the student will be able to:

- Develop an understanding of the principles employed in the solution of problems.
- Add forces, resolve them into components, and determine resultants.
- Draw free body diagrams and use equations of equilibrium in the solution of reactions on particles and rigid bodies.
- Calculate the moment of a force, and determine the resultants of two dimensional force systems.
- Analyse structures and solve for internal forces in trusses, frames, machines, and beams.
- Solve for centroids and moment of inertia for areas.
- Draw shear force and bending moment diagrams for beams.

Course Contents:

- Introduction, vectors, vector operations, resultants, position vectors, 3D force vectors, and dot product;
- Equilibrium in 2D & 3D force systems and free vody diagrams;
- 2D moment of a force, right hand rule, 2D & 3D cross product, 3D moment of a force, moment of force about an axis, moment of a couple, simplification of a force & couple system, and further simplification of a force & couple system;
- Equilibrium & free body diagrams, reduction of a simple distributed loading, and 2-force members;
- Simple trusses, method of joints, zero force truss members, and method of sections;
- Frames and machines;

- Internal Forces, shear force and bending moment diagrams;
- Centre of mass for composite areas;
- Moment of inertia, parallel axis theorem, and moment of inertia for composite areas.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home.

Recommended or Required Reading:

- R.C. Hibbeler, Engineering Mechanics: Statics, Pearson, 14th edition, 2015.
- F. P. Beer, E. R. Johnston Jr, and D. Mazurek, Vector Mechanics for Engineers Statics, McGraw-Hill Education, 11th edition, 2015.
- J. L. Meriam, L. G. Kraige, and J. N. Bolton, Engineering Mechanics: Statics, Wiley, 8th Edition, 2014.

Usability of the Module:

This is a compulsory module for Bachelor's degree programs of Mechanical and Maintenance Engineering, Mechatronics Engineering, Energy Engineering, and Civil Engineering. It is a prerequisite for Mechanics of Materials (MECH0213) and Dynamics (MECH0215).

Prerequisites and Co-requisites:

- MATH101: Calculus I (prerequisite)
- PHYS103: General Physics I (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Heat Transfer	ENE321

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Midterm Exam
30% Home Works
40% Final Exam

Responsible Lecturer(s)

Ammar Alkhalidi

Course	Mode of Delivery	Contact Time	Self-Study
Heat Transfer	Face-to face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation for Home Works: 40 hours;
- Preparation of Midterm exam: 15 hours;
- Exercises and self-reading at home: 30 hours;
- Preparation of final exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Identify and explain the basic mechanisms and modes of heat transfer.
- Solve steady-state and transient one-dimensional heat conduction problems.
- Classify and solve forced and free convection heat transfer problems.
- Analyze and design double pipe, shell and tube, and cross-flow heat exchangers.

Module Contents:

- Basic concepts and mechanisms of heat transfer;
- Heat conduction equation in various coordinate systems;
- Steady heat conduction;
- Transient heat conduction (Lumped system analysis);
- Fundamentals of convection. External and internal forced convection;
- Natural convection;
- Heat Exchangers.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home.

Recommended or Required Reading:

- T. L. Bergman, A. S. Lavine, F. P. Incropera, and D. P. DeWitt, Fundamentals of Heat and Mass Transfer, Wiley, 8th edition, 2018. (Required).
- Y. Çengel and A. Ghajar, Heat and Mass Transfer, McGraw-Hill, 6th edition, 2019.
- J. P. Holman, Heat Transfer, McGraw –Hill, 10th edition, 2009.

Usability of the Module:

This is a compulsory module for Bachelor's degree programs of Mechanical and Maintenance Engineering and Energy Engineering. It is a prerequisite for Energy Conversion (ENE431), Power Plants Engineering (ENE432), Heating Ventilating and Air Conditioning (MECH0541), Thermal and Hydrodynamic equipment (ENE544), and Applied Refrigeration (ENE462).

Prerequisites and Co-requisites:

- MECH0221: Thermodynamics (prerequisite)
- MECH0222: Fluid Mechanics (prerequisite)

Language of Instruction:

English (or if German professors are available: English with German)

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Computing Fundamentals and Lab	CS116

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	5.8
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-University		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Midterm Exam
6% Lab assignments
3% Lab Quizzes
9% Lab midterm exam
12% Lab final exam
40% Final Exam

Responsible Lecturer(s)

Dr. Abdullah Alfarrarjeh

Course	Mode of Delivery	Contact Time	Self-Study
Computing Fundamentals	Face-to-face	45	60
Computing Fundamentals Lab	Blended learning	42	33

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Presence time in labs: 42 hours;
- Guided, task driven and monitored (weekly) self-study for module (part of portfolio): 30 hours;
- Writing programs for the weekly lab assignments (mandatory part of portfolio): 21 hours;
- Preparation of lab (mandatory part of portfolio): 10 hours;
- Lab assessment: 2 hours;
- Preparation of Portfolio: 28 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand what computer languages are and describe what a compiler is.
- Understand a problem and apply methodical problem-solving techniques to develop a C program for that problem.
- Learn the meaning and syntax of C language data types, control statements, and expressions.
- Describe, explain, and declare scalar types (standard and user-defined), pointers, and single and multidimensional arrays.
- Describe, explain, and declare structured data types (struct).
- Understand and utilize C program operators in constructing expressions and statements.
- Understand Boolean expressions.
- Understand and utilize header files and the standard C library.
- Know how to provide simple input and output to C programs.

- Understand the flow of control and C statements such as conditional and unconditional branching, and repetition statements.
- Describe and explain functions, function declarations, and recursion.
- Analyse, develop, and modify C programs.
- Edit, compile, and run C programs on Unix (Solaris) systems using GCC.
- Explain the principles of designing structured programs.
- Describe what is meant by a well-designed program.
- Analyse C programs to discover bugs (debugging errors in coding or specification).
- Write problem specifications.
- Learn how to document programs using comments and how to follow coding style conventions.
- Write programs using the fundamentals of the C language including input/output variables, selection statements (if and switch), loop statements (while, do-while, and for), functions, arrays, strings, pointers, and structures.
- Read a description of a computation task and convert it into a C program.
- Fix expected bugs and errors in written programs.

Module Contents:

Computing Fundamentals

This course introduces computer programming to students with little or no computer programming expertise. The course provides an overview of computer programming concepts using the C language. It gives the student the ability to write computer programs and provide adequate documentation for these programs using standard styles and structures. The course covers the fundamentals of the C programming language including variables, data types, constants, selection statements (if and switch), loop statements (while, do-while, for), arrays, strings, functions, pointers, and structures.

Computing Fundamentals Lab

This lab aims to enhance hands-on experience on topics that are theoretically covered in the CS116 computing fundamentals course, including: variables, data types, constants, selection statements (if and switch), loop statements (while, do-while, for), arrays, strings, functions, pointers, and structures.

Planned Learning Activities and Teaching Methods:

- Lectures;
- In-class exercise;
- Tutorials;
- Practical learning.

Recommended or Required Reading:

- Stephen G. Kochan, Programming in C: A complete introduction to the C programming language, Sams Publishing, 3rd edition, 2005.
- Paul Deitel, and Harvey Deitel, C How To Program, Pearson, 8th edition, 2015.
- R.N. Reddy, and C.A. Ziegler, Programming for Scientists and Engineers, Jones & Bartlett Learning, 1st edition, 2009.

Usability of the Module:

This is a compulsory module for the following Bachelor's Programs: Computer Science, Computer Engineering, Electrical and Communication Engineering, Biomedical Engineering, Pharmaceutical and Chemical Engineering, Mechanical and Maintenance Engineering, Industrial Engineering, Mechatronics and Artificial Intelligence Engineering, Civil and Environmental Engineering, and Energy Engineering. It is a prerequisite for the following modules: Computer Aided MATH for Mechatronics (ME0224), Computer Aided Engineering Drawing (ME0111), Numerical Methods for Engineers (BM371), Numerical Analysis for Engineers (IE333), Computer Aided MATH for IE (IE0222), Operations Research (IE0231), and Digital systems (CE212).

Prerequisites and Co-requisites:

None

Language of Instruction:

English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Engineering Workshop	IE0141

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	2.6
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
20% Reports and Exercises
40% Practical Sessions
40% Final Exam

Responsible Lecturer(s)

Eng. Abdallah Albashir

Course	Mode of Delivery	Contact Time	Self-Study
Engineering Workshop	Blended learning	39	21

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time lectures and training sessions: 13 weeks*3 hours = 39 hours;
- Prelab preparation: 12 hours;
- Preparation for lab exam: 9 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand and follow workshop safety guidelines.
- Describe machines used in the manufacturing and production processes.
- Understand the basic function of a workshop.
- Apply simple concepts and perform basic tasks in each of the following areas: engineering measurement, welding, machining, sheet metal forming, electrical and plumbing maintenance.

Module Contents

- General safety in the workshop;
- Engineering materials and their classifications;
- Measuring devices and their accuracy;
- Theoretical background and practical exercises covering the following topics: carpentry, welding, mechanical fasteners, drilling, metal cutting, sheet-metal working, maintaining electrical and plumbing systems.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;

- Practical workshop sessions.

Recommended or Required Reading:

- Engineering Workshop Handout (School of Applied Technical Sciences, German Jordanian University)

Usability of the Module:

This module is a fundamental course for engineering students in the disciplines of Industrial Engineering, Mechanical Engineering and Mechatronics Engineering. It is a pre-requisite for the module of IE0344 Manufacturing Processes.

Prerequisites and Co-requisites:

None

Language of Instruction:

English; whenever required some explanation may be given in the Arabic language

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Materials and Manufacturing Engineering	IE0348

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

30% midterm exam
10% quizzes
5% assignments and exercises
15% project and presentation
40% final exam

Responsible Lecturer(s)

Dr. Iyas Khader

Course	Mode of Delivery	Contact Time	Self-Study
Materials and Manufacturing Engineering	Blended learning	45	105

Duration of Study:
1 semester

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks ξ 3 hours: 45 hours;
- Exercises and self-reading at home: 45 hours;
- Preparation of project and presentation: 32 hours;
- Preparation for quizzes: 4 hours;
- Preparation for midterm exams: 8 hours;
- Preparation for final exams: 16 hours;

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the link between processing, structure, properties, and performance of engineering materials.
- Describe the structure of engineering materials at atomic, subatomic, micro, and macro levels using classical and modern theories.
- Evaluate the impact of deformation and defects on the structure and properties of solid-state engineering properties.
- Describe the basic properties and mechanical behaviour of materials and their impact on different manufacturing processes.
- Select the appropriate manufacturing process based on the efficiency, advantages, and disadvantages of the process.
- Understand and describe various bulk deformation operations such as forging, rolling, extrusion, and drawing.
- Understand basic metal forming terminology such as sheet metal forming and machining.
- Estimate the force, energy, and defects associated with various metal forming processes.

Module Contents:

- Classification and study of engineering materials, their structure, properties, and behaviour;
- Mechanical properties of engineering materials: inhomogeneous deformation, yield criteria, triaxial stresses, and work hardening;
- Typical metalforming processes utilized in the industry such as forging, rolling, casting, extrusion and drawing with their impact on environmental and economy considerations;
- Examples on modern manufacturing techniques.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In class exercises and discussions;
- Real life scenario discussions and interactive sessions;
- Writing a project report and in-class presentation.

Recommended or Required Reading:

- Callister W.D., Rethwisch D.G., Materials Science and Engineering. 10th Edition. Wiley, Inc., 2020.
- Kalpakjian S., Schmid S., Manufacturing Engineering and Technology, 8th Edition, Pearson, 2020.
- Groover M.P., Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2019.

Usability of the Module:

This is a compulsory module in the Bachelor's program of Mechanical and Maintenance Engineering. It is offered to this program only. The course is not a prerequisite to any other module in the study plan.

Prerequisites and Co-r:

- IE0141: Engineering Workshop (perquisite)
- CHEM103: General Chemistry (perquisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Electrical Circuits and Machines	ME0212

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5

Examination

Portfolio:
30% Midterm exam
20% Assignments
10% Quizzes
40% Portfolio assessment

Responsible Lecturer(s)

Dr. Hani Muhsen

Course	Mode of Delivery	Contact Time	Self-Study
Electrical Circuits and Machines	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:
- Presence time in lectures: 45 hours;
- Guided, task driven and monitored (weekly) self-study for module (part of portfolio): 80 hours;
- Preparation of Portfolio: 23 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:
- Analyse circuit using direct application of Kirchoff's current and voltage laws along with Ohm's law.
- Interpret analytical circuit results to power, current, and voltage in view of passive sign convention.
- Explain the characteristics of capacitor, inductor, and operational amplifier.
- Compute Phasors and Sinusoidal steady-state response.
- Understand and analyse the basics of electronics (semiconductor diodes and Op-Amps, Transistors, bipolar junction transistors, Thyristors).
- Understand the principle of operation of Direct Current and Alternating Current machines.

Module Contents
- Definitions, circuit laws, simple circuit, circuit analysis techniques;
- Phasor concept, Sinusoidal steady-state response;
- Average power and root mean square values, complex power and power factor;
- Poly-phase circuits, tsransformers (single phase);
- Basics in electronics (semiconductor diodes and Op-Amps, transistors, bipolar junction transistor, thyristors);
- DC machines (separately and shunt), three-phase induction motors, special purpose motors.

Planned Learning Activities and Teaching Methods:
- Lectures.

- In class exercises.
- Tutorials.
- Simulation.

Recommended or Required Reading:

- Svoboda, James A., and Richard C. Dorf, Introduction to electric circuits. John Wiley & Sons, 9th edition, 2013.
- Charles, K. Alexander, and N. O. Matthew, Fundamentals of electric circuits. McGraw-Hill Education, 6th edition, 2017.
- Chapman, Stephen J., Electric machinery fundamentals, 5th edition, 2012.
- Franchi, and Claiton Moro, Electrical Machine Drives: Fundamental Basics and Practice, CRC Press, 1st edition, 2019.

Usability of the Module:

This is a compulsory module in Industrial Engineering, and Mechanical and Maintenance Engineering programs. It is a prerequisite for Instrumentation and Measurements and lab module (ME0346), Automation and Industry 4.0 and lab module (ME0577), Building Services module (MECH0544).

Prerequisites and Co-requisites:

PHYS104: Physics II (-prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Control Systems I	ME0344

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5

Examination

Portfolio:
30% Midterm exam
20% Quizzes
10% Project
40% Portfolio assessment

Responsible Lecturer(s)

Dr. Hisham ElMoaqet

Course	Mode of Delivery	Contact Time	Self-Study
Control Systems I	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Guided, task driven and monitored self-study for module (part of portfolio): 54 hours;
- Preparation of class project (mandatory part of portfolio): 25 hours;
- Project assessment/presentation: 1 hour;
- Preparation of Portfolio: 23 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Use modelling techniques to describe mechanical and electrical systems.
- Analyse systems and identify their performance limitations.
- Determine the best control technique to be applied to a specific application.
- Design basic controllers in the frequency and time domains.
- Use MATLAB and Simulink for control design and system modelling.

Module Contents:
This course introduces control systems: history, design process, computer-aided-design. Mechanical, electrical, and electro-mechanical systems modeling in the frequency domain: Laplace, transfer function, and linearization. System modeling in the time domain: state space, transfer function conversion. The time response: poles and zeros, first and second order systems. Stability: Routh-Hurwitz Criterion. Root locus techniques, and Frequency response techniques. Control system design using root locus techniques including Proportional (P), Proportional-Derivative (PD), Proportional-Integral (PI), and Proportional-Integral-Derivative (PID) controllers.

Planned Learning Activities and Teaching Methods:

- Lectures;

- In class exercise;
- Tutorials;
- Simulation software exercises.

Recommended or Required Reading:

- N. Nise, Control Systems Engineering, Wiley, 8th edition, 2019.
- Dorf and Bishop, Modern Control Systems, Prentice Hall, 12th edition, 2011.
- Franklin, Powell and Emami-Naeini, Feedback Control Systems, Prentice Hall, 8th edition, 2018.

Usability of the Module:

This is a compulsory module in the Bachelor's Degree Program Mechatronics and Artificial Intelligence Engineering. It is a prerequisite for German Year and the following compulsory modules: Control and Vibration Lab (ME0345), Control Systems II (ME0548), Robotics (ME0551), Mechatronics Systems Design and Interfacing and lab (ME0561), Machine Intelligence I (ME0571), Automation and Industry 4.0 and lab (ME0577), Signals and Systems (CE331). It is also a is a prerequisite for the following technical elective modules: Real-time Computer Control Systems (ME0403), Digital Control Systems (ME0404), Process Control (ME0405), CNC and Manufacturing Control (ME0406), Linear Systems (ME0407), Mobile Robots (ME0408), Autonomous Systems (ME0409), Process Automation (ME0410), Industrial Robotics (ME0411), Mechatronics of Smart Materials (ME0412), and Mechatronics Projects (ME0413).

Prerequisites and Co-requisites:

MATH205: Differential Equations (prerequisite)
ENE211: Electrical Circuits I (prerequisite)
MECH0215: Dynamics (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Instrumentation and Measurement	ME0346

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	5.6
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5

Examination

Portfolio:
20% Midterm exam
20% Lab assignments
5% Lab Project
10% Report
5% Presentation
40% Portfolio assessment

Responsible Lecturer(s)

Dr. Hani Muhsen

Course	Mode of Delivery	Contact Time	Self-Study
Instrumentation and Measurement	Blended learning	45	47
Instrumentation and Measurement Lab	Blended learning	36	22

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Presence time in labs: 36 hours;
- Guided, task driven and monitored (weekly) self-study for module (part of portfolio): 12 hours;
- Writing a report (mandatory part of portfolio): 7 hours;
- Preparing a presentation (mandatory part of portfolio): 3 hours;
- Prelab preparation (mandatory part of portfolio): 13 hours;
- Preparation of lab project (mandatory part of portfolio): 8 hours;
- Lab project assessment/presentation: 1 hour;
- Preparation of Portfolio: 23 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand measurement principles and apply them within measurement systems.
- Select and specify suitable instrumentation for measurement of physical quantities.
- Analyze and interpret experimental data.
- Perform analog and digital signal processing.
- Identify various sensor technologies and their use in measurement systems.

Module Contents:

- Fundamentals of measurement systems: measurement units, measurement system applications, elements of a measurement system;
- Instrument types and performance characteristics: a review of instrument types, static characteristics, dynamic characteristics, calibration;
- Measurement uncertainty: sources and reduction of systematic error, random errors, and statistical analysis of measurements;
- Measurement noise and signal processing: sources of measurement noise, techniques for reducing measurement noise, analog signal processing, digital signal processing, introduction to data acquisition and processing using LabVIEW;
- Electrical indicating and test instruments: digital meters, analog meters, oscilloscopes;
- Display, recording, and presentation of measurement data: displays, recorders, linear least-squares regression;
- Variable conversion elements: bridge circuits, resistance measurement, inductance measurement, capacitance measurement, current measurement, frequency measurement;
- Sensor technologies: capacitive and resistive sensors, magnetic sensors, hall-effect sensors, piezoelectric transducers, strain gauges, optical sensors, ultrasonic sensors;
- Measurement sensors and instruments: temperature measurement, pressure measurement, flow measurement, level measurement, mass, force, and torque measurement, translational and rotational motion transducers.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Quizzes;
- Exercises in class and at home;
- Experiments;
- Design Projects.

Recommended or Required Reading:

- Morris, Alan S., and Reza Langari. M Measurement and Instrumentation,3rd edition, 2020.
- Bakshi, Uday A., and Late Ajay V. Bakshi, Measurements and Instrumentation. Technical Publications,1st edition, 2020.
- Ghosh, Arun K., Introduction to measurements and instrumentation. PHI Learning Pvt. Ltd., 4th edition, 2012.

Usability of the Module:

This is a compulsory module for the following programs: Industrial Engineering; Mechanical and Maintenance Engineering; and Energy Engineering. It is a prerequisite for the module Automation and Industry 4.0 in the Industrial Engineering program.

Prerequisites and Co-requisites:

- MATH205: Differential Equations (prerequisite)
- ME0212: Electrical Circuits and Machines (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	**Module Code**
Hydraulic and Pneumatics	ME0522

Compulsory Module		**Year of Study**	5	**Semester Hours**	4.3
Elective Module	X	**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
20% Written exam (Midterm)
10% Oral and written quizzes
10% Laboratory assignments
10% Lab Project
10% Design model assignment with a short report
40% Portfolio assessment

Responsible Lecturer(s)

Dr. -Ing. Sahar Qaadan

Course	**Mode of Delivery**	**Contact Time**	**Self-Study**
Hydraulic and Pneumatics	Blended learning	45	65
Hydraulic and Pneumatics laboratory	Blended learning	20	20

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Presence time in labs: 20 hours;
- Guided, task driven and monitored self-study for module (part of portfolio): 25 hours;
- Design model assignment with a short report (mandatory part of portfolio): 8 hours;
- Prelab preparation (mandatory part of portfolio):12 hours;
- Preparation of lab project (mandatory part of portfolio): 7 hours;
- Lab project assessment/presentation: 1 hour;
- Preparation of portfolio: 30 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Define fluid power system and explain the components of fluid power system.
- Distinguish the differences between pneumatics and hydraulics systems, components, source of energy and piping systems.
- Know the advantages and disadvantages of pneumatic and hydraulic systems and compute them in terms of performance and efficiency.
- Know the basic circuits of pneumatics/hydraulics and use them safely with knowledge of the physical conditions.
- Identify hydraulics for mobile applications.
- Design pneumatics and hydraulic circuits for different design systems and apply different components used in the designs.
- Develop teamwork skills, as the associated laboratory is completed in groups.

Module Contents:

Hydraulic and Pneumatics

Starting from the basics of thermodynamics and fluid mechanics, the mode of operation of pneumatic and hydraulic drive and control systems is presented. The differences in the working media of these actuators are shown and comparisons are made. The modes of operation of final control elements and actuators are explained and their application in standard circuits is practiced.

Hydraulic and Pneumatics Laboratory

- Laboratory for building simple basic circuits in pneumatics and hydraulics;
- Define the energy sources including pumps and compressors;
- Build the piping systems for pneumatic and hydraulic circuits;
- Connect the different directional control valves, flow control valves throttle valves, and other servo valves to the main circuit of pneumatic and hydraulic circuits;
- Building electrical circuits in pneumatics and hydraulics including solenoids for different mechanical components in the circuit.

Planned Learning Activities and Teaching Methods:

- Lectures with interactive discussions;
- Exercises during lectures and take home tasks;
- Real design experiments simulations using FLUIDSIM;
- Real design experiments in the laboratory on different setups with different experiments requirements;
- Writing and presenting research papers individually or in groups;
- Design a model assignment based on challenging research papers.

Recommended or Required Reading:

- A. Esposito, Fluid Power with Applications, 2nd edition, 2019.
- F. D. Norvelle, Fluid Power Technology, 1st edition, 2013.
- D. Findeisen, and S. Helduser, Einführung in die Ölhydraulik, 6th edition, 2020.

Usability of the Module:

This is a compulsory module for Bachelor's program in Mechatronics and Artificial Intelligence Engineering. It is also an elective module for Mechanical and Maintenance Engineering program.

Prerequisites and Co-requisites:

Department Approval

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Control Systems II	ME0548

Compulsory Module		**Year of Study**	5	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**		**ECTS**	5
Pre-University		**Pre-program**		**Remedial**	

Examination

Portfolio:
30% Midterm exam
30% Project
40% Portfolio assessment

Responsible Lecturer(s)

Dr. Mutaz Ryalat

Course	Mode of Delivery	Contact Time	Self-Study
Control Systems II	Face-to-face; blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Guided, task driven and monitored self-study for module (part of portfolio): 30 hours:
- Preparation and working on the project (mandatory part of portfolio): 40 hours;
- Preparation of presentation for the project (mandatory part of portfolio): 15 hours;
- Preparation of Portfolio: 18 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the students will be able to:

- Design models of physical systems using linear, time-invariant (LTI) ordinary differential equations.
- Compute the time response from the state-space representation by solving linear ordinary differential equations using matrix exponentials.
- Understand the concept of an equilibrium and equilibria, and to be able to build a linear approximate model of a nonlinear dynamical system.
- Use their knowledge on matrix algebra to the analysis and control of LTI systems.
- Design a state feedback controller for general higher order system.
- Understand controllability and observability properties of dynamical systems.
- Design a state observer using various ways of calculations.
- Use optimal control theory to design optimal controllers and estimators for LTI systems.
- Apply control and estimation techniques in a wide variety of engineering systems.

Module Contents:

- State-space modeling of multi-variable systems;
- Stability, sensitivity, controllability, and observability of the dynamical systems;
- Design of pole-placement controller, optimal observers, Kalman filter, linear quadratic regulators;

- Digital control systems, z-transform, stability, transient response, digital cascade compensators.

Planned Learning Activities and Teaching Methods:

- Lectures;
- In class exercises;
- Tutorials;
- Real cases simulation for a variety of engineering systems;
- Design projects.

Recommended or Required Reading:

- N. Nise, Control Systems Engineering, Wiley, 8th edition, 2019.
- G. Franklin, J. Powell, and A. Emami, Feedback Control of Dynamic Systems, Pearson, 8th edition, 2018.
- K. Ogata, Modern Control Engineering, Pearson, 5th edition, 2009.

Usability of the Module:

This is a compulsory module for Mechatronics and Artificial Intelligence Engineering program. It is also an elective module for Mechanical and Maintenance Engineering program.

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Prerequisites and Co-requisites:

Department Approval

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Robotics	ME0551

Compulsory Module	X	**Year of Study**	5	**Semester Hours**	3
Elective Module		**Spring Semester**		**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5

Examination

30% Written exam—Midterm
10% Oral and written quizzes
15% Presentations based on research papers
5% Simulation project or implemented laboratory
40% Portfolio assessment

Responsible Lecturer(s)

Dr. -Ing. Sahar Qaadan, Dr.Mutaz Ryalat

Course	Mode of Delivery	Contact Time	Self-Study
Robotics	Blended learning	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 45 hours;
- Guided, task driven and monitored self-study for module (part of portfolio): 50 hours;
- Preparing a presentation and papers discussion (mandatory part of portfolio): 15 hours;
- Preparation of simulation project (mandatory part of portfolio): 20 hours;
- Preparation of portfolio: 18 hours;
- Portfolio assessment: 2 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Practice application-oriented exercises with mathematical background self-dependent, timely and in team work.
- Understand the kinematic features of serial and simple parallel robots (includes knowledge transformations, fixed representation, Euler-Angles, etc.).
- Design program models of simple robotic applications.
- Comprehend the complexity and necessity for different path and dynamic planning techniques.
- Describe simple methods for system and sensor calibration.
- Design a robotic system model animation in forward kinematics, inverse kinematics, path planning and trajectory generation.
- Understand position and force control.

Module Contents:
Description of serial robotic systems: This part includes the basic components like different types of joints, sensors and actors. Exemplarily, the differing kinematic types are introduced. Denavit Hartenberg representation. Also, the mathematical backgrounds are presented, necessary for the description of robots. The direct and inverse kinematics for typical 6-jointed industrial robots is explained.

Parallel robot systems: This part deals with the transfer of the results and mathematical models of robotic systems with parallel kinematics. Movement: Robot movements along trajectories/geometric paths are analyzed. Different techniques of path planning are presented as well as methods to determine the configuration space and to perform velocity planning and kinematics. Robot Control: Techniques of control theory and examples of programming techniques in robotics are introduced. Sensor and systems calibration as a typical application of robotics is explained in detail.

Planned Learning Activities and Teaching Methods:

- Lectures with interactive discussions.
- Exercises during lectures and take-home tasks.
- Design simulations using MATLAB or open resource software such as Webot.
- Real experiments in the laboratory (if integrated in the course) on a KUKA robot with different experiments requirements.
- Writing and presenting research papers individually or in groups and present them in an open discussion seminar.

Recommended or Required Reading:

- J. J. Craig, Introduction to Robotics, 2nd edition, 2018.
- R. R. Murphy, Introduction to AI Robotics (Intelligent Robotics and Autonomous Agents series), 2nd edition, 2019.
- J. L. Jones, D. Roth, Robot Programming - A Practical Guide to Behavior-Based Robotics, 2nd edition, 2004.

Usability of the Module:
This module is compulsory for Mechatronics and Artificial Intelligence Engineering program.

Prerequisites and Co-requisites:
ME0344: Control Systems I (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Arabic 99	ARB099

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	0
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	0
Pre-university	X	**Pre-program**		**Remedial**	X

Examination

40% Mid-term exam
20% Participation and homework
40% Final exam

Responsible Lecturer(s)

Dr. Mohammad Alhroot
Dr. Haytham Al-Thawabieh
Dr. Omar Abu Nawwas.

Course	Mode of Delivery	Contact Time	Self-Study
Arabic 99	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation; 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to

- Effectively employ the communication skills of reading, writing, speaking and listening in standard Arabic.
- Use Arabic dictionaries and linking words and terminology.
- Examine the varying components of sentences and accurately breakdown grammatical structures.
- Analyze literary texts and distinguish among their types.
- Explain literary and linguistic works to reveal meaning, purpose and images.
- Orally present an accurate expression of the meanings and purposes of the texts.
- Demonstrate an improved use of resources on linguistic and literary heritage.

Module Contents:

- Relative pronouns;
- Demonstratives;
- The Hamza;
- Verbs;
- Nominal and verbal sentences;
- Pronouns;
- Punctuation marks;
- Poetic texts;
- Prose texts;
- Alʾlif allaiyyina (الألف اللیّنة);
- At-tāʾ almarbūṭa wal maftūḥa;

- Short forms in writing;
- The dual;
- Broken plural;
- Sound masculine plural;
- Sound feminine plural.

Planned Learning Activities and Teaching Methods:
- Lectures with intensive discussions and brainstorming
- Exercises in lecture
- Five-minute presentation discussing any issue related to the topics of the course
- Using the library and internet in obtaining sources and the preparation of material

Recommended or Required Reading:

- Mustafa ʾamīn, An-nahu Al-wāḍiḥ, Ali al-jārim, Dār Al-maʿārif, 1983.

- Yaḥya Mair ʿAlam, Dalīl Qawāʿid Al-ʾImlāʾ wa Mahārātuha, 2014.

- Muṣṭafa Al-Galāyīnī, Jāmiʿ Ad-Durūs Al-ʿArabiyya, Dār Al-kutub Al-ʿilmiyya, 2020

Usability of the Module:
Standard Arabic is a vital part of any student's education. It teaches them to produce well-argued and well-structured texts using a variety of language tools whether as students or in their future careers. In addition, properly learning Arabic teaches the use of the Arabic language to express the needs of the local, Arab and Islamic community. Finally, ARB099 is a prerequisite to other courses, especially ARB100, and successful completion of the course enables the student to register in a broader range of courses.

Prerequisites and Co-requisites:
The score 49 or below in the Arabic Placement Test (prerequisite)

Language of Instruction:
Arabic

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Arabic	ARB100

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
20% Participation and Homework
40% Final exam

Responsible Lecturer(s)

Dr. Mohammad Alhroot
Dr. Haytham Al-Thawabieh
Dr. Omar Abu Nawwas

Course	Mode of Delivery	Contact Time	Self-Study
Arabic	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to

- Apply Standard Arabic on many different levels ranging from remembering and understanding details to being able to evaluate and create grammatically correct and meaningful sentences.
- Understand and explain a word structure and identify its origin and type.
- Analyse and quote famous literary figures such as poets and writers, in addition to knowing their literary eras and work.
- Identify the levels of the linguistic system.
- Analyze sentences and structures, deconstructing them into their constituting components, with a particular focus on nominal sentences and their complements.
- Discern grammatical mistakes at word and sentence level.
- Write correct sentences and phrases exemplifying each linguistic pattern studied.
- Adapt the grammatical role of vocabulary use according to language standards.

Module Contents:

- Summarization;
- Punctuation;
- Spelling;
- Construction and inflection;
- Substitution indescribability;
- Sentence;
- Clause;

- Rhetoric issues and various applications;
- Poetic text (kun Balsaman/ كُنْ بلسماً);
- Short story (Müġāmara Ḫarīra/ مُغامرة خَطيرة);
- Prose text (waḍiyyatu ʾum li ʾibnatiha/ وصيّة أمّ لابنتِها);
- Verbal subject;
- Object whose subject is not mentioned;
- Nominal subject;
- Predicate;
- Active participle;
- Passive participles.

Planned Learning Activities and Teaching Methods:
- Lectures with intensive discussions and brainstorming;
- Exercises in lecture:
- Five-minute presentation discussing any issue related to the topics of the course;
- Using the library and internet in obtaining sources and the preparation of material.

Recommended or Required Reading:

- Abdu Ar-rājiḥī, At-Taṭbīq An-Naḥwī: Dār an-nahḍa,1979.
- ʾImīl Yaʿqūb, Al-Maʿājim Al-ʿArabiyya, Dār Al-ʿilm, 1985.
- Mahir Shaban, Al-Kitāba Al-Wazīfiyya, wa Al-ʾibdāʿiyya, Dar al-masīra, 2010.
- Fādil As-sāmirrāʾī,, Aṣ-ṣarf Al-ʿarabī, Dār ibn kaṯīr, 2013.

Usability of the Module:
Arabic is the native language of Jordan and that of most of the German Jordanian University's students. Thus, it is vital that they graduate with adequate Arabic language skills. Although the native language of the country is Arabic, most day-to-day interaction occurs in colloquial Arabic rather than Standard Arabic. Standard Arabic poses as a challenge for many of our students as they fail to receive sufficient practice. Therefore, taking Arabic during their Bachelor's degree is vital to ensure they are well equipped with the tools to communicate formally in any career they choose.

Prerequisites and Co-requisites:
ARB099: Arabic 99 or a passing grade of 50 on the Arabic Placement Test (prerequisite)

Language of Instruction:
Arabic

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
English II	ENGL099

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	
Pre-university	X	**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Oral presentation
10% Activities (quizzes, speaking, writing skills)
40% final exam

Responsible Lecturer(s)

Abeer Shannees
Areen Tarawneh
Dr. Bassmah Altaher
Dr. Deema Khasawneh
Dina El Hindi
Iman Sha'shaa
Dr. Kawthar Karain
Rasha Hijazeen
Dr. Thelal Oweis
Vera Khamashta

Course	Mode of Delivery	Contact Time	Self-Study
English II	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:
Students will be able to converse using simple Yes/No questions and Wh-questions and answers in Standard English dealing with basic survival needs. They will also be able to describe a sequence of events in the past dealing with their personal life. They will be able to recognize and produce basic constructions such as subject – verb agreement in sentences and appropriate use of pronouns. Moreover, they will be able to convey, to a limited degree, the different meanings of ability, possibility, or suggestion and use the imperative to give, to a limited degree, orders, advice, or warning. Students will be able to understand and convey the appropriate mood of a message.

Module Contents:

- Grammar:
  - English tenses: Present; Past; Present and Past Continuous; Present Perfect; Future Simple
  - -ing forms;
  - Can;
  - Countable and uncountable nouns;
  - Comparative and superlatives;

    - Modals.
- Vocabulary:
    - Personal information, family, word roots;
    - Colors, furniture, objects;
    - Word building: suffixes; collocations; synonyms and antonyms; word families; word forms;
    - Word focus: preposition: in;
    - Verbs and nouns collocations;
    - Word focus: mean, write;
    - Menus, clothes, food verbs;
    - Journey adjectives;
    - Word focus: time, money.
- Writing:
    - Sentences;
    - A paragraph;
    - Topic sentence, supporting details, closing sentence.
- Reading and Listening: Units 1-7 related reading and listening practice:
    - Main ideas and supporting details;
    - Identify examples;
    - Previewing and prediction;
    - Skimming and scanning;
    - Finding the general idea and finding specific information;
    - Contextual meaning of vocabulary.
- Oral:
    - Conversation questions.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions
- Exercises in class and at home
- Writing and presenting alone or in group work
- Watching videos, reading a paragraph and sharing ideas

Recommended or Required Reading:

- National Geographic Learning, Life Elementary 2nd ed. Student book, 2019
- National Geographic Learning, Life Elementary 2nd ed. Workbook, 2019
- National Geographic Learning, Life Elementary 2nd ed. iTools extra activities, 2019

Usability of the Module:
English may not be the most spoken language in the world, but it is the official language of 53 countries and spoken by around 400 million people across the globe. Being able to speak English is not just about being able to communicate with native English speakers, it is the most common second language in the world. If you want to speak to someone from another country, then the chances are that you will both be speaking English to do this. Therefore, it is very important for any university student to learn proper English. This is especially true for the German Jordanian University students as their entire university degree is taught in English. ENGL099 in particular is the foundation course to other levels so that students can begin their journey to improve their skills. Moreover, students taking this course still think in Arabic and translate to English in their minds. This course helps them begin to break free of this common barrier of language learning and begin thinking in English using the culture of English speakers. In addition, they will be spending their internship year in Germany and will have the opportunity to travel to many European countries if they desire. Therefore, improving their English for basic survival and intercultural communication is vital. English 99 is a prerequisite for English 101.

Prerequisites and Co-requisites:
English Placement Test grade of 0-40 (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
English III	ENGL101

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Oral presentation
10% Activities (quizzes, speaking, writing skills)
40% final exam

Responsible Lecturer(s)

Abeer Shannees
Areen Tarawneh
Dr. Bassmah Altaher
Dr. Deema Khasawneh
Dina El Hindi
Iman Sha'shaa
Dr. Kawthar Karain
Rasha Hijazeen
Dr. Thelal Oweis
Vera Khamashta

Course	Mode of Delivery	Contact Time	Self-Study
English III	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, students will be able to use appropriate vocabulary and grammar when formulating sentences and speaking in the English language. Students' reading skills will be improved through critical analysis of reading texts. In addition, students will be able to produce properly written paragraphs using the basic rules of writing, such as: the topic sentence, the supporting sentences and the concluding sentence. Furthermore, students will also be able to use grammatical rules correctly when they converse using the English language. Different oral and speaking skills such as effective speaking, clarity of voice and content, eye contact and effective listening will also be developed after taking this course.

Module Contents:

- Grammar:
  - Present simple;
  - Present continuous;
  - Comparatives and superlatives, comparative modifiers;
  - Past Simple;

    - Past continuous;
    - Quantifiers;
    - Articles;
    - Future forms;
- Vocabulary:
    - Everyday routines;
    - Collocations with do, play and go;
    - Words related to medical problems;
    - Words related to sports;
    - Vocabulary related to travelling;
    - Transport vocabulary;
    - Personal qualities, risks and challenges;
    - Vocabulary related to materials and recycling;
    - Words related to celebrations and life events.
- Writing:
    - Filling a form;
    - Writing an advertisement;
    - Writing a short story;
    - Writing formal emails;
    - Writing a description for a travel blog,
- Reading and Listening:
    - Related reading and listening for units one – six;
    - The main argument;
    - Reading between the lines;
    - Identifying opinion vs. fact;
    - Close reading;
    - Identifying the key information;
    - Supporting the main argument.
- Oral:
    - Speech.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in-group work.

Recommended or Required Reading:

- National Geographic Learning, Life Pre-Intermediate 2nd ed. Student book, 2019
- National Geographic Learning, Life Pre-Intermediate Workbook 2nd ed., 2019
- National Geographic Learning, Life Pre-Intermediate iTools 2nd ed. extra activities, 2019

Usability of the Module:
As English is one of the main languages of the world, this course helps students communicate more effectively in a broader range of cultures and contexts. At ENGL101 level, students are able to handle more complex language constructions in both understanding and producing language. Their vocabulary is broad enough to meet the majority of their academic and personal needs. This course also serves as the prerequisite not only for ENGL102 but also to all the university electives as its completion enables students to understand and present course material in English successfully. Furthermost, the language of instruction at GJU is English; therefore, English skills are a prerequisite to successfully graduate. Last but not least, as GJU's programs aim at graduating internationally competitive students, English communication skills are a basic requirement.

Prerequisites and Co-requisites:
ENGL099: English III or a grade of 41-60 in the English Placement Test (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
English IV	ENGL102

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Oral presentation
10% Activities (quizzes, speaking, writing skills)
40% Final exam

Responsible Lecturer(s)

Abeer Shannees
Areen Tarawneh
Dr. Bassmah Altaher
Dr. Deema Khasawneh
Dina El Hindi
Iman Sha'shaa
Dr. Kawthar Karain
Rasha Hijazeen
Dr. Thelal Oweis
Vera Khamashta

Course	Mode of Delivery	Contact Time	Self-Study
English IV	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:

By the end of this module, the student will demonstrate improved English skills to better communicate, define their needs and recognize the meaning of words in context. They will be able to implement analogies, idioms, and words with precise connotations and denotations in a variety of oral and written presentations in a native professional performance. In addition, students will be able to differentiate, categorize and compare ideas and make inferences and analyses. They will demonstrate the ability to evaluate, critique and rank writings for clarity, sentence variety, precise vocabulary, and effective phrasing. Finally, they will formulate well-designed sentences in an organized text.

Module Contents:

- Grammar:
  - Review of English tenses: Present; Past; Present and Past Continuous;
  - Present and past perfect, Present, Past Perfect Continuous;
  - Future Simple, Future Continuous, Future Perfect Continuous;
  - Static verbs;
  - Question forms: direct and indirect questions;
  - Predictions;

    - Future forms;
    - Model verbs;
    - First conditional: if + will;
    - Using “When, as soon as, unless, until, before”;
    - Purpose: to .., for … and, so that …;
    - Certainty and possibility.
- Vocabulary:
    - Units 1-6 related vocabulary and idioms;
    - Word focus: love;
    - Feelings;
    - Wordbuilding: adjective and noun collocations;
    - Musical styles;
    - Emotions;
    - Word focus: kind;
    - Describing performances;
    - Describing experiences;
    - Wordbuilding: adverbs;
    - Word focus: get;
    - Word focus: job and work.
    - Education;
    - Wordbuilding: prefix re-pay and conditions;
    - Job requirements;
    - A healthy lifestyle;
    - Word focus: so;
    - Restaurants;
    - Word focus: long;
    - Art;
    - Wordbuilding: nouns and verbs;
    - - ly adverbs in stories.
- Writing:
    - Text type: a business profile;
    - Writing skill: criteria for writing;
    - Text type: a review;
    - Writing skill: linking ideas;
    - Text type: a blog post;
    - Writing skill: interesting language;
    - Text type: a covering letter;
    - Writing skill: formal style;
    - Text type: a formal letter/email;
    - Writing skill: explaining consequences;
    - Text type: a news story;
    - Writing skill: structuring a news story.
- Reading and listening:
    - Units 1-6;
    - Drawing conclusions;
    - evaluating sources;
    - Reading between the lines;
    - Understanding different sides of an argument;
    - Understanding language cues;
    - Opinion vs. fact.
- Oral:
    - A debate/presentation.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in group work.

Recommended or Required Reading:

- Life Intermediate 2nd ed. Student book, National Geographic Learning, 2019
- Life Intermediate Workbook 2nd ed, National Geographic Learning, 2019
- Life Intermediate iTools 2nd ed. extra activities, National Geographic Learning, 2019

Usability of the Module:
As English is one of the main languages of the world this course helps students communicate more effectively in a broader range of cultures and contexts. Students focus on English at an intermediate level on the receptive skills of reading and listening and the productive skills of writing and speaking. Since the language of instruction at GJU is English; therefore, English skills are a prerequisite to graduate and support students in their future career path. More specifically, English IV (ENGL102) is a prerequisite for English V (ENGL201).

Prerequisites and Co-requisites:
ENGL101: English III or a score of 61-80 on the English Placement Test (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
English V	ENGL201

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Oral presentation
10% Class activities (speaking, quizzes, and writing skills)
40% Final

Responsible Lecturer(s)

Abeer Shannees
Areen Tarawneh
Dr. Bassmah Altaher
Dr. Deema Khasawneh
Dina El Hindi
Iman Sha'shaa
Dr. Kawthar Karain
Rasha Hijazeen
Dr. Thelal Oweis
Vera Khamashta

Course	Mode of Delivery	Contact Time	Self-Study
English V	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning outcomes:
By the end of the module, students will be able to communicate in English using native-like speaking, reading, and writing skills. The students' vocabulary will have expanded to include proper diction and enabled them to use appropriate phrases and words according to the context. In addition, there will be a significant improvement in their ability to use idioms, synonyms and collocations of English language; they will be competent at expressing their ideas and elaborating on their thoughts. Students will also be able to apply improved critical thinking skills while reading English texts. They will be able to evaluate conclusions, supporting examples, identifying opinions, ways of arguing and looking at different perspectives. They will also be able to understand and use tone to effect meaning and use emotive language. Students apply improved writing skills as well. They can analyze and produce 2 – 3 page essays with an emphasis on argumentation and persuasion working both independently and cooperatively to gather, evaluate, and synthesize necessary information.

Module Contents:

- Grammar:
  - Present tenses: simple, continuous, and perfect;
  - Past simple and present perfect;

    - Use of determiners;
    - Use of expressions of quantity;
    - Verb with infinitive or -ing;
    - Verbs with both -ing and to + infinitive;
    - Zero and first conditionals;
    - Verb patterns with reporting verbs;
    - Passive reporting verbs.
- Vocabulary:
    - Units 1, 4, 5, 7, and 9 related vocabulary and idioms;
    - Describing character;
    - Phrasal verbs about friendships;
    - Word building: forming adjectives;
    - Word focus: sense;
    - Vocabulary: art;
    - Words focus: spend;
    - Vocabulary: urban features;
    - Word building: adverb+ adjective;
    - Word focus: fall;
    - Vocabulary: raising children (verbs);
    - Word focus: same and different;
    - Describing traditions;
    - Vocabulary: reporting verbs;
    - Word focus: word.
- Writing:
    - Outline of an essay;
    - Thesis statements;
    - Topic sentence;
    - Supporting sentences;
    - Parallel structure;
    - Transition words;
    - Punctuation.
- Reading and listening:
    - Identifying the main aspect;
    - Balancing arguments;
    - Fact or opinion;
    - Claims and justifications;
    - Emotive language;
    - Weighing the evidence;
    - Reinforcing ideas.
- Oral:
    - Presentations.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in group work.

Recommended or Required Reading:

- National Geographic Learning, Life Upper Intermediate 2nd ed. Student book, 2019
- National Geographic Learning, Life Upper Intermediate 2nd ed. Workbook, 2019
- National Geographic Learning, Life Upper Intermediate 2nd ed. iTools extra activities, 2019

Usability of the Module:

As English is one of the main languages of the world this course helps students communicate more effectively in a broader range of cultures and contexts. It also helps students in their career path, as upon completion of the course, the students receive a Language Proficiency Certificate, which indicates their language competency in the universally recognized CEFR rating. At English V (ENGL201) level, students are now thinking of their German Year including their internship semester and/or applying for scholarships abroad. This course serves as a bridge between lower-level English and English that is more native in expression and understanding, therefore, helping them achieve their goals. Furthermost, the language of instruction at GJU is English; therefore, English skills are

a prerequisite to successfully graduate. English V (ENGL201) is a prerequisite for English VI (ENGL202). Last but not least, as GJU's programs aim at graduating internationally competitive students, English communication skills are a basic requirement.

Prerequisites and Co-requisites:
ENGL101: English 102 or a grade of 81-120 in the English Placement Test (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
English VI	ENGL202

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Oral presentation
10% Activities (quizzes, speaking, writing skills)
40% Final exam

Responsible Lecturer(s)

Abeer Shannees
Areen Tarawneh
Dr. Bassmah Altaher
Dr. Deema Khasawneh
Dina El Hindi
Iman Sha'shaa
Dr. Kawthar Karain
Rasha Hijazeen
Dr. Thelal Oweis
Vera Khamashta

Course	Mode of Delivery	Contact Time	Self-Study
EnglishVI	Face-to-face; blended learning	45	45

Bachelor

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation of Midterm exam and final exam: 20 hours.

Learning Outcomes:
By the end of this module, the student will be able to

- Better converse in the English language using the idiomatic language of native speakers.
- Read and decipher the language of news and literature for a better understanding of biased language and subtle meanings.
- Apply improved writing skills in order to better communicate in written form in both professional and personal contexts.
- Make connections between a text read independently, make predictions, compare and contrast ideas and make inferences.
- Analyze the relationships among thesis (main idea), evidence (concrete supporting details), and argument to evaluate claims made in informational texts such as newspaper editorials and campaign speeches.
- Use analogies, idioms, and words with precise connotations and denotations in a variety of oral and written presentations.
- Revise writing for clarity, sentence variety, precise vocabulary, and effective phrasing.

Module Contents:

- Grammar:
  - Review of English tenses: Present; Past; Present and Past Continuous; Present and Past Perfect
  - Present and Past Perfect Continuous; Future Simple; Future Continuous; Future Perfect Continuous;
  - Passive voice;
  - Future probability;
  - Past models;
  - Emphatic Structures: cleft sentence; do;
  - Avoiding Repetition: synonyms; ellipsis.
- Vocabulary:
  - Related vocabulary and idioms;
  - Word focus: life;
  - Word building: phrasal verb get;
  - Idioms: safety;
  - Word focus: foot/feet;
  - Adverb and adjective collocations;
  - Word focus: ground;
  - Word building: suffix -able;
  - Word building: give;
  - Repeated word pairs;
  - Word focus matter.
- Writing:
  - Argumentative writing;
  - Outline;
  - Thesis statement;
  - Unity;
  - Coherence;
  - Topic sentence;
  - Fragments;
  - Run-on;
  - Parallel phrases.
- Reading and Listening: Units 1-5 related reading and listening practice:
  - Understanding how an argument develops;
  - Use of contrasts;
  - Fact or opinion;
  - Finding counter arguments;
  - Identifying aims;
  - Analysing descriptive language;
  - Identifying personal opinions;
  - Reading between the lines.
- Oral:
  - News analysis.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in group work.

Recommended or Required Reading:

- National Geographic Learning, Life Advanced 2nd ed. Student book, 2019
- National Geographic Learning, Life Advanced 2nd ed. Workbook, 2019
- National Geographic Learning, Life Advanced 2nd ed. iTools extra activities, 2019

Usability of the Module:

As English is one of the main languages of the world this course helps students communicate more effectively in a broader range of cultures and contexts. It also this course helps students in their career path because upon completion of the course, the students receive and Language Proficiency Certificate which indicates their language competency in the universally recognized CEFR rating. Furthermost, the language of instruction at GJU is English; therefore, English skills are a prerequisite to successfully graduate. The module, which builds upon

English V (ENGL201), is the last in a series of curricular offers in this regard. Last but not least, as GJU's programs aim at graduating internationally competitive students, English communication skills are a basic requirement.

Prerequisites and Co-requisites:
ENGL201: English V (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German I (B1 track)	GERL101B1

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
20% Portfolio consisting of two writing assignments and a video presentation
35% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Anna Kloska (coordinator for German I)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German I (B1 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 35 hours;
- Preparation for the midterm and final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Comprehend very familiar, everyday expressions and very simple sentences and structures related to areas of most immediate relevance according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the Level A1.1 (beginners without pre-knowledge).
- Introduce herself/himself and others, express likes and dislikes, fill out a personal form, ask questions and give answers in present and partially in past tense, set private and semi-official appointments, describe people and things and express frequency and quantity in a very basic way both orally and in writing.
- Communicate with native speakers on a very basic level if those involved in the conversation speak slowly and clearly and are willing to support the non-native speaker.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A1.1 ‘Can Do statements’ related to the four ‘language skills’ according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics: basic personal and family information, numbers, dates, time, possessions and needs, ordering and buying food and groceries, studying and education, work environment and professions, leisure activities, transportation and travelling, daily routine, celebrations, furniture and design. In terms of grammatical phenomena, it deals with simple sentence structures, gender, number and the four forms of articles, nominative and accusative case, verb conjugation (present and perfect tense) for regular and some irregular verbs.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Introductive training focussing on the interrelation between reception and production;
- Training towards an active acquisition of new vocabulary and grammatical phenomena;
- Introduction to blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Very short lectures, simple and structured discussions, and short debates;
- Preparation for assignments and exams.

Recommended or Required Reading:

- Glas-Peters S., Pude A., Reimann M., Menschen: Deutsch als Fremdsprache Kursbuch A1.1, 3rd Edition, Hueber Verlag GmbH & Co. KG, München, 2018.
- Glas-Peters S., Pude A., Reimann M., Menschen: Deutsch als Fremdsprache Arbeitsbuch A1.1, 10th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Scheffler B., Menschen: Deutsch als Fremdsprache Intensivtrainer A1, 3rd Edition, Hueber Verlag GmbH & Co. KG, München, 2018.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the first of six German language modules offered by the German Language Center. Having completed this module, students can choose between two different tracks (B1 or B2) in order to complete their German language study program with either the official B1 exam, conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' or the B2 exam according to the CEFR.

Prerequisites and Co-requisites:
None

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German II (B1 track)	GERL102B1

Compulsory Module	X	**Year of study**	1	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
20% Portfolio consisting of two writing assignments and a video presentation
35% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Dr. Monika Hryniewicka (coordinator for German II)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German II (B1 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 35 hours;
- Preparation for the midterm and final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand and use familiar, everyday expressions and very simple sentences and structures related to areas of most immediate relevance according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A1.2 (basic users).
- Introduce herself/himself and others, express likes and dislikes, fill out a personal form, ask questions and give answers in present and past tense, set private and official appointments, describe people and things, ask for directions, express frequency and quantity in a basic way both orally and in writing.
- Communicate with native speakers on a very basic level if those involved in the conversation speak slowly and clearly and, if need be, are willing to support the non-native speaker.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A1.2 ‘Can Do statements’ related to the four ‘language skills’ according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics: basic personal and family information, locations and directions, living environment, appointments, wishes and desires, health issues, characteristics and physiognomy of people, household, rules and regulations, clothes and fabrics, weather, and common national and international celebrations. In terms of grammatical phenomena, it deals with temporal, local and other prepositions, accusative and dative case, determiners, declension of nouns and pronouns, modal verbs, the imperative form, independent and subordinated clauses, simple past and past perfect forms of regular and irregular verbs.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Training towards an active acquisition and a more independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Short discussions, simple debates and short presentations;
- Preparation for assignments and exams.

Recommended or Required Reading:

- Evans S., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A1.2, 9th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Glas-Peters S., Pude A., Reimann M., Menschen: Deutsch als Fremdsprache Arbeitsbuch A1.2, 8th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Scheffler B., Menschen: Deutsch als Fremdsprache Intensivtrainer A1, 3rd Edition, Hueber Verlag GmbH & Co. KG, München, 2018.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the second of six German language modules within the B1 track offered by the German Language Center which, altogether, lead the students towards the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'.

Prerequisites and Co-requisites:
GERL101B1: German I (B1 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German III (B1 track)	GERL201B1

Compulsory Module	X	**Year of study**	2	**Semester Hours**	6
Elective Module		**Spring Semester**	X	**Workload**	120
Optional Module		**Winter Semester**	X	**ECTS**	4
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
20% Portfolio consisting of two writing assignments and a video presentation
35% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Jakob Goos (coordinator for German III)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German III (B1 track)	Face-to-face; blended learning	90	30

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 6 hours = 90 hours;
- Exercises and self-studying at home: 24 hours;
- Preparation for the midterm and final exam: 6 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand and use familiar, frequently used expressions and simple sentences and structures related to areas of a wider immediate relevance according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A2.1 (basic users).
- Talk about their academic and/or professional background, describe their living conditions, express likes and dislikes, ask questions and give answers in present and past tense, ask for help and support, make suggestions and give advice, describe health problems and talk with medical doctors and nurses, express pity, sorrow and hopes, express frequency and quantity in a basic way both orally and in writing.
- Communicate with native speakers within simple and familiar tasks requiring a simple and direct exchange of information on familiar and routine matters.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A2.1 ‘Can Do statements’ related to the four ‘language skills’ according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics: detailed personal and family information, profession, work and companies, living conditions and housing, tourism and leisure, shopping, lifestyle and culture, sports and fitness, health issues, food, nutrition and eating in restaurants. In terms of grammatical phenomena, it deals with determination, complex verbforms, nominalization, adjective inflection, temporal and local prepositions, the general subjunctive mood, and sentence connectors.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Exercises focussing on the interrelation between receptive and productive activities;
- Training towards an active acquisition and a more independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, debates and presentations
- Preparation for assignments and exams.

Recommended or Required Reading:

- Habersack C., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A2.1, 9th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch A2.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Batra S., Ransberger K., Menschen: Deutsch als Fremdsprache Intensivtrainer A2, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2016.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:

This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the third of six German language modules within the B1 track offered by the German Language Center which, altogether, lead the students towards the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'. In accordance with the GJU study plan, this module consists of 4 ECTS, instead of 6, and therefor offers a stronger progression for the 'basic user' of German who has approached his/her 'waystage' level of the language according to the CEFR.

Prerequisites and Co-requisites:

GERL102B1: German II (B1 Track) (prerequisite)

Language of Instruction:

German

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
German IV (B1 track)	GERL202B1

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
10% Oral exam
10% Written assignment
35% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Elena Kleist (coordinator for German IV)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German IV (B1 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 30 hours;
- Preparation for the midterm and final exam: 9 hours;
- Preparation for the official B1 exam according to the CEFR: 6 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Distinguish between familiar expressions, sentences and structures related to areas of immediate relevance and more elaborated components like the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A2.2 (basic users) and, partially, at the level B1.1 (independent user).
- Talk about personal experiences with languages, express feelings of happiness, joy and discomfort, describe own media consumption habits, describe travel experiences, convince others, describe and report in official situations, describe statistics, write formal invitations and short emails, make suggestions and talk about future events and situations, describe dreams hopes and ambitions and briefly give reasons or explanations for opinions and plans.
- Communicate with native speakers about essential points and ideas in familiar contexts.
- Understand the characteristics of the official B1 exam according to the CEFR and use strategies to overcome obstacles while solving said exam.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A2.2 and, partially, B1.1 ‘Can Do statements’ related to the four ‘language skills’ according to the CEFR. Thus, in terms of communicative activities,

the module focuses on the following topics: administration and bills, telecommunication, books and press, travelling and mobility, weather and climate, education, profession and work specifics, friendships and other relations, invitations, customer services, future and abstractions. In terms of grammatical phenomena, it deals with complex sentence structures (independent and subordinated clauses) and connectors, the passive voice, indirect questions, complex prepositions, past forms of modal verbs, relative clauses, and the future tense. The module eventually introduces the characteristics of the official B1 exam according to the CEFR.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Training towards an active acquisition and a more independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, debates, presentations etc.;
- Preparation for assignments and exams;
- Preparation for the official B1 exam according to the CEFR.

Recommended or Required Reading:

- Habersack C., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A2.2, 7th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Breitsamer A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch A2.2, 5th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Brau-Podeschwa J., Habersack C., Pude A., Menschen: Deutsch als Fremdsprache Kursbuch B1.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch B1.1, 4th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Scheffler B., Menschen: Deutsch als Fremdsprache Intensivtrainer A2, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2016.
- Kersting D., Menschen: Deutsch als Fremdsprache Intensivtrainer B1, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2017.
- Dittrich R., Maenner D., Prüfungstraining Goethe-/ÖSD-Zertifikat B1, 3rd Edition, Cornelsen Schulverlage GmbH, Berlin, 2017.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the fourth of six German language modules within the B1 track offered by the German Language Center which, altogether, lead the students towards the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'.

Prerequisites and Co-requisites:
GERL201B1: German III (B1 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German V (B1 track)	GERL301B1

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

Final exam consisting of the official B1 exam according to the CEFR, conducted in cooperation with the 'Goethe-Instiutut' or the 'TestDaF-Institut'. Students pass the module by successfully passing at least two of the four parts of the exam which are based on the four 'language skills' *reading*, *listening*, *writing* and *speaking*. The module only offers a pass or fail option and therefor does not contain any other forms of examination.

Responsible Lecturer(s)

Friederike Haumann (coordinator for German V)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German V (B1 Track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 30 hours;
- Preparation for the official B1 exam according to the CEFR: 15 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B1.1 and B1.2 (independent user).
- Deal with most situations likely to arise whilst traveling in an area where German is spoken, produce simple connected texts on topic which are familiar or of personal interest, describe experiences and events, dreams, hopes and ambitions, statistics, and briefly give reasons and explanations for opinions and plans.
- Understand the main point of many radio or TV programmes on current events and topics, understand the description of events, feelings and wishes in personal letters, write personal letters/texts describing experiences and impressions, write straightforward connected texts on topics which are familiar or of personal interest.
- Communicate with native speakers about essential points and ideas in familiar contexts and about topics of personal or partially professional interest.
- Follow a lecture or talk within her/his field, provided the subject matter is familiar and the presentation straightforward and clearly structured.
- Understand simple technical information, such as operating instructions for everyday equipment.
- Understand all characteristics of the official B1 exam according to the CEFR and use a variety of strategies to overcome obstacles while solving said exam and all its components.

Module Contents:

Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves B1.1 and B1.2 'Can Do statements' related to the four 'language skills' according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics: events in the past, different emotions and feelings, communication with colleagues and supervisors, job applications, biographies and history, politics and society, visons and future, rules and regulations, environment and climate, and general statistics. In terms of grammatical phenomena, it deals with the future tense, complex adjective inflection, complex syntactical and morphological structures, prepositions, and the passive voice of modal verbs. The module eventually enables the students to successfully pass the official B1 exam according to the CEFR which is a curricular part of this module and thus its final exam.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Training towards an active acquisition and a more independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, debates, presentations etc.;
- Preparation for assignments and exams;
- Preparation for the official B1 exam according to the CEFR.

Recommended or Required Reading:

- Brau-Podeschwa J., Habersack C., Pude A., Menschen: Deutsch als Fremdsprache Kursbuch B1.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch B1.1, 4th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Brau-Podeschwa J., Habersack C., Pude A., Menschen: Deutsch als Fremdsprache Kursbuch B1.2, 7th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch B1.2, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Kersting D., Menschen: Deutsch als Fremdsprache Intensivtrainer B1, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2017.
- Dittrich R., Maenner D., Prüfungstraining Goethe-/ÖSD-Zertifikat B1, 3rd Edition, Cornelsen Schulverlage GmbH, Berlin, 2017.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the fifth of six German language modules within the B1 track offered by the German Language Center. The module enables the students to master the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' and a curricular part of this module.

Prerequisites and Co-requisites:
GERL202B1: German IV (B1 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German VI (Regular)	GERL302REG

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	6
Elective Module		**Summer Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

20% Internship application training (CV, cover letter and interview)
40% Portfolio for technical languages consisting of oral and written assignments/exercises (midterm)
40% Written final exam

Responsible Lecturer(s)

Esther Kurani (coordinator for German VI Intensive and Regular)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German VI (Regular)	Face-to-face; blended learning	90	90

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 6 hours = 90 hours;
- Exercises and self-studying at home: 28 hours:
  - Intercultural communication: 3 hours;
  - Job/internship application: 10 hours;
  - Technical language: 15 hours;
- Preparation for the midterm and final exam: 10 hours;
- Further individually conducted self-studies meeting the students' personal demands: 52 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Successfully manage the application process for a six months internship in Germany which is part of the obligatory 'German Year' for all GJU students. The process consists of finding and understanding a suitable add in accordance with the students' major, writing a convincing CV and cover letter, and mastering an effective and mostly fluent interview, departing spontaneously, taking initiatives, expanding ideas with little help or prodding from the interviewer.
- Successfully manage the most significant situations which the student, in accordance with the currently studied major, encounters during her/his theoretical and practical semester in Germany. This process is being achieved within a technical language training focussing on action orientated and communicative scenarios like following lectures, taking notes, summarizing academic and technical texts, writing official emails and texts related to academic and vocational encounters, holding presentations, communicating both verbally and in writing with professors, university staff, students as well as with colleagues and customers during an internship.
- Understand the concept of general intercultural phenomena, reflect and understand the differences between culture and cultural standards in Jordan and in Germany, understand the concept of 'culture shock' and potentially cope with its different stages, reflect about appropriate and inappropriate behaviour in Germany as well as understand the concepts of open-mindedness and 'culture clash'.

Module Contents:
The content of the module follows the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B1.2 (independent user) while focusing on technical language components, job/internship application and intercultural communication. The module strategically deals with the particular characteristics of the 'German Year' during which, usually in his/her 4th study year, each student pursues a semester at one of the GJU's German partner universities and completes an internship in a German company or organization. Focusing on reception, interaction and production, the module involves B1.2 'Can Do statements' related to the four 'language skills' according to the CEFR, combining them with technical language and vocational components. Thus, the module offers a student-centered approach in realistic and context-based learning scenarios which meet the linguistic demands of the GJU students' future studying and working environment.

Planned Learning Activities and Teaching Methods:
- Activities focussing on the interrelation between reception and production;
- Intensive training towards the independent acquisition and consolidation of vocabulary and verbal phrases as well as more complex grammatical phenomena and syntactical structures;
- Blended learning, flipped classroom and intensified self-studying components;
- Controlled, guided and free in-class activities;
- Individual, partner and group work activities;
- Whole-class activities;
- Lectures, discussions, presentations, debates etc., including aspects of common everyday situations, professional encounters with technical language, internship application and intercultural phenomena;
- Preparation for assignments and exams;
- Writing a CV and a cover letter.

Recommended or Required Reading:
- Kersting D., Menschen: Deutsch als Fremdsprache Intensivtrainer B1, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2017.
- Turtur U., Übungen zum Wortschatz der deutschen Schriftsprache, 3rd Edition, Verlag Liebaug-Dartmann, Meckenheim, 2013.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).
- Handouts/Readers for Technical Language, Application Training and Intercultural Communication (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the last of six language modules within the B1 track offered by the German Language Center. The module enables the students to pursue the 'German Year' which consists of one semester at one of the GJU's German partner universities as well as of an internship in a German company or organization. The module is internally divided in twelve sub-groups according to the students' different majors:
- Architecture (GERL302ARCH);
- Design and Visual Communication (GERL302DES);
- Management Science (GERL302MNG);
- Logistic Sciences (GERL302LOG);
- International Accounting (GERL302ACC);
- Computer Science, Computer Engineering, Communications Engineering, Electrical and Communication Engineering, Electrical Engineering (GERL302IT);
- Industrial Engineering (GERL302IE);
- Mechatronic and Mechanical Engineering (GERL302MM);
- Energy Engineering (GERL302EWE);
- Civil and Environmental Engineering (GERL302CE);
- Biomedical Engineering (GERL302BM);
- Pharmaceutical and Chemical Engineering (GERL302CH).

Prerequisites and Co-requisites:
- GERL301B1: German V (B1 Track) (prerequisite)
- Students who have passed said module with all four parts of the official B1 exam according to the CEFR (prerequisite)
-

Language of Instruction:

German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German VI (Intensive)	GERL302INT

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

20% Internship application training (CV, cover letter and interview)
40% Portfolio for technical languages consisting of oral and written assignments/exercises (midterm)
40% Written final exam

Responsible Lecturer(s)

Esther Kurani (coordinator for German VI Intensive and Regular)
And a team of several instructors whose number varies each semester according to the number of sections for said level.

Course	Mode of Delivery	Contact Time	Self-Study
German VI (Intensive)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 28 hours:
  - Intercultural communication: 3 hours;
  - Job/internship application: 10 hours;
  - Technical language: 15 hours;
- Preparation for the midterm and final exam: 10 hours;
- Preparation for the official B1 exam according to the CEFR: 7 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Successfully manage the application process for a six months internship in Germany which is part of the obligatory ‘German Year’ for all GJU students. The process consists of finding and understanding a suitable add in accordance with the students’ major, writing a convincing CV and cover letter, and mastering an effective and mostly fluent interview, departing spontaneously, taking initiatives, expanding ideas with little help or prodding from the interviewer.
- Successfully manage the most significant situations which the student, in accordance with the currently studied major, encounters during her/his theoretical and practical semester in Germany. This process is being achieved within a technical language training focussing on action orientated and communicative scenarios like following lectures, taking notes, summarizing academic and technical texts, writing official emails and texts related to academic and vocational encounters, holding presentations, communicating both verbally and in writing with professors, university staff, students as well as with colleagues and customers during an internship.
- Understand the concept of general intercultural phenomena, reflect and understand the differences between culture and cultural standards in Jordan and in Germany, understand the concept of ‘culture shock’ and potentially cope with its different stages, reflect about appropriate and inappropriate behaviour in Germany as well as understand the concepts of open-mindedness and ‘culture clash’.
- Understand all characteristics of the official B1 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and its different components.

Module Contents:
The content of the module follows the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B1.2 (independent user) while focusing on technical language components, job/internship application and intercultural communication, and also enabling the students to complete the official B1exam according to the CEFR. The module strategically deals with the particular characteristics of the 'German Year' during which, usually in his/her 4th study year, each student pursues a semester at one of the GJU's German partner universities and completes an internship in a German company or organization. Focusing on reception, interaction and production, the module involves B1.2 'Can Do statements' related to the four 'language skills' according to the CEFR, combining them with technical language and vocational components. Thus, the module offers a student-centered approach in realistic and context-based learning scenarios which meet the linguistic demands of the GJU students' future studying and working environment.

Planned Learning Activities and Teaching Methods:
- Activities focussing on the interrelation between reception and production;
- Intensive training towards the independent acquisition and consolidation of vocabulary and verbal phrases as well as more complex grammatical phenomena and syntactical structures;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Individual, partner and group work activities;
- Whole-class activities;
- Lectures, discussions, presentations, debates etc., including aspects of common everyday situations, professional encounters with technical language, internship application and intercultural phenomena;
- Preparation for assignments and exams;
- Writing a CV and a cover letter;
- Preparation for the official B1 exam according to the CEFR.

Recommended or Required Reading:
- Frater A., Loumiotis U., Schäfer N., Weidinger S., Mit Erfolg zum Goethe-/ÖSD-Zertifikat B1, 7th Edition, Ernst Klett Sprachen, Stuttgart, 2021.
- Kersting D., Menschen: Deutsch als Fremdsprache Intensivtrainer B1, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2017.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).
- Handouts/Readers for Technical Language, Application Training and Intercultural Communication (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the last of six language modules within the B1 track offered by the German Language Center, qualifying the students to complete the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'.The module enables the students to pursue the 'German Year' which consists of one semester at one of the GJU's German partner universities as well as of an internship in a German company or organization. The module is internally divided in twelve sub-groups according to the students' different majors:
- Architecture (GERL302ARCH);
- Design and Visual Communication (GERL302DES);
- Management Science (GERL302MNG);
- Logistic Sciences (GERL302LOG);
- International Accounting (GERL302ACC);
- Computer Science, Computer Engineering, Communications Engineering, Electrical and Communication Engineering, Electrical Engineering (GERL302IT);
- Industrial Engineering (GERL302IE);
- Mechatronic and Mechanical Engineering (GERL302MM);
- Energy Engineering (GERL302EWE);
- Civil and Environmental Engineering (GERL302CE);
- Biomedical Engineering (GERL302BM);
- Pharmaceutical and Chemical Engineering (GERL302CH).

Prerequisites and Co-requisites:
- GERL301B1: German V (B1 Track) (prerequisite)

- Students who have passed said module with only two or three parts of the official B1 exam according to the CEFR (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German II (B2 track)	GERL102B 2

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
5% Video project
10% Portfolio consisting of different oral and/or written exercises and assignments
10% Written in-class test
30% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Samir Haskic (coordinator for the B2 track)
And a team of several instructors whose number varies each semester according to the number of sections for said level.

Course	Mode of Delivery	Contact Time	Self-Study
German II (B2 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 35 hours;
- Preparation for the midterm and final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand and use familiar, everyday expressions and simple sentences and structures related to areas of most immediate relevance according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A1.2 and, partially, A2.1 (basic users).
- Talk about their academic and/or professional background, describe their living conditions, express likes and dislikes, ask questions and give answers in present and past tense, ask for help and support, make suggestions and give advice, express pity, sorrow and hopes, express frequency and quantity in a basic way both orally and in writing.
- Introduce herself/himself and others, express likes and dislikes, fill out a personal form, ask questions and give answers in present and past tense, set private and official appointments, describe people and things, ask for directions, express frequency and quantity in a basic way both orally and in writing.
- Communicate with native speakers on a basic level if those involved in the conversation speak slowly and clearly and, if need be, are willing to support the non-native speaker.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A1.2 and, partially, A2.1 'Can Do statements' related to the four 'language skills' according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics: basic personal and family information, locations and directions, living

environment, appointments, wishes and desires, health issues, characteristics and physiognomy of people, household, rules and regulations, clothes and fabrics, weather, common national and international celebrations, profession and work, living environment, shopping and groceries, travel, urbanism and culture. In terms of grammatical phenomena, it deals with different forms and functions of prepositions, accusative and dative case, determiners, declension of nouns and pronouns, modal verbs, the imperative form, independent and subordinated clauses, simple past and past perfect forms of regular and irregular verbs, adjective declination and general subjunctive mood.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Training towards an active acquisition and a more independent consolidation of vocabulary and grammatical phenomena;
- Introducing forms of blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Short lectures, discussions, debates and presentations;
- Preparation for assignments and exams.

Recommended or Required Reading:

- Evans S., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A1.2, 9th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Glas-Peters S., Pude A., Reimann M., Menschen: Deutsch als Fremdsprache Arbeitsbuch A1.2, 8th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Habersack C., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A2.1, 9th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch A2.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Scheffler B., Menschen: Deutsch als Fremdsprache Intensivtrainer A1, 3rd Edition, Hueber Verlag GmbH & Co. KG, München, 2018.
- Batra S., Ransberger K., Menschen: Deutsch als Fremdsprache Intensivtrainer A2, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2016.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and, together with its' prerequisite GERL101B1, the second of six language modules within the optional B2 track offered by the German Language Center. The B2 track qualifies GJU students to master the official B2 exam according to the CEFR which is conducted either internally at the German Language Center or in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' during the students' sixth study semester.

Prerequisites and Co-requisites:
GERL101B1: German I (B1 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German III (B2 track)	GERL201B 2

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	6
Elective Module		**Spring Semester**	X	**Workload**	120
Optional Module		**Winter Semester**	X	**ECTS**	4
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
5% Video project
10% Portfolio consisting of different oral and/or written exercises and assignments
10% Written in-class test
30% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Samir Haskic (coordinator for the B2 track)
And a team of several instructors whose number varies each semester according to the number of sections for said level.

Course	Mode of Delivery	Contact Time	Self-Study
German III (B2 track)	Face-to-face; blended learning	90	30

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 6 hours = 90 hours;
- Exercises and self-studying at home: 24 hours;
- Preparation for the midterm and final exam: 6 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Distinguish between familiar expressions, sentences and structures related to areas of immediate relevance and more elaborated components like the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A2.1 and A2.2 (basic users).
- Talk about their academic and/or professional background, describe their living conditions, express likes and dislikes, ask questions and give answers in present and past tense, ask for help and support, make suggestions and give advice, describe health problems and talk with medical doctors and nurses, express pity, sorrow and hopes, describe simple statistics, express frequency and quantity in a basic way both orally and in writing, express feelings of happiness, joy and discomfort and write personal emails and letters, understand and produce comments, blogs and reports.
- Communicate with native speakers in simple and familiar tasks requiring a simple and direct exchange of essential information on familiar and routine matters.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves A2.1 and A2.2 ‘Can Do statements’ related to the four ‘language skills’ according to the CEFR. Thus, in terms of communicative activities, the module

focuses on the following topics: detailed personal and family information, profession, work and companies, living conditions and housing, tourism and leisure, shopping, lifestyle and culture, sports and fitness, health issues, food, nutrition and eating in restaurants, experiences with learning languages, administration and bills, telecommunication, media, books and press, travelling and mobility, weather and climate, education, profession and work specifics. In terms of grammatical phenomena, it deals with complex sentence structures (independent and subordinated clauses) and connectors, the passive voice, indirect questions, complex prepositions, past forms of modal verbs, relative clauses, and the future tense.

Planned Learning Activities and Teaching Methods:

- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Exercises focussing on the interrelation between receptive and productive activities;
- Training towards an active acquisition and an independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, debates and presentations;
- Preparation for assignments and exams.

Recommended or Required Reading:

- Habersack C., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A2.1, 9th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch A2.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Habersack C., Pude A., Specht F., Menschen: Deutsch als Fremdsprache Kursbuch A2.2, 7th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Breitsamer A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch A2.2, 5th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Batra S., Ransberger K., Menschen: Deutsch als Fremdsprache Intensivtrainer A2, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2016.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the third of six language modules within the optional B2 track offered by the German Language Center. The B2 track qualifies GJU students to master the official B2 exam according to the CEFR which is conducted either internally at the German Language Center or in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' during the students' sixth study semester. In accordance with the GJU study plan, this module consists of 4 ECTS, instead of 6, and therefor offers a stronger progression for the 'basic user' of German who, by completing this module, reaches her/ his 'waystage' language level according to the CEFR.

Prerequisites and Co-requisites:
GERL102B2: German II (B2 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Programme Components:
None

Bachelor

Module Title	Module Code
German IV (B2 track)	GERL202B2

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
5% Video project
10% Portfolio consisting of different oral and/or written exercises and assignments
10% Written in-class test
30% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Samir Haskic (coordinator for the B2 track)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German IV (B2 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 28 hours;
- Preparation for the midterm and final exam: 10 hours;
- Preparation for the official B1 exam according to the CEFR: 7 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B1.1 and B1.2 (independent user).
- Deal with most situations likely to arise whilst traveling in an area where German is spoken, produce simple connected texts on topic which are familiar or of personal interest, describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
- Understand the main point of many radio or TV programmes on current events and topics, understand the description of events, feelings and wishes in personal letters, write personal letters/texts describing experiences and impressions, write straightforward connected texts on topics which are familiar or of personal interest.
- Communicate with native speakers about essential points and ideas in familiar contexts and about topics of personal or partially professional interest.
- Follow a lecture or talk within her/his field, provided the subject matter is familiar and the presentation straightforward and clearly structured.
- Understand simple technical information, such as operating instructions for everyday equipment.
- Understand all characteristics of the official B1 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and all its components.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves B1.1 and B1.2 'Can Do statements' related to the four 'language skills' according to the CEFR. Thus, in terms of communicative activities, the module focuses on the following topics and tasks: friendships and other relations, invitations, customer services, events in the future and abstractions, formal invitations and short emails, making suggestions, events in the past, different emotions and feelings, communication with colleagues and supervisors, job applications, biographies and history, politics and society, expressing visons, rules and regulations, environment and climate, verbalization of statistics. In terms of grammatical phenomena, it deals with the future tense, complex adjective inflection, complex syntactical and morphological structures, different forms and functions of prepositions, and the passive voice of modal verbs. The module eventually introduces the characteristics of the official B1 exam according to the CEFR.

Planned Learning Activities and Teaching Methods:
- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Training towards an active acquisition and an independent consolidation of vocabulary and grammatical phenomena;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, debates and presentations;
- Preparation for assignments and exams;
- Preparation for the official B1 exam according to the CEFR.

Recommended or Required Reading:
- Brau-Podeschwa J., Habersack C., Pude A., Menschen: Deutsch als Fremdsprache Kursbuch B1.1, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2021.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch B1.1, 4th Edition, Hueber Verlag GmbH & Co. KG, München, 2019.
- Brau-Podeschwa J., Habersack C., Pude A., Menschen: Deutsch als Fremdsprache Kursbuch B1.2, 7th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Breitsameter A., Glas-Peters S., Pude A., Menschen: Deutsch als Fremdsprache Arbeitsbuch B1.2, 6th Edition, Hueber Verlag GmbH & Co. KG, München, 2022.
- Kersting D., Menschen: Deutsch als Fremdsprache Intensivtrainer B1, 1st Edition, Hueber Verlag GmbH & Co. KG, München, 2017.
- Dittrich R., Maenner D., Prüfungstraining Goethe-/ÖSD-Zertifikat B1, 3rd Edition, Cornelsen Schulverlage GmbH, Berlin, 2017.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the fourth of six language modules within the optional B2 track offered by the German Language Center. The B2 track qualifies GJU students to master the official B2 exam according to the CEFR which is conducted either internally at the German Language Center or in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' during the students' sixth study semester. The module also enables the students to master the official B1 exam according to the CEFR which is conducted in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'. The exam is a curricular part of the fifth semester module GERL301B1 and has to be passed by all students of the German Language Center.

Prerequisites and Co-requisites:
GERL201B2: German III (B2 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Programme Components:
None

Bachelor

Module Title	Module Code
German V (B2 track)	GERL301B2

Compulsory Module	X	**Year of study**	3	**Semester Hours**	9
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

5% Active participation
5% Video project
10% Portfolio consisting of different oral and/or written exercises and assignments
10% Written in-class test
30% Oral or written midterm exam
40% Written final exam

Responsible Lecturer(s)

Samir Haskic (coordinator for the B2 track)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German V (B2 track)	Face-to-face; blended learning	135	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 9 hours = 135 hours;
- Exercises and self-studying at home: 35 hours;
- Preparation for the midterm and final exam: 10 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Largely understand and produce rather complex texts on both concrete and abstract topics, including technical discussions in her/his field of specialisation and according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B2.1 (independent user).
- Interact with an initial degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party.
- Largely understand standard spoken language, live or broadcast, on both familiar and unfamiliar topics normally encountered in personal, social, academic or vocational life.
- Show a relatively high controlled degree of grammatical control without making errors which cause misunderstanding and with the growing ability to correct most of her/his mistakes.
- Largely follow essentials of lectures, talks, reports and other forms of academic/professional presentation which are propositionally and linguistically complex.
- Understand announcements and messages on concrete and abstract topics spoken in standard dialect at normal speed.
- Scan quickly through long texts, locating relevant details and understand and exchange complex information and advice on the full range of matters related to her/his occupational role.
- Understand the main characteristics of the official B2 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and its different components.

Module Contents:
Creating a student-centered approach in realistic and context-based learning scenarios, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU). Focusing on reception, interaction and production, the module involves B2.1 'Can Do statements' related to the four 'language skills' according to the CEFR. Thus, in terms of communicative activities and grammatical phenomena, the module focuses on the following tasks and topics: written texts on a wide range of subjects, viewpoints on a topical issue, oral and written expression of advantages and disadvantages of various options, conversations, spoken descriptions and viewpoints on different general topics, morphological and syntactical structures like tenses and moods, inflection and derivation, and complex sentence connectors.

Planned Learning Activities and Teaching Methods:
- Listening and reading exercises (reception);
- Exercises combining spoken interaction and production;
- Exercises combining written interaction and production;
- Activities focussing on the interrelation between reception and production;
- Intensive training towards the independent acquisition and consolidation of vocabulary and verbal phrases as well as complex grammatical phenomena and syntactical structures;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Whole-class activities;
- Individual, partner and group work activities;
- Lectures, discussions, presentations, debates etc., including aspects of common everyday situations and professional encounters;
- Preparation for assignments and exams;
- Introduction to the official B2 exam according to the CEFR.

Recommended or Required Reading:
- Koithan U., Schmitz H., Sieber T., Sonntag R., Aspekte neu B2.1 Lehrbuch, 9th Edition, Ernst Klett Sprachen, Stuttgart, 2020.
- Koithan U., Schmitz H., Sieber T., Sonntag R., Aspekte neu B2.1 Arbeitsbuch, 10th Edition, Ernst Klett Sprachen, Stuttgart, 2022.
- Lütke M., Moritz U., Rodi M., Aspekte neu B2 Intensivtrainer, 3rd Edition, Ernst Klett Sprachen, Stuttgart, 2019.
- Frater A., Schäfer N., Weidinger S., Mit Erfolg zum Goethe-Zertifikat B2, 2nd Edition, Ernst Klett Sprachen, Stuttgart, 2020.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the fourth of six language modules within the optional B2 track offered by the German Language Center. The B2 track qualifies GJU students to master the official B2 exam according to the CEFR which is conducted either internally at the German Language Center or in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut' during the students' sixth study semester.

Prerequisites and Co-requisites:
GERL202B2: German IV (B2 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
German VI (B2 track)	GERL302B 2

Compulsory Module	X	**Year of Study**	3	**Semester Hours**	6
Elective Module		**Spring Semester**	X	**Workload**	180
Optional Module		**Winter Semester**	X	**ECTS**	6
Pre-university		**Pre-program**		**Remedial**	

Examination

15% Internship application training (CV, cover letter and interview)
15% Oral or written midterm exam (language)
30% Portfolio for technical languages consisting of oral and written assignments/exercises
40% Written final exam

Responsible Lecturer(s)

Samir Haskic (coordinator for the B2 track)
And a team of several instructors whose number varies each semester according to the number of sections for said level

Course	Mode of Delivery	Contact Time	Self-Study
German VI (B2 Track)	Face-to-face; blended learning	90	90

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and exams: 15 weeks * 6 hours = 90 hours;
- Exercises and self-studying at home: 28 hours:
  - Intercultural communication: 3 hours;
  - Job/internship application: 10 hours;
  - Technical language: 15 hours;
- Preparation for the midterm and final exam: 20 hours;
- Preparation for the official B2 exam according to the CEFR: 42 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Understand and produce rather complex texts on both concrete and abstract topics, including technical discussions in her/his field of specialisation and according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B2.2 (independent user).
- Interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party.
- Understand standard spoken language, live or broadcast, on both familiar and unfamiliar topics normally encountered in personal, social, academic or vocational life.
- Show a highly controlled degree of grammatical control without making errors which cause misunderstanding and with the growing ability to correct most of her/his mistakes.
- Follow essentials of lectures, talks, reports and other forms of academic/professional presentation which are propositionally and linguistically complex.
- Understand announcements and messages on concrete and abstract topics spoken in standard dialect at normal speed.
- Scan quickly through long texts, locating relevant details and understand and exchange complex information and advice on the full range of matters related to her/his occupational role.
- Understand all characteristics of the official B2 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and its different components.

- Successfully manage the application process for a six months internship in Germany which is part of the obligatory 'German Year' for all GJU students. The process consists of finding and understanding a suitable add in accordance with the students' major, writing a convincing CV and cover letter, and mastering an effective and mostly fluent interview, departing spontaneously, taking initiatives, expanding ideas with little help or prodding from the interviewer.
- Successfully manage the most significant situations which the student, in accordance with the currently studied major, encounters during her/his theoretical and practical semester in Germany. This process is being achieved within a technical language training focussing on action orientated and communicative scenarios like following lectures, taking notes, summarizing academic and technical texts, writing official emails and texts related to academic and vocational encounters, holding presentations, communicating both verbally and in writing with professors, university staff, students as well as with colleagues and customers during an internship.
- Understand the concept of general intercultural phenomena, reflect and understand the differences between culture and cultural standards in Jordan and in Germany, understand the concept of 'culture shock' and potentially cope with its different stages, reflect about appropriate and inappropriate behaviour in Germany as well as understand the concepts of open-mindedness and 'culture clash'.

Module Contents:
Combining everyday language with technical language components, job/internship application and intercultural communication, the module strategically deals with the unique demands made by everyday student life at the German Jordanian University (GJU), including the particular characteristics of the 'German Year' during which, usually in his/her 4th study year, each student pursues a semester at one of the GJU's German partner universities and completes an internship in a German company or organization. Focusing on reception, interaction and production, the module involves B2.2 'Can Do statements' related to the four 'language skills' according to the CEFR, which – in terms of non-technical language components – cover the following communicative activities and grammatical phenomena: detailed written texts on a wide range of subjects, viewpoints on a topical issue, oral and written expression of advantages and disadvantages of various options, extended conversations, spoken descriptions and viewpoints on most general topics, and the following morphological and syntactical structures: inflection and derivation, indirect speech and conjunctive mood, and complex independent and subordinated clauses. Altogether, the module offers a student-centered approach in realistic and context-based learning scenarios which meet the linguistic demands of the GJU students' future studying and working environment.

Planned Learning Activities and Teaching Methods:
- Activities focussing on the interrelation between reception and production;
- Intensive training towards the independent acquisition and consolidation of vocabulary and verbal phrases as well as complex grammatical phenomena and syntactical structures;
- Blended learning, flipped classroom and self-studying components;
- Controlled, guided and free in-class activities;
- Individual, partner and group work activities;
- Whole-class activities;
- Lectures, discussions, presentations, debates etc., including aspects of common everyday situations, professional encounters with technical language, internship application and intercultural phenomena;
- Preparation for assignments and exams;
- Writing a CV and a cover letter;
- Preparation for the official B2 exam according to the CEFR.

Recommended or Required Reading:
- Koithan U., Mayr-Sieber T., Schmitz H., Sieber T., Sonntag R., Lösche R.-P., Moritz U., Aspekte neu B2.2 Lehrbuch, 10th Edition, Ernst Klett Sprachen, Stuttgart, 2021.
- Koithan U., Schmitz H., Sieber T., Sonntag R., Aspekte neu B2.2 Arbeitsbuch, 10th Edition, Ernst Klett Sprachen, Stuttgart, 2022.
- Lütke M., Moritz U., Rodi M., Aspekte neu B2 Intensivtrainer, 3rd Edition, Ernst Klett Sprachen, Stuttgart, 2019.
- Frater A., Schäfer N., Weidinger S., Mit Erfolg zum Goethe-Zertifikat B2, 2nd Edition, Ernst Klett Sprachen, Stuttgart, 2020.
- Lode-Gerke M., Pourseifi M., Weidinger S., Mit Erfolg zum TestDaF, 10th Edition, Ernst Klett Sprachen Stuttgart, 2020.
- Handouts for Reading, Listening, Writing and Speaking Comprehension (German Language Center).
- Handouts/Readers for Technical Language, Application Training and Intercultural Communication (German Language Center).

Usability of the Module:
This is a compulsory module in the Bachelor's program for students of all schools (except SAHL) and the last of six language modules within the optional B2 track offered by the German Language Center, qualifying the

students to master the official B2 exam according to the CEFR which is conducted internally at the German Language Center or in cooperation with the 'Goethe-Institut' or the 'TestDaF-Institut'. Eventually, the module enables the students to pursue the 'German Year' which consists of one semester at one of the GJU's German partner universities as well as of an internship in a German company or organization. The module is divided in twelve sub-groups according to the students' different majors:

- Architecture (GERL302ARCH);
- Design and Visual Communication (GERL302DES);
- Management Science (GERL302MNG);
- Logistic Sciences (GERL302LOG);
- International Accounting (GERL302ACC);
- Computer Science, Computer Engineering, Communications Engineering, Electrical and Communication Engineering, Electrical Engineering (GERL302IT);
- Industrial Engineering (GERL302IE);
- Mechatronic and Mechanical Engineering (GERL302MM);
- Energy Engineering (GERL302EWE);
- Civil and Environmental Engineering (GERL302CE);
- Biomedical Engineering (GERL302BM);
- Pharmaceutical and Chemical Engineering (GERL302CH).

Prerequisites and Co-requisites:
GERL301B2: German V (B2 Track) (prerequisite)

Language of Instruction:
German

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Military Science [For Jordanians Only]	MILS100

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Participation and Homework
10% Presentation
40% Final exam

Responsible Lecturer(s)

Military Science Office at GJU

Course	Mode of Delivery	Contact Time	Self-Study
MILS100	Face-to-face; blended learning	45	15

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 5 hours;
- Exercises and self-reading at home: 5 hours;
- Preparation of Midterm exam and final exam: 5 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Express his/her national feeling and loyalty to the country's leadership and encourage their pride in Jordanian constants and values.
- Demonstrate an overall general military education.
- Comprehend and understand the capabilities of the Jordanian Armed Forces.
- Comprehend and understand the capabilities of the Arab Army and other security agencies.
- Comprehend and understand the role of the Jordanian Armed Forces and the Arab Army in developing and serving the Jordanian society.

Module Contents:

- The evolution and development of the Hashemite Kingdom of Jordan and the Jordanian Armed Forces - the Arab Arm;
- Roles of the Jordanian Armed Forces - The Arab Army;
- Development of Security and Protection Agencies;
- Citizenship and Challenges.

Planned Learning Activities and Teaching Methods:

- Classroom lectures using PPT Slides;
- Interactive discussions.

Recommended or Required Reading:
Military Science Book; 2020 Edition

Usability of the Module:
The Military Science course is a mandatory course in all of Jordanian universities. It promotes and increases Jordanian university students' national feeling and loyalty to the country's leadership and encourage their pride in Jordanian morals and values, while providing them with an overall general military education. In addition, highlighting the capabilities of the Jordanian Armed Forces / Arab Army and other security agencies, their capabilities and their role in developing and serving the Jordanian society through predefined lectures and comprehensive material. Overall knowledge of the role of the armed forces in society instils in people a deep respect for them rather than misunderstanding their presence or role in any society.

Prerequisites and Co-requisites:
ARB099: Arabic 99 (prerequisite)

Language of Instruction:
Arabic

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
National Education	NE101

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

30% mid-term exam
10% written report,
10% presentation
10% students' class discussions and participation
40% final exam

Responsible Lecturer(s)

Dr. Abdallah Raggad
Dr. Safa Shweihat

Course	Mode of Delivery	Contact Time	Self-Study
National Education	Face-to-face; blended learning (Online platform Edraak)	45	15

Duration of Study:
One Semester.

Allocation of Workload Hours:

- Presence time in classroom lectures, exercises and presentations: 15 weeks * 1.5 hours = 22.5 hours;
- Presence on online platform Edraak: 15 weeks * 1.5 hours = 22.5 hours;
- Preparation and practicing oral presentation: 5 hours;
- Exercises and self-reading at home: 5 hours;
- Preparation of Midterm exam and final exam: 5 hours.

Learning Outcomes:
By the end of the course students will

- Understand and apply the balance between behavioral claims such as "the rights of the citizen, and compliance with obligations" as stipulated by the Jordanian Constitution.
- Commit to the values of good citizenship: responsible freedom, positive and active participation, equality and equal opportunities, solidarity, cooperation and the preservation of public property.
- Demonstrate a commitment to the rights and duties as a Jordanian citizen according to the constitution, as well as the ethics of the Jordanian society.
- Create a sense of respect and appreciation for the diversity of ethnic, religious and cultural references in Jordanian society.
- Question behavior which conflicts with the supreme national interest and will demonstrate national unity and loyalty.
- Integrate voting or running for election in various types of elections on objective grounds in their role as a citizen.
- Differentiate between the terms of National Education: affiliation, loyalty, the supreme national interest, political development and democracy, the political culture, good citizenship, equality and participation.

Module Contents:

- Introduction to Civic Education;
- History of the Hashemite Kingdom of Jordan;
- Development and population;

- Political system in Jordan, and its process of democratization;
- Jordan's economy;
- Jordanian society and change;
- National security in Jordan;
- Education system in Jordan.

Edraak Online platform: Video interviews on:

- History of Jordan;
- Role of women in Jordan;
- Political challenges;
- Cultural issues and challenges.

Planned Learning Activities and Teaching Methods:

- Lectures;
- Edraak online platform;
- Dialogue and discussion;
- Student class presentation;
- Scientific reports;
- Following-up on important or problematic Jordanian events.

Recommended or Required Reading:

- سعيد التل، سهيلة بنات ، وهالة بوادي ، وآخرون "التربية الوطنية / الاردن أنموذج "(2020)
- Safa Shweihat, "The role of universities in the development of political awareness among students and ways to develop It " An-Najah University Journal for the humanities, Vol (34) No (10), 2020
- Safa Shweihat, "The Role of Education Faculties at Jordanian Universities in Developing Citizenship among Students", Dirasat, Human and Social Sciences, University of Jordan, VOL 46, 2, 2019
- Safa Shweihat, "The Foundation of National Education "2006
- Safa Shweihat, "Jordanian Citizenship "2009
- George Joffe Editor, Hurst & Co, "Jordan in Transition 1990-2000," 2003
- Royal Hashemite Court. "The Jordanian Constitution" 1952
- Bill Coplin, "Manual for good Citizenship, Public policy Skills in Actions," 2010
- Edraak online platform videos and material

Usability of the Module:

National Education is a mandatory course by the Jordanian Government in every university to teach students Jordanian laws and citizen responsibilities. It is an important course because it helps students understand their diverse culture and the role of government in addition to the role of individuals in making a country united and successful. They will carry this sense of loyalty and understanding with them anywhere they go because they appreciate that any individual in any country regardless of whether they are a citizen or a visitor have both rights and responsibilities.

Prerequisites and Co-requisites:

ARB099: Arabic 99 or a passing grade of 50 or above on the Arabic placement test (prerequisite).

Language of Instruction:

Arabic

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
National Education in English	NEE101

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term Examination
40% Final Exam
10% Presentations
10% Class work activities (debates, written exercises)
5% Participation
5% Quizzes

Responsible Lecturer(s)

Dr. Thelal Oweis

Course	Mode of Delivery	Contact Time	Self-Study
National Education in English	Face-to-face; blended learning	45	15

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in classroom lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 5 hours;
- Exercises and self-reading at home: 5 hours;
- Preparation of Midterm exam and final exam: 5 hours.

Learning Outcomes:
By the end of the course students will

- Understand and apply the balance between behavioral claims such as "the rights of the citizen, and compliance with obligations" as stipulated by the Jordanian Constitution.
- Commit to the values of good citizenship: responsible freedom, positive and active participation, equality and equal opportunities, solidarity, cooperation and the preservation of public property.
- Demonstrate a commitment to the rights and duties as a Jordanian citizen according to the constitution, as well as the ethics of the Jordanian society.
- Create a sense of respect and appreciation for the diversity of ethnic, religious and cultural references in Jordanian society.
- Question behavior which conflicts with the supreme national interest and will demonstrate national unity and loyalty.
- Integrate voting or running for election in various types of elections on objective grounds in their role as a citizen.
- Differentiate between the terms of National Education: affiliation, loyalty, the supreme national interest, political development and democracy, the political culture, good citizenship, equality and participation.

Module Contents:

- Introduction to Civic Education:
  - What is National Education? Why do we study National Education?
  - History of the Hashemite Kingdom of Jordan;
  - Jordan on the map of the world, flag of Jordan, map of Jordan.

- Historical Background: Development and population:
  - Great Arab Revolt 1916, Sykes - Picot Agreement 1916;
  - Lawrance of Arabia;
  - Balfour Declaration of 1917; Arab Government in Damascus 1918-1920;
  - The Emira era 1921-1946: Jerusalem Conference March 1921. Forming the government of 11th April 1921;
- Political system in Jordan, and its process of democratization:
  - Declaration of Independence and turning Jordan into the kingdom;
  - Arabization of the Arab Army, 1956;
  - June war 1967; Karama War 1968;
  - Jordanian Constitution: The King; the executive power;
  - Judiciary and legislative authority.
- Jordan's economy;
- Jordanian society and change;
- National security in Jordan;
- Education system in Jordan.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in group work.

Recommended or Required Reading:

- Kamal Salibi, "A Modern History of Jordan" 1998, second ed.
- Philip Robins, "A History of Jordan" 2nd ed. 2019
- King Abdullah II "Our Last Best Chance: A Story of War and Peace" 2012

Usability of the Module:

National Education is a mandatory course by the Jordanian Government in every university to teach students Jordanian laws and citizen responsibilities. It is an important course because it helps students understand their diverse culture and the role of government in addition to the role of individuals in making a country united and successful. They will carry this sense of loyalty and understanding with them anywhere they go because they appreciate that any individual in any country regardless of whether they are a citizen or a visitor have both rights and responsibilities.

National Education in English specifically is offered instead of National education in Arabic to suit the diverse background of our students. Since some of our students were raised abroad or others might have been in international school programs their Arabic is not sufficient enough to excel at this course in Arabic. Therefore, for the sake of inclusivity and so as not to lower these students' GPA, the German Jordanian University offers the course in English.

Prerequisites and Co-requisites:

ARB099: Arabic 99or a passing grade on the Arabic placement test (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Business Entrepreneurship	BE302

Compulsory Module		**Year of Study**	3	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term exam
10% Participation
10% Quiz
10% Project
40% Final exam

Responsible Lecturer(s)

Dina El Hindi

Course	Mode of Delivery	Contact Time	Self-Study
Business Entrepreneurship	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours
- Preparation project: 10 hours
- Exercises and self-reading at home: 15 hours
- Preparation of Midterm exam and final exam: 20 hours

Learning Outcomes:
By the end of this module, the student will be able to

- Demonstrate improved management, creativity and thinking skills.
- Understand the basic development of entrepreneurship as a profession and comprehend various business models.
- Identify capital resources for new ventures and small businesses.
- Recall basic knowledge of human resource management for small businesses and will understand the social responsibilities of small business managers.
- Create their own vision, write a business plan, lead with their vision, and sell their own vision to become a real project**.**

Module Contents:

- Entrepreneurship mindset;
- Creativity;
- Social responsibility;
- Stakeholders;
- SWOT Analysis;
- Setting goals;
- Planning (action plans);
- Business models;
- Marketing;
- Branding;
- Pricing Models;

- Budgeting.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Project planning.

Recommended or Required Reading:

- Luis Cota, “Business Inception: Successful Tools for Entrepreneurs” 2021.
- Kevin D. Johnson, “The Entrepreneur Mind: 100 Essential Beliefs, Characteristics, and Habits of Elite Entrepreneurs” 2013.
- Donald Kuratko, “Entrepreneurship: Theory, Process, Practice”, 11th ed., 2019.

Usability of the Module:

Since the German Jordanian University is an applied university, the Business Entrepreneurship course is an important course for students because it enables them to approach their careers as an entrepreneur and an innovator. It enables them to bring positive change in the society and their lives through this innovation. Business Entrepreneurship can complement any major they choose in university as it teaches them to adopt the entrepreneurial mind-set and behave responsibly and ethically in their roles as entrepreneurs or better understand the business environment as an employee.

Prerequisites and Co-requisites:

ENGL101: English III (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Arts' Appreciation	DES101

Compulsory Module		**Year of Study**	Any	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

Portfolio:
25% Midterm Exam
25% Report and Presentation
10% Attendance and Participation
40% final exam

Responsible Lecturer(s)

Prof. Ziyad Haddad

Course	Mode of Delivery	Contact Time	Self-Study
Arts' Appreciation	Face-to-face; blended learning	45	45

Duration of Study:
One Semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Research Paper and self-reading at home: 15 hours;
- Preparation of presentation = 10 hours:
- Preparation of mid exam and final exam: 20 hours.

Learning Outcomes:
Students who attend all lectures, complete all course requirements successfully will gain the following learning outcomes:

Knowledge and Understanding:

Students passing this course will be able to:

- They will be able to understand art works within an objective framework based on informed historical context, style, form, meaning, subject matter and content.
- They will be able to deduce and read cultural, social, and aesthetic messages and symbolic statements and to identify visual elements of art works.
- Assessment: will examine student's ability to employ theoretical and historical knowledge in a plausible critical, objective rather than subjective, arguments.

Cognitive and intellectual skills (thinking and analysis):

Students passing this course will be able to:

- Understand the relation between aesthetic visual forms and their embedded meanings.
- Show a high sense of understanding of the correlation between form and context in order to grasp, understand, recognize, and distinguish between the formal qualities of art work and its socio-cultural themes and concepts.
- Assessment: will examine active participation and accumulative positive progress knowledge, objective reading, research and ability to practice academic critical writing.

Communication skills (personal and academic):

Students passing this course will be able to:

- Show significant progress towards acceptable independent thinking in relation to analysing and understanding art work.
- Demonstrate acceptable level of communicating their conceptual thoughts in written forms. Oral and written skills are vital towards the development of a highly educated personality to understand, appreciate and criticize art work.
- Assessment: will examine the ability to put forward plausible arguments and counter arguments, throughout the course verbally, and in writing.

Professional skills:

Students passing this course will be able to:

- Further develop and employ their understanding and education in professional life by means of the theoretical skills, the learning curve, know how, and practical skills they have acquired throughout this course.
- Assessment: will test the progress of individual cases, attendance, and responsible behaviour.

Practical and subject specific skills (transferable skills):

Students passing this course will be able to:

- Identify their inclinations to art history and standpoint on art criticism.
- Analysis and be more self-aware of their own stand from the world of art, and the real world around.
- Assessment: will examine the ability to do group work, relate to the course. be punctual, do homework, meet deadlines and work under pressure.

Overall:

By the end of this module, the students will be able to:

- Comprehend and understand key theoretical concepts about art.
- Identify key historic moments in art evolution and development.
- Understand the fine arts of different periods, styles, movements, and media.
- Identify and understand visual elements of design principles of art works.
- Be critical in an objective rather than subjective manner and better informed about art in general.
- Understand art within a theoretical and cultural framework, purpose and meaning.
- Comprehend the universal and timeless potentials and qualities characterizing great art works.
- Evaluate, improve and develop their understanding of art world's cultures.

Module Contents:

This course is a study of the major art styles and movements appeared since the late 19th century to the early 21st century. The course explores the different economic, cultural, scientific and other changes that influence the artistic creative developments within global and historical contexts. Emphasis will be based on the understanding of stylistic development including the rise of avant-garde groups, the eventual triumph of Modernism, and the development of Postmodernism and contemporary art. Upon the completion, students should be able to identify and analyse a variety of artistic styles, periods, and media.

Planned Learning Activities and Teaching Methods:

Sessions include lectures and (group) discussions with accompanying PowerPoint presentation of images, concepts, vocabulary terms, study questions, and suggested readings. The material presented in the lecture closely follows the images and concepts in the assigned reference materials in addition to other information that are to be researched by the students. Students will be responsible for all the material covered in both the lecture and reference materials that relate to topic.

Through a small project assignment, each student will have the opportunity to employ theoretical understanding into an assigned art work to be described, analysed and interpreted aesthetically within cultural and historical contexts.

The students will work individually and in teams. They will undergo major blocks of research towards presenting their research results. First, they will learn various theoretical frameworks on art works. Second, they will learn about the analytical methods that allow them to understand and criticize the different art movements and approaches and go in groups and individually in developing their analysis.

Recommended or Required Reading:

- Schlam, Carolyn (2020), The Joy of Art: How to Look at, Appreciate, and Talk about Art. Allworth. ISBN: 1621537056, 9781621537052, Simon and Schuster, New York
- Gordon, Pamela (2019), Art Matters: A Contemporary Approach to Art Appreciation. Oxford University Press, Oxford.
- Kleiner, Fred S. (2013), Gardner, Helen: Gardner's Art through the Ages. Boston, MA: Wadsworth Cengage Learning.
- Russel, J. (1981), The Meanings of Modern Art, Museum of Modern Art i. a., New York.
- Greenough, H. (1947), Form and Function, University of California Press, Berkeley, CA.

- Jones, A., (2006), A Companion to Contemporary Art since 1945. Blackwell Publishing Ltd., Malden, MA.
- Barrett, Terry. (2007), Teaching Toward Appreciation. International Handbook of Research of Arts Education, in: Liora Bresler, (ed). International Handbook of Research in Arts Education. Springer, New York: pages 639-654

Usability of the Module:
Students will acquire soft skills that could be of some meaning for their personal development and therefore also for their professional life. Through the course offered, the students can reflect their own appreciations, develop and defend standpoints, become accustomed to group work, research, presentation. The course enables the students to develop themselves into informed citizens. The course can be taken by all disciplines as it caters for an introduction to art in the daily life and therewith, they can perceive the urban environment in a more holistic manner.

Prerequisites and Co-requisites:
None

Language of Instruction:
English

Recommended Optional Program Components
None

Bachelor

Module Title	Module Code
Leadership and Emotional Intelligence	EI101

Compulsory Module		**Year of Study**	1	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term exam
10% Oral presentation
10% Scrapbook
10% Class activities and participation
40% Final exam

Responsible Lecturer(s)

Dina El Hindi
Dr. Bassmah Altaher
Dr. Kawthar Karain

Course	Mode of Delivery	Contact Time	Self-Study
Leadership and Emotional Intelligence	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 20 hours;
- Preparation of Midterm exam and final exam: 15 hours.

Learning Outcomes:
By the end of the module, the student will be able to

- Better understand and manage his/her emotions.
- Control the emotional impact they have on others to optimize any situation.
- Understand others and empathize with others, as well as value the importance of social skills and of empathy.
- Apply necessary skills to be leaders both in their personal and professional lives, distinguishing the various styles of leadership and when and how to apply them.
- Analyse their personal lives and evaluate moments of leadership in their lives and implement what they have learned to what they have already encountered and experienced in life.
- Take an intelligent leader's perspective on what they have previously thought was an average experience of themselves or of others.

Module Contents:

- EI test
- Assessing Your Emotional Intelligence
- Universal emotions
- Triggers and emotional hijacks
- Daniel Goleman's EI Model: Self-awareness; self-management; empathy; social skills
- Women in leadership roles

- Emotional labor
- The Open Loop
- Understanding the science of moods
- Mirroring and emotional contagion
- Leadership vs. management
- Top 10 leadership qualities of a manager
- Ethics and leadership
- Leadership that gets results (leadership styles)
- Feedback
- Teamwork
- Self-improvement: Comfort zone
- Being realistic
- Antithesis theory

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions
- Exercises in class and at home
- Writing and presenting alone or in group work

Recommended or Required Reading:

- Daniel Goleman, "Emotional Intelligence", 2010
- Daniel Goleman, "What Makes a Leader: Why Emotional Intelligence Matters ", 1, 2013
- Travis Bradberry & Jean Greaves, "Emotional Intelligence 2.0", 2009
- James Kouzes & Barry Posner, "The Leadership Challenge", 5th ed., 2012

Usability of the Module:
The skills students will learn will serve them during the course of their studies in project related courses, courses that require teamwork and especially during local field training and international internship. It will also help them succeed in any career they choose because emotional intelligence is currently a key requirement of employers in any field. In addition, individuals who learn the skills highlighted in this course are more likely to avoid miscommunication, reach consensus, manage stress and deal with conflicts effectively.

Prerequisites and Co-requisites:
ENGL101: English III (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
Intercultural Communications	IC101

Compulsory Module		**Year of Study**	1	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term exam
10% Participation
20% Short essay quizzes
40% Final exam

Responsible Lecturer(s)

Dr. Eva Haddad

Course	Mode of Delivery	Contact Time	Self-Study
Intercultural Communications	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation for essay quizzes: 10 hours;
- Self-reading and chapter questions at home: 20 hours;
- Preparation of Midterm exam and final exam: 15 hours.

Learning Outcomes:
By the end of the module the student will be able to

- Realize the importance of intercultural communication and the power to exchange ideas, thoughts and having a win-win approach when dealing with others.
- Demonstrate intercultural communication in a manner that understands, comprehends and empathizes with the other while maintaining a sense of identity and appreciation for one‘s own culture.
- Demonstrate the skills of sending and receiving messages between people whose cultural background could lead them to interpret verbal and nonverbal signs differently.
- Recognize the diversity of these cultural differences and at the same time distinguish the possibilities to overcome them.

Module Contents:

- Identity;
- Culture;
- Communication;
- Barriers to intercultural communication;
- Communication competence;
- Nonverbal communication across cultures;
- Future challenges to intercultural communication;
- Acculturation and deculturation;
- The stress Adaptation Growth Dynamic;
- Intercultural identity and cultural relativism.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing Short essays.

Recommended or Required Reading:

- Fred Jandt, "Intercultural Communication ", 9th edition, 2018
- Larry A. Samovar, "Communication Between Cultures", 8th edition, 2013
- Larry A.Samover, "Intercultural Communication A reader", 14th edition, 2015

Usability of the Module:

Students will be empowered with the tools that offer powerful possibilities for improving the communication process. The skills students will learn will serve them to acquire skills for a lifetime. It empowers them with abilities to becoming competent communicators, realizing the concepts of cultural relativism and world citizenship, and embracing cultural differences through verbal and nonverbal communication. This will create in them a sense of empathy and respect for various identities and teach them to value the importance of our shared human identity. Finally, students will value diversity and work towards inclusion and harmony with their world. The skills acquired in the module will prepare the students for their mandatory German Year. The University's efforts to recognize and surmount cultural differences bears the potential to open up business and social opportunities throughout the world and maximize the contribution of all the citizens in a diverse world.

Prerequisites and Co-requisites:

ENGL101: English III (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Sports and Health	PE101

Compulsory Module		**Year of Study**	1	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Mid-term exam
10% Report presentation
10% Class activities and participation
40% Final exam

Responsible Lecturer(s)

Fawwaz Al-Saqqar

Course	Mode of Delivery	Contact Time	Self-Study
Sports and Health	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing report presentation: 10 hours;
- Exercises and self-reading at home: 20 hours;
- Preparation of Midterm exam and final exam: 15 hours.

Learning Outcomes:
By the end of the module, the students will be able to

- Identify and summarize the important features of Health Culture in their lives and to link between sports and health.
- Apply what they learned in their everyday lives for optimal health.
- Apply important concepts and principles of first aid to treat any accidents that might occur and to avoid injuries during sport or otherwise.
- Identify nutrition science by recognizing the essential food elements, components and facts.
- Make educated choices when choosing their meals for better health.
- Identify and understand Olympic values and practices.
- Demonstrate their knowledge about the significance of current research in sports and health by writing and presenting a report.

Module Contents:

- Introduction to sports and health;
- Health and fitness;
- Physical fitness (component, benefits);
- Nutrition;
- Obesity;
- Diabetes;
- Olympic;
- Olympic values;
- Sports in Jordan;

- Doping;
- Smoking;
- Sport injuries and first aid;
- Hooliganism.

Planned Learning Activities and Teaching Methods:

- Lectures with intensive discussions;
- Exercises in class and at home;
- Writing and presenting alone or in group work.

Recommended or Required Reading

- Muhammad Mobaideen, Muhammad al-Sakran. "Sport and health in our life". 1st ed., 2012.
- Zine El Abidine Bani Hani et. al. "Principles of Physical Education". 1st ed., 2016.
- Youssef Lazem Kamlan. “Sports, Health and Environment”. 2016
- Subhi Kabalan, “Introduction to Physical Education - Sport for All”, 1st ed., 2014.
- Saleh Abdullah Al-Zoubi. "Sports and Health" 2011
- Hazem Al Nahar, "Sport and health”, 2012
- A varied summary that combines multiple topics related to the course, prepared by the course instructor Fawwaz Al-Saqqar, 2021

Usability of the Module:

In addition to improved physical health, the skills and knowledge students learn will serve them by improving academic achievement, increasing their self-esteem, decreasing behavioural problems, and improving psychosocial conduct. In addition, students who learn the knowledge and skills highlighted in this course are more likely to be able to distinguish, realize, practice and improve the physical, mental, psychological and social health role in their life circle. By learning healthy nutrition, the importance of sports, and basic first aid, students will be able to lead healthier lives and healthier families. They will be a more productive, healthy part society and will less likely be a liability to the government, society and health sector. Learning these skills will also allow students to be more independent during their German internship year as they are more aware of general health practices and are able to apply basic first aid practices.

Prerequisites and Co-requisites:

ARB099: Arabic 99 (prerequisite)

Language of Instruction:

English with occasional Arabic explanations

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Social Entrepreneurship and Enterprises	SE301

Compulsory Module		**Year of Study**	3	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term exam
20% Case study
10% Class activities & participation
40% Final exam

Responsible Lecturer(s)

Rasha Al-Hijazeen

Course	Mode of Delivery	Contact Time	Self-Study
Social Entrepreneurship and Enterprises	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises and presentations: 15 weeks * 3 hours= 45 hours;
- Preparing and analysing case studies: 10 hours;
- Preparing and studying at home: 20 hours;
- Preparation of midterm and final exams: 15 hours.

Learning Outcomes:
At the end of this course, students will be able to

- Design a business plan for a social venture.
- Outline the field of social entrepreneurship and many of the opportunities, challenges, and issues facing social entrepreneurs.
- Recall their research on leading social entrepreneurs who are using business skills to address complex social problems.
- Integrate the learned concepts and how business skills can be the solution to many social problems.
- Applying solutions challenges in the field of social entrepreneurship.

Module Contents:

- The meaning of a social enterprise;
- Examples of social enterprises;
- Social enterprises, private sector and charities;
- Mission and purpose;
- Business plan in a nutshell;
- Vision, mission and values;
- Branding;
- Commercial strategy;
- Quality assurance;
- Marketing and sales funnel;
- Market research;
- Competitor analysis;

- Marketing and PR channels;
- Sales strategy;
- Sales target;
- Managing finance;
- Social enterprise budgeting.

Planned Learning Activities and Teaching Methods:

- Lectures with engaging and interactive discussions;
- In-class group activities;
- Presenting and analysing case studies in groups.

Recommended or Required Reading:

- Muhammad Yunus & Karl Weber, “Building Social Business”, 2011”
- Daniel Lubetzky “Do the Right Thing”, 2015
- Rory Ridley-Duff & Mike Bull “Understanding Social Enterprise: Theory and Practice”, 3rd ed. 2019.

Usability of the Module:

Social Entrepreneurship is a field which is becoming increasingly important in today’s world. Ending poverty and unemployment, establishing peace, reducing global warming, and improving public education and healthcare are but a few examples of long-term goals social entrepreneurs work innovatively to achieve. In addition, social entrepreneurs enjoy vision, leadership skills and capacities, knowledge of social concerns and the capabilities to strategically plan and execute successful projects that are meant to cause long lasting change. Enterprises run on business principles for a social cause, and businesses paying attention to social concerns are becoming very vital to achieving sustainable and comprehensive development. When we teach our students the necessary skills to achieve this, we contribute to the overall betterment of society to complement whatever their field of study.

Prerequisites and Co-requisites:

Engl101: English III (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Soft Skills	SFTS101

Compulsory Module		**Year of Study**	1	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

30% Mid-term exam
10% Oral presentation
20% Quizzes
40% Final exam

Responsible Lecturer(s)

Dr. Eva Haddad
Dr. Deema Khasawneh

Course	Mode of Delivery	Contact Time	Self-Study
Soft Skills	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, presentations: 15 weeks * 3 hours = 45 hours;
- Preparation and practicing oral presentation: 10 hours;
- Exercises and self-reading at home: 20 hours;
- Preparation of Midterm exam and final exam: 15 hours.

Learning Outcomes:
By the end of the module, the student will be able to

- Demonstrate the required skills to become a self-learning, interactive and proactive individual, empowered with critical thinking abilities.
- Recognize the different soft skills needed in their daily lives and their future career including but not limited to communication skills, presentation skills, time management, leadership, teamwork and problem solving and negotiation.
- Integrate their personal development skills and interpersonal skills to advance their private and professional lives.
- Succeed in any interview and master self-confidence and self-monitoring.

Module Contents:

- Soft skills and critical thinking;
- Personal development;
- Personal skills for the mind;
- Personal SWOT analysis;
- Creative thinking;
- Emotional intelligence;
- Self-awareness;
- Time management;
- Communication skills;
- Listening skills;

- Nonverbal communication;
- Verbal communication;
- Conflict resolution;
- Groups and teams;
- Decision making;
- Problem solving;
- Negotiation skills;
- Leadership skills;
- Entrepreneurship;
- The seven habits of highly effective people;
- Job skills activities.

Planned Learning Activities and Teaching Methods:

- Students' Presentation;
- Exercises in class and at home;
- Discussions in class.

Recommended or Required Reading:

- Kumar E. Suresh, Sreehari P, J Savithri. “Communication Skills and Soft Skills - An Integrated Approach” 2011
- Bruce Tulgan. “Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today’s Young Talent” 2015
- John Sonmez. “Soft Skills: The Software Developers Life Manual” 2020
- Zsolt Nagy. “Soft Skills to Advance Your Developer Career: Actionable Steps to Help Maximize Your Potential” 2019
- Stephen Covey “The Seven Habits of Highly Effective People.” 2020

Usability of the Module:
Soft skills are a very important but often overlooked part of a student’s education. This course helps students by combining the hard skills they learn in their major with the soft skills that make them a more suitable candidate for further opportunities such as higher education, scholarships and job opportunities. The course’s focus on the skills needed to develop their social and work-life skills makes them especially well-equipped to travel abroad for their German Year, including the German Year Internship Semester. They will have all the skills needed to interact with a new culture, exhibit teamwork, problem solving skills, and creativity (to name a few), all while portraying their own nationality in an appropriate manner.

Prerequisites and Co-requisites:
ENGL101: English III (prerequisite)

Language of Instruction
English

Recommended Optional Program Components
None

Bachelor

Module Title	Module Code
Technical and Workplace Writing	TW303

Compulsory Module		**Year of Study**	3	**Semester Hours**	3
Elective Module	X	**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	3
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Participation
20% Writing Assignments
30% Midterm Exam
40% Final Exam

Responsible Lecturer(s)

Dr. Bassmah B. AlTaher

Course	Mode of Delivery	Contact Time	Self-Study
TW303	Face-to-face; blended learning	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures, exercises, and presentations: 15 * 3 hours = 45 hours;
- Preparation and practicing writing assignments: 20 hours;
- Exercises and self-reading at home: 10 hours;
- Preparation of Midterm exam and final exam: 15 hours.

Learning Outcomes:
By the end of this course, students will be able to

- Produce different processes of writing and how to share information in a professional setting and convey information in the clearest and most effective manner.
- Apply skills of a good technical writer and to be concise, focused, clear, error-free, and audience based.
- Convey their message ethically, fully aware of who their audience is and what the audience knows in order to make their writing efficient and effective.
- Deliver a clear message, use multiple forms of communication for external and internal audiences.
- Acquire the skills to be attentive to detail and work in collaboration with a project team.
- Gather data and analyze, plan and prioritize, and know how to deal with scientific knowledge used for administrators.

Module Contents:

- Professionalism and Ethics:
  - Thinking logically;
  - Citing sources and avoiding plagiarism;
  - Using plain language.
- Writing in a professional and ethical manner.
- The Writing process:
  - Defining your purpose;
  - Defining the target audience;
  - Finding the topic;
  - Understanding tone;
  - Choosing format;

    - The document cycle;
    - Creating a schedule;
    - Collaboration;
    - External audience;
    - Worksheet;
    - Web audience worksheet.
- Short Communications:
    - I-centered vs. You-centered language;
    - Emails and email checklists;
    - Memos and memo checklists;
    - Letters and letter checklists.
- Page Design:
    - How readers read;
    - Readability;
    - White space;
    - Bullets and numbering;
    - Headings and subheadings;
    - Organization;
    - Style sheets.
- Summaries:
    - The summary writing process;
    - Abstracts;
    - Descriptive summaries;
    - Evaluative summaries;
    - Executive summaries.
- Short Reports:
    - General formats;
    - Incident report;
    - Meeting minutes report;
    - Event report;
    - Progress report;
    - Evaluation / recommendation report;
    - Budget report;
    - Short report checklist.
- Graphics:
    - The power of showing;
    - Types of graphics:
    - Photographs;
    - Drawings;
    - Diagrams;
    - Graphs, charts, and tables;
    - Logos, symbols, icons, clip art;
    - Guidelines for using graphics;
    - Choosing the right graphic.
- Proposals:
    - Considering the audience;
    - Organization;
    - Document style.
- Writing for the Web:
    - Purpose and audience;
    - Ethical standards and cultural sensitivity;
    - Graphics on the web;
    - Page design;
    - Content: hard copy to web copy;
    - Blogging.

Planned Learning Activities and Teaching Methods:
Technical writing uses a wide range of programs to create and edit illustrations and diagramming programs to create visual aids and document processors to design, create, and format documents. The instructor will incorporate different teaching approaches for the purpose of presenting vital writing skills to the participants by using intensive writing assignments and exercise drills. A fair amount of homework will be given to allow students a chance to revise what they have learned during the lectures. One-to-one discussions and learning samples are part of the comprehensive learning process.

Recommended or Required Reading:

- Alred, Gerald J & Brusaw, Charles T. & Oliu, Walter E. The Handbook of Technical Writing with 2020 APA Update, 12th Ed. (2020)
- Markel, Mike & Selber, Stuart A. Technical Communication, 12th Ed. (2017)
- Johnson, Nell and Sylwester, Mary. Technical Writing Simplified, 4th Ed. (2017)
- Pringle, Alan S. & O'Keefe, Sarah S. Technical Writing 101: A Real World Guide to Planning and Writing Technical Content, 3rd Ed. (2009)

Usability of the Module:

The Technical and Workplace Writing course focuses on essentials; it introduces students to professional and technical writing through a straightforward structure, adding knowledge while practicing different forms and skills. Since this course is a practical one, the course offers the (how – instructions) and the (what – examples) with discussion topics and exercises designed to make instruction straightforward. Students are exposed to certain genres, such as web page design, summaries, and proposals. This is why this course is designed with a student / worker in mind, who would greatly benefit from the techniques of writing presented throughout the course. This course is also designed to support all other courses in the student's major and higher education, if the student chooses to pursue it, because it teaches them the various forms of technical writing they may need to succeed. This will culminate later in the Graduation Project/Thesis.

Prerequisites and Co-requisites:

ENGL101: English III (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Pre Math	MATH099

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	90
Optional Module		**Winter Semester**	X	**ECTS**	0
Pre-university	X	**Pre-program**		**Remedial**	

Examination

30% Midterm exam
20% Quizzes
40% Final exam

Responsible Lecturer(s)

Mrs. Anwar Bostanji
Dr. Laith Hawawsheh
Dr. Dia Zeidan
Dr. Mohammad AlQudah
Dr. Mohamad Abudayah
Dr. Omar Al-Omari

Course	Mode of Delivery	Contact Time	Self-Study
Pre Math	Face-to-face	45	45

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks * 3 hours: 45 hours;
- Exercises and self-reading at home: 15 hours;
- Preparation for quizzes: 10 hours;
- Preparation for theoretical exams: 20 hours.

Learning Outcomes:
By the end of the module, the student will be able to

- Discuss linear functions and quadratic functions, which belong to the class of polynomial functions.
- Analyze polynomials and rational functions.
- Decipher whether these functions belong to the class of algebraic functions, that is, functions that can be expressed in term of sums, differences, products, power, or root of polynomials.
- Demonstrate knowledge of inverse functions and understand their properties, particularly the relationship between the domain and range of a function and its inverse.
- Define the exponential function and the inverse of the exponential function, the logarithmic function.
- Define the six trigonometric functions using the unit circle.
- Evaluate the trigonometric functions.
- Graph sinusoidal functions.
- Define the inverse trigonometric functions and solve equations involving the trigonometric functions.

Module Contents:

- Functions and Their Graphs;
- Linear and Quadratic Functions;
- Polynomial and Rational Functions;
- Exponential and Logarithmic Functions;
- Trigonometric Functions;

- Analytic Trigonometry;
- Applications of Trigonometric Functions.

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Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions.

Recommended or Required Reading:

- Michael Sullivan, Precalculus, 11th Edition, 2021
- Robert Blitzer, Precalculus, 6th Edition, 2017
- Ron Larson, Precalculus, 10th Edition, 2018

Usability of the Module:

The main goal of this course is to provide the student with the basic concepts of functions and the mathematical maturity needed for learning calculus. Students will use skills learned in this course in their calculus series of compulsory courses. This module is a prerequisite of module Calculus I (MATH101).

Prerequisites and Co-requisites:

None

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Calculus I	MATH101

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

40% midterm exam
20% quizzes
40% final exam

Responsible Lecturer(s)

Mrs. Anwar Bostanji
Dr. Laith Hawawsheh
Dr. Dia Zeidan
Dr. Mohammad AlQudah
Dr. Mohamad Abudayah
Dr. Omar Al-Omari

Course	Mode of Delivery	Contact Time	Self-Study
Calculus I	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks * 3 hours: 45 hours;
- Exercises and self-reading at home: 35 hours;
- Preparation for quizzes: 30 hours;
- Preparation for theoretical exams: 40 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Compute the expression for the line tangent to a function at a point.
- Interpret the tangent line geometrically as the local linearization of a function.
- Verify the value of the limit of a function at a point using the definition of the limit.
- Calculate the limit of a function at a point numerically and algebraically using appropriate techniques including l'Hospital's rule.
- Find points of discontinuity for functions and classify them.
- Be able to show whether a function is differentiable at a point.
- Compute the value of the derivative at a point algebraically using the (limit) definition.
- Interpret the derivative of a function at a point as the slope of the tangent line and estimate its value from the graph of a function.
- Differentiate exponential, logarithmic, and trigonometric and inverse trigonometric functions.
- Sketch the graph of the derivative from the given graph of a function.
- Derive the expression for the derivative of elementary functions from the (limit) definition.
- Compute the expression for the derivative of a function using the rules of differentiation. Including the power rule, product rule, and quotient rule and chain rule.
- Compute the expression for the derivative of a composite function using the chain rule of differentiation.
- Differentiate a relation implicitly and compute the line tangent to its graph at a point.
- Interpret the derivative of a function at a point the as the instantaneous rate of change in the quantity modelled and state its units.

- Understand the consequences of the intermediate value theorem for continuous functions.
- Interpret a function from an algebraic, numerical, graphical and verbal perspective and extract information relevant to the phenomenon modelled by the function.

Module Contents:

- Limits and continuity;
- Differentiation;
- Applications of derivatives;
- Integration;
- Integrals and transcendental functions;
- Techniques of integration.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions.

Recommended or Required Reading:

- Joel Hass, Thomas' Calculus: Early Transcendentals 14th edition, 2017
- Howard Anton, Irl C. Bivens, Stephen Davis: Calculus: Early Transcendentals, 11th edition, 2020
- James Stewart, Calculus: Early Transcendentals, 8th edition, 2016

Usability of the Module:

The purpose of this course is to provide the first-year students with the basic skills of mathematics required for the general education courses, and foundation for advance speciality courses. It is an introduction to multiple courses that the science and engineering degrees' students will encounter during their senior years. Therefore, the main goals set forth by this course can be summarized within two main targets:

1. To develop a good understanding of calculus concepts.
2. To apply the acquired knowledge and skills in professional and specialist courses.

Prerequisites and Co-requisites:

MATH099: Pre-Math or passing GJU Math Placement Test (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Calculus II	MATH102

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

40% Midterm exam
10% Quizzes
10% Participation
40% Final exam

Responsible Lecturer(s)

Mrs. Anwar Bostanji
Dr. Laith Hawawsheh
Dr. Dia Zeidan
Dr. Mohammad AlQudah
Dr. Mohamad Abudayah
Dr. Omar Al-Omari

Course	Mode of Delivery	Contact Time	Self-Study
Calculus II	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks * 3 hours = 45 hours;
- Exercises and self-reading at home: 35 hours;
- Preparation for quizzes: 30 hours;
- Preparation for theoretical exams: 40 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Use the concept of the limit at infinity to determine whether a sequence of real numbers is bounded and whether it converges or diverges, interpret the concept of a series as the sum of a sequence, and use the sequence of partial sums to determine convergence of a series, decide whether and to what value an infinite geometric series converge.
- Use comparison with a corresponding integral with other series to decide whether infinite series (including p-series) converge or diverge.
- Decide whether an alternating series converges from the limit and monotonic decrease of the sequence of absolute values of its terms, distinguish between absolute and conditional convergence of series and be aware of the consequences of reordering terms in conditionally converging series.
- Perform the ratio and root test to determine convergence of infinite series, interpret a converging power series as a function.
- Determine the Taylor series of the nth order and determine an upper bound on its remainder, and manipulate Taylor series by substitution and (anti-) differentiation to obtain expansions for other functions.
- Evaluate double and triple integrations over rectangles and general regions.
- Calculate the area by double integration and use triple integration to calculate the volume.
- Perform calculus operations on vector-valued functions, including derivatives and integrals, perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.

- Determine partial derivative and differentials.
- Use the chain rule for functions of several variables, calculate directional derivatives and gradients, determine tangent planes and normal lines and determine extrema and saddle point for functions of several variables.

Module Contents:

- Sequences and series, power series, convergence theorems: integral, ratio, and alternating-series tests;
- Vectors in three-dimensional space;
- Partial derivatives;
- Multiple integrals;
- Topics in vector calculus.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions.

Recommended or Required Reading:

- Joel Hass, Thomas' Calculus: Early Transcendentals 14th edition, 2017
- Howard Anton, Irl C. Bivens, Stephen Davis: Calculus: Early Transcendentals, 11th edition, 2020
- James Stewart, Calculus: Early Transcendentals, 8th edition, 2016

Usability of the Module:

This module provides the first-year students with the mathematics skills required for the general education courses, and foundation for advance speciality courses. This course is a continuation of module Calculus I (MATH101) that focuses on understanding more advance calculus concepts. It is an introduction to multiple courses that the science and engineering degrees' students will encounter during their senior years and a prerequisite to the module Applied Mathematics for Engineering (MATH203) and the module Differential Equations (MATH205) where students utilize skills learned to solve differential equations and evaluate line integrals.

Prerequisites and Co-requisites:

MATH101: Calculus I (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Module Title					Module Code
Applied Mathematics for Engineers					MATH203

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

40% midterm exam
10% quizzes
10% participation
40% final exam

Responsible Lecturer(s)

Mrs. Anwar Bostanji
Dr. Laith Hawawsheh
Dr. Dia Zeidan
Dr. Mohammad AlQudah
Dr. Mohamad Abudayah
Dr. Omar Al-Omari

Course	Mode of Delivery	Contact Time	Self-Study
Applied Mathematics for Engineers	Face-to-face	45	105

Bachelor

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks x 3 hours: 45 hours;
- Exercises and self-reading at home: 35 hours;
- Preparation for quizzes: 30 hours;
- Preparation for theoretical exams: 40 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Demonstrate understanding of the basic concepts underlying complex analysis.
- Demonstrate familiarity with a range of examples of these concepts.
- Prove basic results in complex analysis.
- Apply the methods of complex analysis to evaluate definite integrals and infinite series.
- Determine if a vector field is conservative and find the potential scalar function of a conservative vector field.
- Calculate line integrals and apply the information contained in Green’s Theorem and Stokes’ Theorem.
- Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion.
- Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem.
- Perform common matrix operations such as addition, scalar multiplication, multiplication, and transposition
- Recognize and use equivalent forms to identify matrices and solve linear systems.
- Discuss associativity and noncommutativity of matrix multiplication.
- Compute with and recognize properties of particular matrices.
- Formulate, solve, apply, and interpret properties of linear systems.

- Perform row operations on a matrix.
- Find the transpose of a matrix.
- Recognize and use equivalent statements regarding invertible matrices, pivot positions, and solutions of homogeneous systems.
- Relate an augmented matrix to a system of linear equations.
- Relate a matrix to a homogeneous system of linear equations.
- Multiply matrices.
- Recognize when two matrices can be multiplied.
- Qualitative describe features of a matrix, e.g., diagonal, upper or lower triangular.
- Define what it means for a linear system to be consistent or inconsistent.
- Determine when a system of linear equations has no, one, or many solutions.
- Distinguish between homogeneous and nonhomogeneous systems.
- Identify special matrices like the zero matrix and the identity matrix.
- Solve linear systems of equations using the language of matrices.
- Translate word problems into linear equations.
- Define the inverse of a matrix.
- Compute the inverse of a matrix.
- Provide a definition of the determinant.
- Use determinants and their interpretation as volumes.
- Describe how performing row operations affects the determinant.
- Analyse the determinant of a product algebraically and geometrically.
- Determine the sign of a permutation.
- Compute the determinant of a two-by-two matrix.
- Compute the determinant of a three-by-three matrix.
- Compute the determinant of an upper triangular matrix.
- Compute the determinant of a matrix via cofactor expansion.
- Describe properties of the determinant.
- Relate the determinant of three-by-three matrices to the cross product.
- Describe how the determinant of a matrix and its transpose are related.
- Describe how the determinant of a matrix and its inverse are related.
- Use determinants to calculate the inverse of a matrix.
- Describe how the determinant of a product of matrices relates to the determinant of the individual matrices.
- Describe coordinates of a vector relative to a given basis.
- Determine a basis and the dimension of a finite-dimensional space.
- Discuss linear independence for vectors in R^n.
- Define the dimension of a vector space.
- Define row space and column space of a matrix.
- Find the eigenvalues and eigenvectors of a matrix.
- Use characteristic polynomials to compute eigenvalues and eigenvectors.
- Use eigenspaces of matrices, when possible, to diagonalize a matrix.
- Explain the significance of eigenvectors and eigenvalues.
- Find the characteristic polynomial of a matrix.
- Understand how to determine the angle between vectors and the orthogonality of vectors.
- Norms.
- Discuss orthogonal and orthonormal bases.
- Define orthogonal complements.
- Define orthogonal projections.
- Discuss general inner product spaces and symmetric matrices, and associated norms.
- Explain how orthogonal projections relate to least square approximations.

Module Contents:

- Complex Numbers and Functions:
  - Complex Numbers and Their Geometric Representation;
  - Polar Form of Complex Numbers. Powers and Roots;
  - Derivative. Analytic Function;
  - Cauchy–Riemann Equations. Laplace's Equation;
  - Exponential Function;
  - Trigonometric and Hyperbolic Functions. Euler's Formula;
- Linear Algebra:
  - Matrices, Vectors: Addition and Scalar Multiplication;
  - Matrix Multiplication;
  - Second- and Third-Order Determinants;

    - Determinants. Cramer's Rule;
    - The Matrix Eigenvalue Problem;
    - Determining Eigenvalues and Eigenvectors;
    - Symmetric, Skew-Symmetric, and Orthogonal Matrices;
    - Eigenbases. Diagonalization. Quadratic Forms;
- Vector Differential Calculus. Grad, Div, Cur 9.1 Vectors in 2-Space and 3-Space;
    - Inner Product (Dot Product);
    - Vector Product (Cross Product);
    - Vector and Scalar Functions and Their Fields. Vector Calculus: Derivatives;
    - Curves. Arc Length;
    - Gradient of a Scalar Field. Directional Derivative.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions.

Recommended or Required Reading:

- Dennis G. Zill, Advanced Engineering Mathematics, 7th edition, 2020
- K.A. Stroud and Dexter Booth, Advanced Engineering Mathematics, 6th edition, 2020
- Peter V. O'Neil, Advanced Engineering Mathematics, 8th edition, 2017

Usability of the Module:

This is a compulsory module in the Bachelor's program of Engineering. This Module provides a comprehensive introduction to the Applied Mathematics. The module will focus on building the rigorous theoretical foundations of applied mathematics. Student will utilize skilled learned in their advance engineering courses in their senior years. This module is a prerequisite for advance modules such as ENE211 Electric Circuits I, ECE331 Electromagnetics, and CE331 Signals and Systems in the Bachelor's program of Engineering.

Prerequisites and Co-requisites:

MATH102: Calculus II (prerequisite)

Language of Instruction:

English

Recommended Optional Program Components:

None

Bachelor

Module Title	Module Code
Differential Equations	MATH205

Compulsory Module	X	**Year of Study**	2	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	x	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

40% midterm exam
10% quizzes
10% participation
40% final exam

Responsible Lecturer(s)

Mrs. Anwar Bostanji
Dr. Laith Hawawsheh
Dr. Dia Zeidan
Dr. Mohammad AlQudah
Dr. Mohamad Abudayah
Dr. Omar Al-Omari

Course	Mode of Delivery	Contact Time	Self-Study
Differential Equations	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in lectures: 15 weeks * 3 hours = 45 hours;
- Exercises and self-reading at home: 35 hours;
- Preparation for quizzes: 30 hours;
- Preparation for theoretical exams: 40 hours.

Learning Outcomes:
By the end of this module, the student will be able to:

- Explain the concept of differential equation, i.e. he/she:
  - Classifies the differential equations with respect to their order and linearity;
  - Explains the meaning of solution of a differential equation;
  - Expresses the existence-uniqueness theorem of differential equations.
- Solve first-order ordinary differential equations, i.e. he/she:
  - Solves exact differential equations;
  - Converts separable and homogenous equations to exact differential equations by integrating factors.
- Solve Bernoulli differential equation.
- Find solution of higher-order linear differential equations, i.e. he/she:
  - Expresses the basic existence theorem for higher- order linear differential equations;
  - Solves the homogeneous linear differential equations with constant coefficients;
  - Applies the method of undetermined coefficients to solve the non-homogeneous linear differential equations with constant coefficients;
  - Uses the method "variations of parameters" to find to solution of higher-order linear differential equations with variable coefficients;
  - Solves the Cauchy-Euler equations .
- Solve systems of linear differential equations, i.e. he/she:

    - Determines the type of a linear differential equation system;
    - Uses the operator method to solve linear systems with constant coefficients;
    - Solves the linear systems in normal form;
    - Solves the homogeneous linear systems with constant coefficients.
- Use the Laplace transform in finding the solution of linear differential equations; i.e. he/she:
    - Explains basic properties of Laplace transform;
    - Expresses the inverse Laplace transform;
    - Finds Laplace transforms solution of linear differential equation with constant coefficients.
- Use Series method to find solutions of ODEs.
- Use Fourier Analysis to express periodic functions in terms of infinite series.

Module Contents:

- First-Order Ordinary Differential Equations:
    - Basic Concepts;
    - Separable ODEs;
    - Exact ODEs;
    - Linear ODEs.
- Second-Order ODEs:
    - Homogeneous Linear ODEs of Second Order;
    - Homogeneous Linear ODEs with Constant Coefficients;
    - Euler–Cauchy Equations;
    - Nonhomogeneous ODEs.
- Laplace Transforms:
    - Laplace Transform. Linearity;
    - Transforms of Derivatives and Integrals, ODEs;
    - Unit Step Function (Heaviside Function);
    - Short Impulses;
    - Differentiation and Integration of Transforms;
    - Systems of ODEs.
- Series solutions of ODEs and Special functions:
    - Power Series Method;
    - Legendre's Equation.
- Fourier Analysis:
    - Fourier Series;
    - Arbitrary Period;
    - Even and Odd Functions.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions.

Recommended or Required Reading:

- Dennis G. Zill, Advanced Engineering Mathematics, 7th edition, 2020
- K.A. Stroud and Dexter Booth, Advanced Engineering Mathematics, 6th edition, 2020
- Peter V. O'Neil, Advanced Engineering Mathematics, 8th edition, 2017

Usability of the Module:

This module is an introductory course of differential equations and mathematical modelling that can be used to study a wide range of social issues. Among the topics that have a natural fit with the mathematics in a course on ordinary differential equations are all aspects of population problems: growth of population, over-population, carrying capacity of an ecosystem, the effect of harvesting, such as hunting or fishing, on a population and how over-harvesting can lead to species extinction, interactions between multiple species populations, such as predator-prey, cooperative and competitive species. This course provides a comprehensive introduction to the qualitative and quantitative theory of ordinary differential equations. Students will see how applied mathematicians use differential equations to solve practical problems in biology, chemistry, economics, and physics. The course will focus on building the rigorous theoretical foundations of differential equations, and using these concepts to interpret differential equations and their results in the context of applications. Differential equations is a main branch of mathematics and is widely used to study and analyse topics from a variety of fields. This module is a prerequisite for the module ECE331 Electromagnetics in the Bachelor's program of Engineering.

Prerequisites and Co-requisites:
MATH102: Calculus II (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
General Physics I	PHYS103

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Participation
50% Three online exams
40% Final exam

Responsible Lecturer(s)

Prof. Nabil Ayoub
Dr. Suhad Sbeih
Dr. Husam Abu-Safe
Dr. Hussein Taani
Dr. Inshad Yousef
Dr. Sameer Arabasi

Course	Mode of Delivery	Contact Time	Self-Study
General Physics I	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Attendance of the online lectures: 15 weeks * 3 hours = 45 hours;
- Preparation for the lecture (self-reading, presentation): 30 hours;
- Exercises and homework: 35 hours;
- Preparation for the semester and final exams: 40 hours.

Learning Outcomes:
By the end of this module each student will be able to

- Understand the basic dimensions of physical quantities (mass, length, and times).
- Analyze the complex expression that involve physical quantities into its basic dimensions.
- Perform addition, subtraction, and multiplication of vectors.
- Use and implement the kinematical laws of motion in one and two-dimensions to determine the objects position with respect to a frame of reference, velocity, and acceleration.
- Interpret the ratio between the force applied to an object and the gained acceleration as a mathematical expression to represent the resistance of the object to change its status of motion and define it in a term called the mass of the object.
- Apply the understanding of this force-acceleration relation to formulate the Newton's laws of motion.
- Apply laws in rectilinear as well as uniform and non-uniform circular motions to solve problems involving the force of gravity (weight of the object), tension in strings and ropes, frictional forces, and friction coefficients.
- Comprehend the concept of work and its relationship to changes in the object's total energy.
- Correlate change in the object's total energy to the external forces affecting an object and be able to solve practical problems involving force, work, and energy.
- Understand conservation of total energy and define an expression for the energy of motion (kinetic energy) and internal energies (potential energies) that are present in open and closed mechanical systems.
- Perform the calculations necessary to determine the magnitude of total energy in these systems.

- Calculate the work done by a constant and varying forces.
- Understand the momentum of an object and its conservation law and solve problems using the principle of conservation of energy and momentum.

Module Contents:
The following topics will be covered during the course timeline using the calculus approach:

- Physics and measurement;
- Motion in one dimension;
- Vectors;
- Motion in two dimensions;
- The laws of motion;
- Circular motion and other applications of Newton's Laws;
- Energy of a system;
- Conservation of energy;
- Linear momentum and collisions.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions;
- Writing reports and in-class presentations.

Recommended or Required Reading:

- Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers with Modern Physics, 10th edition, 2019.
- David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, 10th edition, 2015.
- Hugh Young, Roger Freedman, University Physics, 15th edition, 2020.
- Douglas C. Giancoli, Physics for Scientists & Engineers with Modern Physics, 5th edition, 2021.

Usability of the Module:
The purpose of this course is to provide first-year students with the theoretical knowledge and the necessary skills to understand and realize the laws that govern motion. There are several courses in the university curriculum for science majors and engineering degrees that require a robust and clear understanding of the concepts provided and explained in this course. These courses are Statics (CEE201), Statics and strength of materials (MECH0216), Biomechanics and rehabilitation I (BM 341) and Statistics (TME 212). Therefore, the main goals set forth by this course can be summarized within two main targets to develop a good understanding of the classical laws that determine objects general motion and to gain the ability to reason qualitatively and quantitatively these laws in different practical applications.

Prerequisites and Co-requisites:
None

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
General Physics II	PHYS104

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	3
Elective Module		**Spring Semester**	X	**Workload**	150
Optional Module		**Winter Semester**	X	**ECTS**	5
Pre-university		**Pre-program**		**Remedial**	

Examination

10% Participation
50% Three online exams
40% Final Exam

Responsible Lecturer(s)

Prof. Nabil Ayoub
Dr. Suhad Sbeih
Dr. Husam Abu-Safe
Dr. Hussein Taani
Dr. Inshad Yousef
Dr. Sameer Arabasi

Course	Mode of Delivery	Contact Time	Self-Study
General Physics II	Face-to-face	45	105

Duration of Study:
One semester.

Allocation of Workload Hours:

- Attendance of the online lectures: 15 weeks * 3 hours = 45 hours;
- Preparation for the lecture (self-reading, presentation): 30 hours;
- Exercises and homework: 35 hours;
- Preparation for the semester and final exams: 40 hours.

Learning Outcomes:
At the end of the module, the student will be able to

- Prove incremental knowledge about the fundamental properties of the electric charge, electric force between charges, electric field in the vicinity of object that carries a net charge.
- Demonstrate knowledge of how to calculate the electric field for an object with charge distributions by implementing the concept of charge density.
- Understand the electric potential energy and the concept of electric potential (voltage).
- Understand and apply voltage calculations for a system of point charges and charge distributions.
- Understand capacitance and the energy stored in a system of capacitors.
- Recognize the concepts of the electric current in conductors and their resistance, in addition to analyzing electric circuits.
- Understand motion of charged particles in a magnetic.
- Compute the magnetic force on a wire carrying an electric current.
- Calculate the magnetic field due to an electric current flowing in different conductors with different geometrical arrangements.
- Solve problems associated with the electrostatic force (Coulomb's law), the electric field, Gauss’s law, the electric potential, and potential difference.
- Define capacitance and solve problems associated with capacitors of various combinations (in series and in parallel).
- Determine the effect of dielectric materials on the capacitance and stored energy in a capacitor.

- Define electric current, current density, and solve problems involving combinations of resistors, batteries, and capacitors.
- Apply Ohm's law, Kirchhoff's laws, in direct current circuits.
- Calculate the magnitude and direction of the magnetic field for symmetric current distributions using Biot-Savart law.
- Implement Ampere's law to calculate the magnetic field for current-carrying wires.
- Define the magnetic field, solve problems associated with the effect of magnetic fields on moving charges and current-carrying wires.

Module Contents:
The following topics will be covered during the course timeline using the calculus approach:

- Electric charge, electric force;
- Electric Field;
- Motion of charged particle in a uniform electric field;
- Gauss's Law;
- Conductors in electrostatic equilibrium;
- Electric potential;
- Electric potential energy;
- Capacitance and dielectrics;
- Combination of capacitors;
- Current and resistance;
- Electromotive force;
- Connecting resistors in series and parallel;
- RC circuits;
- Kirchhoff's rules;
- Magnetic force;
- Motion of a charged particle in a uniform magnetic field;
- Magnetic force on a current carrying conductor;
- Biot-Savart Law;
- Magnetic force between two parallel conductors.

Planned Learning Activities and Teaching Methods:

- Lectures to present concepts theoretically and through examples;
- In-class exercises and discussions;
- Real-life scenario discussions and interactive sessions;
- Writing reports and in-class presentations.

Recommended or Required Reading:

- Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers with Modern Physics, 10th edition, 2019.
- David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, 10th edition, 2015.
- Hugh Young, Roger Freedman, University Physics, 15th edition, 2020.
- Douglas C. Giancoli, Physics for Scientists & Engineers with Modern Physics, 5th edition, 2021.

Usability of the Module:
The purpose of this course is to provide first-year students with the theoretical knowledge and necessary skills to understand and realize the phenomena of electricity and magnetism in nature and in practical applications. There are several courses in the university curriculum for science majors and engineering degrees that require a robust and clear understanding of the concepts provided and explained in this course. These Courses are listed as follows: Electrical circuits and Machines (ME0212), Electrical Circuits I (ENE211), Automatic Control System for Medical Applications (BM325), Optics for Medical Applications (BM351), Medical Physics (MB401), Biophysics (MB432), Laser-Tissue Interaction (BM527), Introduction to Ionizing Radiation (BM528), Physiological Modeling and Control Systems (MB3255). Therefore, the main goals set forth by this course can be summarized within two main targets: To develop a good understanding of the important concepts in electricity and magnetism and to gain the ability to reason qualitatively and quantitatively the concepts of electricity and magnetism in nature and in different practical applications.

Prerequisites and Co-requisites:
PHYS103: General Physics I (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None

Bachelor

Module Title	Module Code
General Physics Lab	PHYS106

Compulsory Module	X	**Year of Study**	1	**Semester Hours**	2
Elective Module		**Spring Semester**	X	**Workload**	60
Optional Module		**Winter Semester**	X	**ECTS**	2
Pre-university		**Pre-program**		**Remedial**	

Examination

60% Semester Work
40% Final Exam

Responsible Lecturer(s)

Prof. Nabil Ayoub
Dr. Suhad Sbeih
Dr. Husam Abu-Safe
Dr. Hussein Taani
Dr. Inshad Yousef
Dr. Sameer Arabasi

Course	Mode of Delivery	Contact Time	Self-Study
General Physics lab	Face-to-face; blended learning	36	24

Duration of Study:
One semester.

Allocation of Workload Hours:

- Presence time in labs: 12 weeks x 3 hours = 36 hours (12 experiments);
- Lab report preparation: 14 hours;
- Preparation for quizzes: 2 hours;
- Preparation for final exam: 8 hours.

Learning Outcomes:
By the end of this module each student will be able to

- Recall incremental knowledge about the basic experimental skills that are important for verifying the understanding of physical concepts related to motion mechanics and, Electricity and Magnetism.
- Understand how to apply these skills in familiar and unfamiliar situations observed in the physical world.
- Show practical awareness of laboratory exercises that apply the physical principles in running experiments.
- Understand how to implement data analysis, observations, and scientific reasoning to verify the results of experiments.
- Interpret and explain such results qualitatively and quantitatively.

Module Contents:
This lab consists of 12 experiments, six in Mechanics and six in Electricity and Magnetism. The following topics will be covered with the 12 laboratory meeting sessions using experimental and data analysis approach:

- Basics of experimental error analysis;
- Measurements and calculation of errors;
- Determination of objects position, velocity, and acceleration;
- Objects free falling analysis;
- Study of projectile motion;
- Implementation of Newton's Second Law of accelerated objects;
- Friction analysis;

- Linear momentum and collision;
- Charging and charge distribution;
- Resistors and resistors connections;
- Kirchhoff's Laws;
- Capacitors and capacitors connections;
- Magnetic field in a current-carrying coil;
- Magnetic induction;
- Transformer basics.

Planned Learning Activities and Teaching Methods:
- Experiments done in the lab;
- Writing reports and in-class presentations.

Recommended or Required Reading:
The following lab manual is required for the course:
- General Physics Lab manual: Prepared and edited by German Jordanian University physics faculty.
- Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers with Modern Physics, 10th edition, 2019.
- David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, 10th edition, 2015.
- Hugh Young, Roger Freedman, University Physics, 15th edition, 2020.
- Douglas C. Giancoli, Physics for Scientists & Engineers with Modern Physics, 5th edition, 2021.

Usability of the Module:
The purpose of this course is twofold: (i) to develop experimental skills to assist in the understanding of important concepts in Mechanics, Electricity and Magnetism, (ii) learning to apply these concepts to familiar and unfamiliar situations and gaining the ability to reason the description of the physical world qualitatively and quantitatively. Physics Lab is an important part of a student's education because it is in the laboratory that physics students learn to practice the activities of scientists such as asking questions, performing procedures, collecting data, analyzing data, answering questions, and thinking of new questions to explore. As the German Jordanian University is an applied university, being able to apply what students learned in the typical classroom setting is imperative to the quality of their education.

Prerequisites and Co-requisites:
PHYS103: General Physics I (prerequisite)

Language of Instruction:
English

Recommended Optional Program Components:
None