German Jordanian University

School of Applied Technical Sciences
Department of Industrial Engineering
Bachelor of Science in Industrial Engineering

Dual Study Plan 2023

I. Program Objectives

Industrial Engineering program emphasizes the application of technologies and tools in the short term, and the ability to discover, acquire, and adapt new knowledge and skills in the long term, such that our graduates are prepared to:

a. Define, analyze, and solve complex problems within and between enterprises.
b. Discover, understand, and incorporate appropriate new technologies in the design and operation of enterprises.
c. Lead/manage design, development, and improvement efforts that benefit customers, employees, and stakeholders.
d. Function in culturally diverse teams, communicate in a professional manner, and uphold the ethical standards of the engineering profession.

II. Learning Outcomes

The B.Sc. program in Industrial Engineering provides students with an understanding of fundamental Industrial Engineering concepts, methodologies, and technologies as demonstrated by the following program learning outcomes (PLOs) and their associated key performance indicators (KPIs):

PLO 1. The ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Key Performance Indicator (KPI)	**Level**
PLO 1.1. Understanding complex engineering problems	Knowledge
PLO 1.2. Formulating complex engineering problems by transferring and applying principles of engineering, science, and mathematics	Competencies
PLO 1.3. Practicing principles of engineering, science, and mathematics to solve complex engineering problems	Skills

PLO 2. The ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Key Performance Indicator (KPI)	**Level**
PLO 2.1. Understanding engineering design requirements, strategy, constraints considering public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Knowledge
PLO 2.2. Practicing engineering processes to develop and evaluate feasible solutions against specifications/ requirements with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Skills

PLO 3. The ability to communicate effectively with a range of audiences

Key Performance Indicator (KPI)	**Level**
PLO 3.1. Taking responsibility for composing and constructing clear and professional content, reports and graphical communication documents	Competencies
PLO 3.2. Taking responsibility for developing and composing clear and professional presentations/views to a range of audience	Competencies

PLO 4. The ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Key Performance Indicator (KPI)	Level
PLO 4.1. Understanding ethical and professional responsibilities in engineering situations	Knowledge
PLO 4.2. Analyzing the impact of engineering solutions in global, economic, environmental, and societal contexts	Skills

PLO 5. The ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Key Performance Indicator (KPI)	Level
PLO 5.1. Taking responsibility for group work and working effectively to establish goals and plan tasks to meet the objectives of the team	Competencies
PLO 5.2. Organizing the works of a team in collaborative and inclusive environment and the execution of plans to meet objectives of the team	Skills

PLO 6. The ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Key Performance Indicator (KPI)	Level
PLO 6.1. Managing the procedure of an experiment	Competencies
PLO 6.2. Analyzing data collected from an experiment to draw conclusions about the experiment's outcomes	Skills

PLO 7. The ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Key Performance Indicator (KPI)	Level
PLO 7.1. Describing new knowledge using appropriate learning strategies	Knowledge
PLO 7.2. Practicing new knowledge using appropriate learning strategies	Skills

Course Delivery Methods

Courses are in one of the following three methods:

- **Face-to-Face (F2F) Method**
  Courses that are taught through face-to-face learning and are delivered at the university campus.
- **Blended (BLD) Method**
  Courses in which teaching consists of face-to-face learning and asynchronous E-learning. The face-to-face learning takes place at the university campus. Asynchronous E-learning takes place through activities, tasks, educational duties, and assignments through the virtual E-learning platforms (Moodle and MyGJU) without direct meetings with course instructors.
- **Online (OL) Method**
  Courses in which teaching consists of synchronous E-learning and asynchronous E-learning. Synchronous E-learning takes place through interactive virtual meetings between instructors and students directly through the virtual E-learning platform (MS Teams). The asynchronous E-learning takes place through activities, tasks, educational duties, and assignments through the virtual E-learning platforms (Moodle and MyGJU) without direct meetings with course instructors.

III. Admission Requirements

To apply for admission, the following minimum requirements must be met:

a. A minimum GPA of 82% in the National High School Certificate or equivalent.
b. Sitting university placement tests.
c. Sitting for the German Language Intensive course offered by the university.

Placement Tests

Applicants must sit for placement tests in the Arabic Language, the English Language, and Mathematics to determine whether the applicant may be required to take remedial courses in the mentioned subjects. Depending on or the applicant scores in the placement tests, some of the following 3-credit-hour remedial courses are required:

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
ARB0099	Elementary Arabic	3	3	3	-	OL	Placement test
ENGL0098	Elementary English	3	3	3	-	F2F	Placement test
ENGL0099	Intermediate English	3	3	3	-	F2F	ENGL0098
MATH0099	Pre-Math	3	3	3	-	OL	Placement test
	Total	**12**	**12**	**12**	**-**		

- Remedial courses are to be completed and passed within the first year of enrollment.
- Passing grade of remedial courses is 60%.
- ECTS (B.Sc.): is the European Credit Transfer System, and Accumulation System, One ECTS is equivalent to 30 actual workloads hours.

IV. Degree Requirements

The requirements to obtain a B.Sc. degree in Industrial Engineering are the following:

a. A total of 169 credit hours of compulsory and elective courses, and practical training.
b. A minimum of 12 credit hours of elective courses are to be taken at a partner university in Germany.
c. A minimum of 20-week of International Internship at a company in Germany.

V. Framework for B.Sc. Degree (Credit hours)

Classification		Credit Hours			ECTS		
		Compulsory	Elective	Total	Compulsory	Elective	Total
University Requirements	Compulsory	21	-	21	25	-	25
	Dual Study	6	-	6	12	-	12
School Requirements		46	-	46	79	-	79
Program Requirements		83	12	95	164	20	184
Total		**156**	**12**	**168**	**280**	**20**	**300**

Course Delivery Method	Credit Hours	Percentage
Online Courses	18	11%
Blended Courses	51	30%
Face-to-Face Courses	99	59%
Total	**168**	**100%**

1. University Requirements: (27 credit hours)

1.1. Compulsory: (21 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
ARB100	Arabic		3	3	3	-	OL	ARB0099
ENGL1001	Upper-Intermediate English		3	3	3	-	F2F	ENGL0099
ENGL1002	Advanced English		3	3	3	-	F2F	ENGL1001
GERL101B1	German I B1-Track		3	6	9	-	F2F	-
GERL102B1	German II	B1-Track	3	6	9	-	F2F	ARB0099,ENGL0099, GERL101B1
GERL102B2		B2-Track						
MILS100	Military Science		3	2	3	-	OL	-
NE101	National Education		3	2	3	-	OL	-
NEE101	National Education in English							
	Total		**21**	**25**	**33**	**-**		

1.2. Dual Study: (6 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours	Type	Prerequisites / Corequisites
				Prac.		
DS101	Dual Study Practical I	3	3	12 weeks	F2F	-
DS201	Dual Study Practical II	3	3	12 weeks	F2F	ARB0099,ENGL0099, DS101
DS301	Dual Study Practical III	0	6	12 weeks	F2F	DS201
	Total	**6**	**12**			

2. School Requirements: (46 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
IE0121	Probability and Statistics		3	5	3	-	F2F	MATH101
IE0141	Engineering Workshop		1	4	-	3	BLD	-
IE0281-DS	Technical Writing and Engineering Ethics		2	3	2	-	F2F	ENGL1001
IE0361-DS	Engineering Economics		3	5	3	-	OL	IE0121
ME0111-DS	Computer Aided Engineering Drawing		2	4	-	6	BLD	CS116
MECH2102	Statics and Strength		3	5	3	-	BLD	ARB0099,ENGL0099, PHYS103, MATH102
CHEM103	General Chemistry		3	5	3	-	F2F	-
CS116	Computing Fundamentals		3	6	3	-	F2F	-
CS1160	Computing Fundamentals Lab		1	0	-	3	BLD	CS116^{co}
GERL201B1	German III	B1-Track	3	4	6	-	F2F	ARB0099,ENGL0099, GERL102B1 or GERL102B2
GERL201B2		B2-Track						ARB0099,ENGL0099, GERL102B2
GERL202B1	German IV	B1-Track	3	6	9	-	F2F	GERL201B1 or GERL201B2
GERL202B2		B2-Track						ARB0099,ENGL0099, GERL201B2
MATH101	Calculus I		3	5	3	-	BLD	MATH0099
MATH102	Calculus II		3	5	3	-	F2F	MATH101
MATH203	Applied Mathematics for Engineers		3	5	3	-	F2F	ARB0099,ENGL0099, MATH102
MATH205	Differential Equations		3	5	3	-	F2F	ARB0099,ENGL0099, MATH102
PHYS103	Physics I		3	5	3	-	BLD	-
PHYS104	Physics II		3	5	3	-	F2F	PHYS103
PHYS106	General Physics Lab		1	2	-	3	BLD	PHYS103, PHYS104^{co}
		Total	**46**	**79**	**50**	**15**		

3. Program Requirements (95 credit hours)

3.1. Program Requirements (Compulsory): (83 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
IE0111	Introduction to IE	1	3	1	-	BLD	-
IE0222	Computer Aided MATH For IE	2	4	-	6	F2F	ARB0099,ENGL0099, MATH102, CS116, IE0121
IE0223	Applied Statistics	3	5	3	-	F2F	ARB0099,ENGL0099, IE0121
IE0231	Operations Research	4	6	3	3	BLD	ARB0099,ENGL0099, MATH203, IE0222, IE0232^{co}

F2F: Face-to-face BLD: Blended OL: Online co: Corequisite

IE0242	Materials Science and Engineering		3	5	3	-	F2F	ARB0099,ENGL0099, IE0141, CHEM103
IE0243	Materials Science and Engineering Lab		1	3	-	3	BLD	ARB0099,ENGL0099, IE0242, MECH2102
IE0251	Work Measurement and Standards		3	6	2	3	BLD	ARB0099,ENGL0099, IE0121, IE0111, IE0252[co]
IE0312	Simulation		3	6	2	3	F2F	IE0223, IE0313[co]
IE0314	Production Planning		3	6	3	-	BLD	IE0312, IE0231
IE0324	Quality Engineering		4	6	3	3	BLD	IE0223, IE0325 [co]
IE0344	Manufacturing Processes		4	6	3	3	BLD	IE0242, IE0345 [co]
IE0353	Ergonomics		3	6	2	3	F2F	IE0251, IE0223, IE0354[co]
IE0483	International Internship[a]		12	30	20 Weeks		F2F	Dept. Approval
IE0515	Product Development and Entrepreneurship		3	6	3	-	BLD	IE0353
IE0516	Facility and Asset Management		3	6	3	-	F2F	IE0314
IE0526	Data Analytics for Industrial Engineering		3	6	3	-	F2F	IE0222, IE0223, IE0231
IE0533	Supply Chain Engineering		3	5	3	-	F2F	IE0231, IE0314
IE0546	Modern Manufacturing Technology		3	6	2	3	F2F	IE0344, IE0547[co]
IE0562	Industrial Cost analysis		3	6	3	-	BLD	IE0361-DS
IE0584	Graduation Project I		1	4	-	3	BLD	IE0483, 132 CrHr
IE0585	Graduation Project II		3	6	-	9	BLD	IE0584
ME0212	Electrical Circuits and Machines		3	5	3	-	F2F	ARB0099,ENGL0099, PHYS104
ME0346	Instrumentation and Measurements		2	3	2	-	BLD	MATH205, ME0212
ME0347	Instrumentation and Measurements Lab		1	2	-	3	BLD	MATH205, ME0212, ME0346[co]
ME0577	Automation and Industry 4.0		3	5	2	3	BLD	ME0212, ME0346, ME0578[co]
GERL301B1	German V	B1-Track	3	6	9	-	F2F	GERL202B1 or GERL202B2
GERL301B2		B2-Track						GERL202B2
GERL302B1	German VI	B1-Track	3	6	6	-	F2F	GERL301B1 or GERL301B2
GERL302B2		B2-Track						GERL301B2
	Total		**83**	**164**	**64**	**48**		

[a] The International Internship is prerequisite to all elective courses if registered in Jordan.

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

A minimum of 12 credit hours of coursework are required. This list is open for modifications based on school council decisions.

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
IE0401	Engineering Project Management	3	5	3	-	F2F	BSC001
IE0402	Reliability and Maintainability	3	5	3		F2F	BSC001
IE0403	Special Topics in Statistics and Quality Engineering	3	5	3	-	F2F	BSC001
IE0404	Special Topics in Manufacturing processes and Engineering Materials	3	5	3	-	F2F	BSC001
IE0405	Multi-Criteria Decision Making	3	5	3	-	OL	BSC001
IE0406	Special Topics in Optimization and Mathematics	3	5	3	-	F2F	BSC001
IE0407	Nonlinear Programming	3	5	3	-	F2F	BSC001
IE0408	Design of Industrial Information Systems	3	5	3	-	F2F	BSC001
IE0409	Fuzzy Logic and Neural Networks	3	5	3	-	F2F	BSC001
IE0410	Special Topics in Informatics	3	5	3	-	F2F	BSC001
IE0411	Occupational Health and Safety	3	5	3	-	OL	BSC001
IE0412	Special Topics in Ergonomics	3	5	3	-	F2F	BSC001
IE0413	Advanced Engineering Economics	3	5	3	-	OL	BSC001
IE0414	Special Topics in Engineering Economics and Finance	3	5	3	-	F2F	BSC001
IE0417	Business and Labor Law	3	5	3		OL	BSC001
IE0419	Strategic Planning	3	5	3		OL	BSC001
IE0420	Lean Manufacturing	3	5	3	-	F2F	BSC001
IE0421	Special Topics in Operations Management and Managerial Sciences	3	5	3	-	F2F	BSC001
IE0422	Special Topics in IE I	1	-	1	-	F2F	BSC001
IE0423	Special Topics in IE II	2	-	2	-	F2F	BSC001
IE0424	Special topics in IE	3	5	3	-	F2F	BSC001
IE0425	Applied Project	3	5	3	-	F2F	BSC001
MGT314	Human Resource Management	3	5	3	-	F2F	BSC001
MGT418	Quality Management	3	5	3	-	F2F	BSC001
MGT493	Leadership	3	5	3	-	F2F	BSC001
	Total	**12**	**20**	**12**	**-**		

[b] All elective courses to be taken at a partner university in Germany.

Study Plan[c] Guide for a B.Sc. Degree in Industrial Engineering (Dual Study)

First Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
PHYS103	Physics I	3	5	3	-	BLD	-
CHEM103	General Chemistry	3	5	3	-	F2F	-
GERL101	German I	3	6	9	-	F2F	-
MATH101	Calculus I	3	5	3	-	BLD	MATH0099
CS116	Computing Fundamentals	3	6	3	-	F2F	CS1160[co]
CS1160	Computing Fundamentals Lab	1	0	-	3	BLD	CS116[co]
	Total	**16**	**27**	**21**	**3**		

First Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0111	Introduction to IE	1	3	1	-	BLD	-
IE0121	Probability and Statistics	3	5	3	-	F2F	MATH101
GERL102	German II	3	6	9	-	F2F	GERL101B1
MATH102	Calculus II	3	5	3	-	F2F	MATH101
PHYS104	Physics II	3	5	3	-	F2F	PHYS103, PHYS106 [co]
PHYS106	General Physics Lab	1	2	-	3	BLD	PHYS103, PHYS104[co]
IE0141	Engineering Workshop	1	4	-	3	BLD	-
	Total	**15**	**30**	**19**	**6**		

First Year							
Summer Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
DS101	Dual Study Practical I	3	3	12 weeks		F2F	-
	Total	**3**	**3**				

[c] The following study plan guide does not take into account possible remedial courses.

Second Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0222	Computer Aided MATH For IE	2	4	-	6	F2F	ARB0099,ENGL0099, MATH102, CS116, IE0121
IE0223	Applied Statistics	3	5	3	-	F2F	ARB0099,ENGL0099, IE0121
IE0242	Materials Science and Engineering	3	5	3	-	F2F	ARB0099,ENGL0099, IE0141, CHEM103
MECH2102	Statics and Strength	3	5	3	-	BLD	ARB0099,ENGL0099, PHYS103, MATH102
GERL201	German III	3	4	6	-	F2F	ARB0099,ENGL0099, GERL102
MATH203	Applied Mathematics for Engineers	3	5	3	-	F2F	ARB0099,ENGL0099, MATH102
	Total	**17**	**28**	**18**	**6**		

Second Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
ME0111-DS	Computer Aided Engineering Drawing	2	4	-	6	BLD	CS116
IE0231	Operations Research	4	6	3	-	BLD	ARB0099,ENGL0099, MATH203, IE0222, IE0232^{co}
IE0232	Operations Research Lab	0	0	-	3	BLD	ARB0099,ENGL0099, MATH203, IE0222, IE0231^{co}
IE0251	Work Measurement and Standards	3	6	2	-	BLD	ARB0099,ENGL0099, IE0121, IE0111, IE0252^{co}
IE0252	Work Measurement and Standards Lab	0	0	-	3	BLD	ARB0099,ENGL0099, IE0121, IE0111, IE0251^{co}
ME0212	Electrical Circuits and Machines	3	5	3	-	F2F	ARB0099,ENGL0099, PHYS104
GERL202	German IV	3	6	9	-	F2F	ARB0099,ENGL0099, GERL201
NE101	National Education	3	2	3	-	OL	-
	Total	**18**	**29**	**20**	**12**		

Second Year							
Summer Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
DS201	Dual Study Practical II	3	3	12 weeks		F2F	ARB0099,ENGL0099, DS101
	Total	**3**	**3**				

Third Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
ENGL1001	Upper-Intermediate English	3	3	3	-	F2F	ENGL0099
IE0312	Simulation	3	6	2	-	F2F	IE0223, IE0313^{co}
IE0313	Simulation Lab	0	0	-	3	BLD	IE0223, IE0312^{co}
ME0346	Instrumentation and Measurements	2	5	2	-	BLD	MATH205, ME0212
ME0347	Instrumentation and Measurements Lab	1	0	-	3	BLD	MATH205, ME0212, ME0346^{co}
GERL301	German V	3	6	9	-	F2F	GERL202
MILS100	Military Science	3	2	3	-	OL	-
		15	**22**	**19**	**6**		

Third Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0281-DS	Technical Writing and Engineering Ethics	2	3	2	-	F2F	ENGL1001
MATH205	Differential Equations	3	5	3	-	F2F	ARB0099,ENGL0099, MATH102
IE0344	Manufacturing Processes	4	6	3	-	BLD	IE0242, IE0345 ^{co}
IE0345	Manufacturing Processes Lab	0	0	-	3	BLD	IE0242, IE0344 ^{co}
IE0324	Quality Engineering	4	6	3	-	BLD	IE0223, IE0325 ^{co}
IE0325	Quality Engineering Lab	0	0	-	3	BLD	IE0223, IE0324^{co}
GERL302	German VI	3	6	6	-	F2F	GERL301
	Total	**16**	**26**	**17**	**6**		

Third Year							
Summer Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0314-DS	Production Planning	3	6	3	-	BLD	IE0312, IE0231
DS301	Dual Study Practical III	0	6	12 weeks		F2F	DS201
	Total	**3**	**12**				

Fourth Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0361-DS	Engineering Economics	3	5	3	-	OL	IE0121
IE0533	Supply Chain Engineering	3	5	3	-	F2F	IE0231, IE0314
	Technical Elective	3	5	-	-	OL	-
	Technical Elective	3	5	-	-	F2F	-
	Technical Elective	3	5	-	-	F2F	-
	Technical Elective	3	5	-	-	F2F	-
	Total	**18**	**30**	**6**	**-**		

Fourth Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0483	International Internship[d]	12	30	20 Weeks		F2F	Dept. Approval
	Total	**12**	**30**				

German year prerequisites are:

Passing four out of the five following courses:

- IE0231 Operations Research
- IE0251 Work Measurement and Standards
- IE0324 Quality Engineering
- IE0344 Manufacturing Processes
- IE0314 Production Planning

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

Fifth Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0353	Ergonomics	3	6	2	-	F2F	IE0251, IE0223, IE0354[co]
IE0354	Ergonomics Lab	0	0	-	3	BLD	IE0251, IE0223, IE0353[co]
IE0516	Facility and Asset Management	3	6	3	-	F2F	IE0314
IE0562	Industrial Cost analysis	3	6	3	-	BLD	IE0361-DS
IE0584	Graduation Project I	1	4	-	3	BLD	IE0483, 132 CrHr
ME0577	Automation and Industry 4.0	3	5	2	-	BLD	ME0212, ME0346, ME0578[co]
ME0578	Automation and Industry 4.0 Lab	0	0	-	3	BLD	ME0212, ME0346, ME0577[co]
IE0243	Materials science and engineering Lab	1	3	-	3	BLD	ARB0099,ENGL0099, MECH2102, IE0242
ARB100	Arabic	3	3	3	-	OL	ARB0099
	Total	**17**	**33**	**13**	**12**		

Fifth Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
IE0515	Product Development and Entrepreneurship	3	6	3	-	BLD	IE0353
IE0526	Data Analytics for Industrial Engineering	3	6	3	-	F2F	IE0222, IE0223, IE0231
IE0546	Modern Manufacturing Technology	3	6	2	-	F2F	IE0344, IE0547 [co]
IE0547	Modern Manufacturing Technology Lab	0	0	-	3	BLD	IE0344, IE0546 [co]
IE0585	Graduation Project II	3	6	-	9	BLD	IE0584
ENGL1002	Advanced English	3	3	3	-	F2F	ENGL1001
	Total	**15**	**27**	**11**	**12**		

VI. Compulsory Courses Offered by Industrial Engineering Department

IE0121 Probability and Statistics **3 Cr Hr (3,0)** **5 ECTS**

Descriptive statistics, probability concepts, discrete and continuous random variables and distributions, joint probability distributions, covariance and correlation of random variables, point and interval estimation for single sample, sampling distributions, and statistical inference for single sample.

Prerequisites: MATH101

IE0141 Engineering Workshop **1 Cr Hr (0,3)** **4 ECTS**

General safety, materials and their classifications, measuring devices and their accuracy, theoretical background and practical exercises including, carpentry, welding, mechanical fasteners, drills, lathes, milling machines, and sheet-metal working.

IE0281-DS Technical Writing and Engineering Ethics **2 Cr Hr (2,0)** **3 ECTS**

Technical communication, process of writing, presentations, relationship between ethical standards and technology, analysis of ethical dilemmas.

Prerequisites: ARB0099, ENGL0099, ENGL1001

IE0361-DS Engineering Economics **3 Cr Hr (3,0)** **5 ECTS**

Principles of engineering economics, cost concepts, time value of money, interest formula, depreciation models, rate of return, cash flow, project evaluation methods, replacement analysis, break even analysis, economic studies for decision making.

Prerequisites: ARB0099, ENGL0099, IE0121

IE0111 Introduction to IE **1 Cr Hr (1,0)** **3 ECTS**

module is designed to familiarize first year industrial engineering students with the definition, need, scope, evolution, and developments of industrial engineering. The different disciplines in industrial engineering including: systems optimization, variability in systems, production systems, industrial automation, manufacturing processes, operations management, and ergonomics. In addition, the course presents various guest speakers from different IE fields and industries to open up the door for possibilities.

IE0222 Computer Aided MATH For IE **2 Cr Hr (0,6)** **4 ECTS**

This module introduces open-source programming languages used in the industry. The module gives the students an insight on generic programming language concepts and their application on data analytics and conducting mathematical calculations. The programming methods learned in this course will be easily transferred to other programming languages. Students will be familiar with software such as R or Python to provide them with the skill of utilizing different libraries. The module will teach students to use the programming language to perform mathematical operations on various types of data. The module also introduces the production of different charts to represent the data in curves, scatter plots, or histograms.

Prerequisites: ARB0099, ENGL0099, MATH102, CS116, IE0121

IE0223 Applied Statistics **3 Cr Hr (3,0)** **5 ECTS**

Students learn statistical inference for two samples, simple and multiple linear regression analyses, analysis of variances (ANOVA), and design of experiment for single and several factors, and non-parametric statistics.

Prerequisites: ARB0099, ENGL0099, IE0121

IE0231 Operations Research **4 Cr Hr (3,3)** **6 ECTS**

Students learn principles of linear programming as well as modelling techniques of simple production problems, network problems, and binary integer problems. Students learn solving models graphically for a two-dimensional model, using Simplex Method for more than two variables, and coding a linear program on Python and use the

package Pulp to solve the models to optimality. Students learn post-optimality analysis as well as duality theory and their uses.

Prerequisites: ARB0099, ENGL0099, MATH203, IE0222,
Corequisites: IE0232

IE0242 Materials Science and Engineering **3 Cr Hr (3,0)** **5 ECTS**

Students will be acquainted with the fundamental concepts of materials science and engineering involving the aspects of processing, structure, properties, and performance. They will learn about the basic theories of crystallography, elasticity, plasticity, and processing involving diffusion and thermal treatment. Different failure modes in engineering materials will be discussed and ways to characterize those using destructive and non-destructive testing methods. Concepts of equilibrium, phase transformation, microstructure evolution under thermal processing will be covered as well as the various ways to strengthen engineering materials. Aspects related to safety in design, economics, and environmental considerations will be addressed. The course will prepare students for roles ranging from materials testing, materials selection, and design of innovative engineering materials.

Prerequisites: ARB0099, ENGL0099, IE0141, CHEM103

IE0243 Materials Science and Engineering Lab **1 Cr Hr (0,3)** **3 ECTS**

Studying the properties of engineering materials and the relationship between these properties and atomic structure. Applying the following techniques and performing the following experiments: sample preparation, optical microscopy, heat treatment, corrosion behavior, tensile and compression strength measurement, hardness test, impact test, creep behavior test, and fatigue behavior test.

Prerequisites: ARB0099, ENGL0099, IE0242, MECH2102

IE0251 Work Measurement and Standards **3 Cr Hr (2,3)** **5 ECTS**

The student will be introduced to work systems, concepts of productivity, and work study. Students learn basic procedure for motion study, time study, charting techniques, multiple activity charts, operation charts, flow processes charts, and two-handed charts. Students study the principles of motion economy, fundamental hand motions, and how to perform micro-motion and macro-motion studies. The module also covers the topics of work measurement, work sampling, computerized work measurement, work factors, standard data, and wage payment and incentive plans.

Prerequisites: ARB0099, ENGL0099, IE0121, IE0111
Corequisites: IE0252

IE0312 Simulation **3 Cr Hr (2,3)** **5 ECTS**

Students develop an understanding of numerical models of dynamic systems, understand statistical techniques for modelling and simulation as well as apply modelling and simulation techniques to real world problems. Students will be able to identify, model, and analyze systems that are appropriately modelled using discrete event computer simulation. Students learn how to apply queueing tools to design and evaluate the performance of queueing systems.

Prerequisites: IE0223
Corequisites: IE0313

IE0314 Production Planning **3 Cr Hr (3,0)** **5 ECTS**

Students are introduced to production planning and inventory control concepts. The course is designed to view this subject as an essential tool that enhances managers' abilities to improve production systems. Concepts, quantitative techniques, examples, exercises and case studies used in this class are given from a wide variety of engineering disciplines to cover main topics such as forecasting, process analysis, capacity planning, production planning, inventory management, and production constrains management

Prerequisites: IE0312, IE0231

IE0324 Quality Engineering **4 Cr Hr (3,3)** **6 ECTS**

To familiarize students with fundamentals quality engineering concepts and tools. The covered topics include: Quality definitions, Quality management principles, TQM strategy, Quality management systems, Excellence

models, Economics of quality, DMAIC methodology, Statistical process control, Acceptance sampling, Capability analysis, and Measurement system analysis. For the lab part, it will cover topics of: ISO standards, quality management system documentation, quality planning and control tools (quality function deployment, FMEA, magnificent seven) implementation, SPC and DoE computer applications, Gauge R&R studies, and DMIAC project.

Prerequisites: IE0223
Corequisites: IE0325

IE0344 Manufacturing Processes **4 Cr Hr (3,3)** **6 ECTS**

Typical manufacturing processes utilized in the industry such as forging, rolling, casting, extrusion and drawing with their impact on environmental and economy consideration. Basic manufacturing methods in sheet metal forming and machining. Materials mechanical properties: inhomogeneous deformation, yield criteria and triaxial stresses, and work hardening. Experiments involve sand casting, machining, polymers extrusion, sheet metal forming, metal finishing and coating, wear analysis, mechanical behavior, welding principles, and forging.

Prerequisites: IE0242
Corequisites: IE0345

IE0353 Ergonomics **3 Cr Hr (2,3)** **5 ECTS**

Basic concepts of anthropometry, to match the physical dimensions of workplaces and products with the body dimensions of intended users. An introduction to occupational biomechanics, the structure and properties of the musculoskeletal system, and related upper extremity related cumulative trauma disorders. Physiological aspects of muscle work and the implications of work capacity limits for ergonomic job design. Nature of light stimulus, eyeball anatomy and characteristics of the visual sensory system. Human information processing model, cognition processes, limitations of the human cognitive system, implications and solutions for design problems. Human factors principles in the design of displays and controls.

Prerequisites: IE0251, IE0223
Corequisites: IE0354

IE0483 International Internship **12 Cr Hr (0,0)** **30 ECTS**

Twenty-weeks of internship at a company in Germany

Prerequisites: Dept. Approval

IE0515 Product Development and Entrepreneurship **3 Cr Hr (3,0)** **6 ECTS**

Integration of the marketing, design, and manufacturing functions of organizations in creating entrepreneurial and new innovative products. Tools and methods for product design and development. Multiple functions in creating a new product (marketing, finance, industrial design, engineering, production), Definition of entrepreneurs and entrepreneurship, Entrepreneurship in economic theory, Historical development of entrepreneurship, Type of entrepreneurship and features and types of businesses and entrepreneurs, Sources of business ideas, Innovation and entrepreneurship, Entrepreneurship and small business.

Prerequisites: IE0353

IE0516 Facility and Asset Management **3 Cr Hr (3,0)** **6 ECTS**

Students learn the concepts and methodology of facilities planning as well as layout planning, optimization algorithms applied to facilities layout, selection of material handling systems, and operations of warehouse. Students acquire knowledge and skills in the areas of strategic facilities planning and manufacturing facilities design. Students carry independent project work and research in the field.

Prerequisites: IE0314

IE0526 Data Analytics for Industrial Engineering **3 Cr Hr (3,0)** **6 ECTS**

This course prepares students to use the statistical software R to describe and analyze data and to use advanced statistical tools to make decisions on operations, risk management, finance, marketing, etc. Topics include univariate analysis, bivariate analysis, classification, clustering, regression, association rules, dimensionality reduction, and attributes selection. Students also learn model evaluation measures such as true positive or negative, false positive or negative, positive and negative predictive values, and other accuracy measures. By the

end of this course, students will be able to gather sufficient relevant data, demonstrate a sophisticated understanding of the concepts and methods, and use advanced techniques to conduct thorough and insightful analysis, and interpret the results correctly with detailed and useful information.

Prerequisites: IE0222, IE0223, IE0231

IE0533 Supply Chain Engineering **3 Cr Hr (3,0)** **5 ECTS**

The module covers topics related to supply chain design, planning, and integration. This includes sourcing decisions, logistic systems, capacity analyses, aggregate planning, and distribution networks. The module also discusses latest development in supply chain management including sustainability and technology applications. The team project portion of the module allows the students to model and evaluate a real-world supply chain. This includes developing a SIPOC structure, setting KPIs, and optimizing the supply chain network.

Prerequisites: IE0231, IE0314

IE0546 Modern Manufacturing Technology **3 Cr Hr (2,3)** **6 ECTS**

Traditional and non-traditional manufacturing processes, green manufacturing, additive manufacturing and rapid prototyping. Digital manufacturing and CAD/CAM. Non-conventional machining: electric discharge machining and electro-chemical machining. Powder metallurgy. Non-conventional welding and cutting processes. Microfabrication and microelectromechanical systems (MEMS). Selected topics in advanced manufacturing technologies.

Prerequisites: IE0344
Corequisites: IE0547

IE0562 Industrial Cost analysis **3 Cr Hr (3,0)** **6 ECTS**

Students gain knowledge regarding managerial accounting and cost concepts, classifications and calculations. Module also introduces ABC and other costing methods such as cost for pricing, cost evaluation and improvement, costs for decision making, budgeting, and variance analysis. Students are introduced to financial balance sheet calculations, depreciation, assets and liabilities, and taxes.

Prerequisites: IE0361-DS

IE0584 Graduation Project I **1 Cr Hr (0,3)** **4 ECTS**

The first part of a team-based one-year senior design project in the field of Industrial engineering.

Prerequisites: IE0483, 132 CrHr

IE0585 Graduation Project II **3 Cr Hr (0,9)** **6 ECTS**

The second and final part of a team-based one-year senior design project in the field of Industrial engineering.

Prerequisites: IE0584

VII. Elective Course Offered by Industrial Engineering Department

IE0401 Engineering Project Management **3 Cr Hr (3,0)** **5 ECTS**

Examines the organization, planning, and controlling of projects and provides practical knowledge on managing project scope, schedule and resources. Topics include project life cycle, work breakdown structure and Gantt charts, network diagrams (CPM and PERT), and resource allocation decisions. Concepts are applied through team projects using project management software. Competence with a set of tools and methods for product design and development. The main topics of this course are as follows:

- Selecting projects strategically: project selection models and project portfolio process.
- The project Manager and the project team: the project manager role, selecting the project manager, cultural differences and environmental impacts, project team, and MBTI.
- The role of projects in the organization: the project as a part of the organization, pure and functional project organizations, matrix organization, and mixed organization systems.
- The process of planning projects: project coordination, systems integration, the work breakdown structure and linear responsibility charts.
- Cost estimation and the budgeting process: estimating project budgets and improving the process of cost estimation.
- The function of scheduling: creating time tables using network techniques such as PERT and CPM, and risk analysis.
- Allocating resources: critical path method, the resource allocation problem, constrained resource scheduling, and multi-project scheduling and resource allocation.
- Managing projects through information systems: planning-monitoring-controlling cycle, information needs and the reporting process, and earned value analysis.
- Controlling projects: purposes of control, types of control processes, and control systems.

Prerequisites: BSC001

IE0402 Reliability and Maintainability **3 Cr Hr (3,0)** **5 ECTS**

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 1 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.

Prerequisites: BSC001

IE0403 Special Topics in Statistics and Quality Engineering **3 Cr Hr (3,0)** **5 ECTS**

A course on a special topic in statistics and quality management.

Prerequisites: BSC001

IE0404 Special Topics in Manufacturing processes and Engineering Materials **3 Cr Hr (3,0)** **5 ECTS**

Understanding specific modern manufacturing techniques. Application of the manufacturing techniques in producing samples. Understanding the engineering and synthesis of specific materials and material classes. Applying the knowledge in producing samples. Inspecting and studying materials using various microscopy and analytical techniques.

Prerequisites: BSC001

IE0405 Multi-Criteria Decision Making **3 Cr Hr (3,0)** **5 ECTS**

Decision processes for problems involving multiple conflicting criteria; multiple attribute decision making; multiple objective decision-making, and group decision making under multiple criteria. Various methods/approaches for different problems are discussed.

Prerequisites: Dept. approval

IE0406 Special Topics in Optimization and Mathematics **3 Cr Hr (3,0)** **5 ECTS**

A course on a special topic in optimization and mathematics.

Prerequisites: BSC001

IE0407 Nonlinear Programming **3 Cr Hr (3,0)** **5 ECTS**

Develop nonlinear models, convex sets and functions, optimality conditions, Lagrangian duality, unconstrained minimization techniques. Constrained minimization techniques covering penalty and barrier functions, sequential quadratic programming and the reduced gradient method.

Prerequisites: BSC001

IE0408 Design of Industrial Information Systems **3 Cr Hr (3,0)** **5 ECTS**

The relational database model, data modeling, structured analysis and functional architecture design, informational architecture and logical database design, design of a user interface, e-business and web enabled databases, unified modeling language, workflow management systems.

Prerequisites: BSC001

IE0409 Fuzzy Logic and Neural Networks **3 Cr Hr (3,0)** **5 ECTS**

Current topics in automation, distributed control, control code generation, control logic validation, CAM integration, CAD/CAM data structures, planning for control systems.

Prerequisites: BSC001

IE0410 Special Topics in Informatics **3 Cr Hr (3,0)** **5 ECTS**

A course on a special topic in informatics.

Prerequisites: BSC001

IE0411 Occupational Health and Safety **3 Cr Hr (3,0)** **5 ECTS**

Understanding the significance of healthy and safe working environment of employees for enhancing workers' productivity. This will specifically enable them to, recruit or propose qualified safety coordinators with high-level responsibility and authority, regularly review safety activity results against predetermined objectives, evaluate organizational supervisors based on the safety performance of their employees, provide financial support for safety programs, and give alert on unhealthy and unsafe environment.

Prerequisites: BSC001

IE0412 Special Topics in Ergonomics **3 Cr Hr (3,0)** **5 ECTS**

Students will gain knowledge about

- The diverse human factors issues associated with the design and use of road vehicles within a systems context.
- Related anthropometric measurements of drivers and passengers and their applications in vehicles design;
- Driver vision, field of view and sensory conspicuity.

- In-vehicle systems; controls and displays.
- Driver interaction with vehicle systems.
- • Types of drivers, passengers and their vehicles including but not limited to; impaired drivers, older drivers and child passengers.
- • Driving Safety Improvements.

Prerequisites: BSC001

IE0413 Advanced Engineering Economics **3 Cr Hr (3,0)** **5 ECTS**

This course expands on the principles of the fundamental engineering economics analysis. Emphasis is placed on quantification and evaluation of risk and uncertainty factors, effects of inflation and taxes, economic consequences of estimating models, utility theory, engineering capital equipment replacement analysis and decision-tree and multi-attribute decision models.

Prerequisites: BSC001

IE0414 Special Topics in Engineering Economics and Finance **3 Cr Hr (3,0)** **5 ECTS**

A course on a special topic in economics and finance.

Prerequisites: BSC001

IE0417 Business and Labor Law **3 Cr Hr (3,0)** **5 ECTS**

A program elective course in business and labor Law.

Prerequisites: BSC001

IE0419 Strategic Planning **3 Cr Hr (3,0)** **5 ECTS**

A program elective course in strategic planning.

Prerequisites: BSC001

IE0420 Lean Manufacturing **3 Cr Hr (3,0)** **5 ECTS**

A program elective course in lean manufacturing.

Prerequisites: BSC001

IE0421 Special Topics in Operations Management and Managerial Sciences **3 Cr Hr (3,0)** **5 ECTS**

A course on a special topic in operations management and managerial sciences.

Prerequisites: BSC001

IE0422 Special Topics in IE I **1 Cr Hr (1,0)** **0 ECTS**

A program elective course on a special topic in industrial engineering.

Prerequisites: BSC001

IE0423 Special Topics in IE II **2 Cr Hr (2,0)** **0 ECTS**

A program elective course on a special topic in industrial engineering.

Prerequisites: BSC001

IE0424 Special topics in IE **3 Cr Hr (3,0)** **5 ECTS**

A program elective course on a special topic in industrial engineering.

Prerequisites: BSC001

IE0425 Applied Project **3 Cr Hr (3,0)** **5 ECTS**

A program elective course in applied project.

Prerequisites: BSC001

VIII. Course Offered by Other Departments

ME0111-DS Computer Aided Engineering Drawing **2 Cr Hr (0,6)** **4 ECTS**

The use of computer aided software in drawing such as AutoCAD. Geometric construction. Orthographic and Isometric projections; Sketching, sectioning, dimensioning and layering. Model layout (wire-frame, surface, and solid modeling), plotting to scale, blocks and attributes, Introduction to descriptive geometry, perspective drawing, engineering applications.

Prerequisites: CS116

ME0212 Electrical Circuits and Machines **3 Cr Hr (3,0)** **5 ECTS**

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, transformers (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.

Prerequisites: ARB0099, ENGL0099, PHYS104

ME0346 Instrumentation & Measurements **2 Cr Hr (2,0)** **5 ECTS**

Introduction to instrumentation, Units, Dimensions and standards, Error measurements, Statistical analysis of experimental data, Op-Amp circuits in instrumentation, Basic electrical measurement and sensing devices: physics of electric, magnetic, chemical sensors displacements, area, pressure, flow, temperature, thermal and transport properties, force, torque and strain measurements. Smart sensors and networking of sensor systems. Data acquisition and processing.

Prerequisites: MATH205, ME0212

ME0347 Instrumentation and Measurements Lab **1 Cr Hr (0,3)** **0 ECTS**

Measurements with different micrometers & Vernier measuring instruments, angular measurements, roundness & concentricity of cylindrical work pieces, tool maker's microscope, optical projectors, surface measurements. Analysis of experimental data and error estimation. Basic electrical measurement and sensing devices: physics of electric, magnetic, chemical sensors, displacement, area, pressure, flow, temperature, thermal and transport properties, force, torque and strain measurements. Smart sensors and networking of sensor systems. Data acquisition and processing.

Prerequisites: MATH205, ME0212
Corequisites: ME0346

ME0577 Automation and Industry 4.0 **3 Cr Hr (2,3)** **5 ECTS**

Introduction to production concepts, serial production lines, assembly systems and types of automation. Programmable Logic Controllers (PLC); Theoretical and applied material, including: application and hardware composition of programmable logic controllers; functional programming blocks such as logic gates including AND, OR etc. as well as latches, timers, counters, and analog blocks; design approaches based on Boolean and structured logic, state machines, flowcharts; programming methodologies including: ladder diagrams, blocks and text-based. Concepts and definitions for Industry 4.0 approaches, Industry 4.0 and the Future of Production. Smart Factory Architecture and overview of Smart Production Systems and Integrated production technology. Enabling technologies for Industry 4.0. Industrial Internet of Things (IIoT) for production systems. The class will address challenges of security and vulnerability, authentication and authorization, data/device security and cloud computing.

Prerequisites: ME0212, ME0346
Corequisites: ME0578

MECH2102 Statics and Strength **3 Cr Hr (3,0)** **5 ECTS**

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.

Prerequisites: ARB0099, ENGL0099, PHYS103, MATH102

IX. Courses offered by Other Schools

ARB0099 Elementary Arabic **3 Cr Hr (3,0)** **3 ECTS**

This course aims to develop student's ability to read, comprehend, literary analyze, grammatically analyze, linguistically analyze, poetically analyze, and rhetorically analyze texts properly. The course also includes a selection of Arabic literature in poetry and prose representing different literary ages, in addition to several common forms of writing such as scientific article, news article, and others.

Prerequisites: Placement test

ARB100 Arabic **3 Cr Hr (3,0)** **3 ECTS**

This course aims to improve the student's competence in the various linguistic skills in terms of reading, comprehension, and taste. This is achieved through the study of selected texts with many implications that raise issues in spelling, grammar, composition, meaning, and inference, and the use of an old and modern thesaurus.

Prerequisites: ARB099

ENGL0098 Elementary English **3 Cr Hr (3,0)** **3 ECTS**

Students will focus on English at an elementary level through the receptive skills of reading and listening and the productive skills of writing and speaking. English III is aimed at students who have achieved a grade of between 0 and 60 on the English Placement Test. This course is zero credit hours. This course enables students to contribute their own knowledge or experience in speaking activities, and use the language correctly. The exposure to a wide variety of listening material with a variety of accents, including some non-native speakers of English improves their level. English III integrates the focus on individual sounds of word and sentence stress where students are encouraged to copy the rhythm of English. Pronunciation is also integrated into Grammar and Vocabulary activities.

Prerequisites: Placement test

ENGL0099 Intermediate English **3 Cr Hr (3,0)** **3 ECTS**

Students will focus on English at an intermediate level through the receptive skills of reading and listening and the productive skills of writing and speaking. English IV is aimed at students who have successfully passed English III or achieved a grade of between 61-80 on the English Placement Test. This course is zero credit hours. Attendance: Students are required to attend regularly according to the regulations of GJU and should provide the instructor with official excuses in case they are absent for a long time. Participation and homework: Students are required to participate in the group discussion in class. Interaction is necessary as well as oral presentations will be given to measure how fluent students are and to improve their skill of speaking. Medium of communication: GJU email, face to face (on campus) and during office hours. Teaching method: Explaining, discussing and doing the exercises given to students.

Prerequisites: ENGL098

ENGL1001 Upper-Intermediate English **3 Cr Hr (3,0)** **3 ECTS**

Education is the ability to listen to almost anything without losing your temper or your self-confidence." Robert Frost (1874 - 1963) English V is aimed at students who have achieved a passing grade in English IV or a grade between 81 and above on the English Placement Test. English V is equal to three credit hours. Students will focus on English at an upper intermediate level. Students will analyze and produce essays with an emphasis on argumentation and persuasion working both independently and cooperatively to gather, evaluate, and synthesize necessary information. Class activities include interactive lectures, small group and class discussions, informal debates, peer feedback, individual presentations, focused listening exercises and focused viewing exercises as well as assorted reading, writing, and grammar assignments. There will be some poetry analysis together with reading and understanding a short story and a drama using basic literary terms and concepts. Note: The process of argumentation enables us to clarify and develop our own responses to important issues, and a significant part of that process involves dialogue with both those who share our opinions and those who do not. In order to participate responsibly and effectively in meaningful dialogue, we must maintain an attitude characterized by openness, responsibility, rationality, and respect for all participants. Upon finishing this level, all students are

eligible to receive an English language proficiency letter indicating their level according to the Common European Framework Reference for Languages (CEFR) varying between B1 and B2 according to the grade they get upon finishing this level.

Prerequisites: ENGL0099

ENGL1002 Advanced English **3 Cr Hr (3,0)** **3 ECTS**

English VI, is the last of the English levels at the German Jordanian University to arm graduates with the best command of the English language in its varied aspects: Reading, Writing, Speaking, Listening and Understanding. It is aimed at students who successfully pass English V and it is three credit hours. This level focuses on a higher level of enhancement of their language. Students can address any audience, through delivering a persuasive speech, making an informative presentation, or analyzing controversial News through News Analysis. The students' Thesis Statements are backed up with: mistake-free language, persuasive logic and verified statistics, numbers and facts to convince the audience with their points of view. Other tools are enhanced involving their language, including specific terminology, tone, intonation and body language to make them acquire the best outcome. Students can also address any topic in writing. With the language skills provided in this level, GJU graduates become more equipped with outstanding abilities and get better chances in the work market, in addition to their knowledge and education in the major fields. The assessment of the students applies Bloom's Taxonomy where the learning objectives are classified according to the different domains including: learning (remembering), understanding, applying, analyzing, evaluating, the creating. Upon finishing this level, all students are eligible to receive an English language proficiency letter indicating their level according to the Common European Framework Reference for Languages (CEFR) varying between B2, C1 or C2 according to the grade they get upon finishing this level.

Prerequisites: ENGL1001

GERL101B1 German I B1-Track **3 Cr Hr (9,0)** **6 ECTS**

Can understand and use familiar, everyday expressions and very simple sentences, which aim at the satisfaction of specific needs. Can introduce oneself, and others, and ask others questions to themselves - e.g. where they live, which people they know or what kind of things they have - and can give answers on questions of this kind. Can communicate on a basic level if those involved with him/ her in a conversation speak slowly and clearly and are willing to help.

GERL102B1 German II B1-Track **3 Cr Hr (9,0)** **6 ECTS**

Can understand sentences and frequently used expressions if those are connected with things of immediate meaning (e.g., information to the person and to the family, buying, work, closer environment). Can communicate in simple, routine situations, with the purpose of a simple and direct exchange of information about familiar and common things. Can describe with simply means their own origin and training, direct environment and things that are in connection with directneeds.

Prerequisites: GERL101B1

GERL201B1 German III B1-Track **3 Cr Hr (6,0)** **4 ECTS**

Can understand the main points if no dialect is used and if it concerns familiar things about work, school, spare time etc. Can master most situations, which one encounters on journeys in a German speaking area. Can express oneself simply and coherently about familiar topics and areas of personal interest. Can report experiences and events, describe dreams, hopes and goals and give short reasons or explanations about plans and opinions.

Prerequisites: ARB0099, ENGL0099*,* GERL102B1

GERL202B1 German IV B1-Track **3 Cr Hr (9,0)** **6 ECTS**

Can understand the main contents of complex texts, as well as concrete and abstract topics; even discussions between specialists in his/ her own special field. Can communicate spontaneously and fluidly a normal discussion with native speakers, without larger effort on both sides. Can express oneself clearly, in detail in a broad spectrum of topics, describe a point of view to a current question, and indicate the pro and cons of different possibilities.

Prerequisites: ARB0099, ENGL0099*,* GERL201B1

GERL301B1 German V B1-Track **3 Cr Hr (9,0)** **6 ECTS**

Can understand and seize implicit meanings of a broad spectrum of demanding, longer texts. Can express oneself spontaneously and fluidly, recognizing words without having to search for words frequently. Can use the language effectively and flexibly in social and vocational life or in training and study. Can express oneself clearly, structured and detailed, to complex subjects and use appropriate different means for linkage of texts.

Prerequisites: GERL202B1

GERL302B1 German VI B1-Track **3 Cr Hr (6,0)** **6 ECTS**

German VI is a strongly practice-oriented course in preparation for your German Year. The course includes the modules "Intercultural Communication", "Job Application Training" and the technical languages. In part, it includes a special support program for students who did not achieve their language goal of a full B1 certificate in German V

Prerequisites: GERL301B1

CHEM103 General Chemistry **3 Cr Hr (3,0)** **5 ECTS**

Stoichiometry of formulas and equations. Gases and the kinetic-molecular theory. Quantum theory and atomic structure. The components of matter. The major classes of chemical reactions (precipitation, acid-base, oxidation-reduction, and reversible reactions). Thermodynamics: energy flow and chemical change. Quantum theory and atomic structure. Electron configurations and chemical periodicity. Kinetics: rates and mechanisms of chemical reactions. Equilibrium: The extent of chemical reactions. Acid-base equilibria.

CS116 Computing Fundamentals **3 Cr Hr (3,0)** **6 ECTS**

Basic computer skill; Programming concepts; algorithms: data types, arithmetic, logical, relational, Boolean, and assignment operators, simple input and output statements; programming control structures; data structures: single and multidimensional arrays; character strings; functions; pointers; file structures and representation; 3-hours lab session every week to enhance hands-on experience on topics that are theoretically covered in the course using Gnu C compiler on a Solaris/Sun environment

CS1160 Computing Fundamentals Lab **1 Cr Hr (0,3)** **0 ECTS**

Basic computer skill; Programming concepts; algorithms: data types, arithmetic, logical, relational, Boolean, and assignment operators, simple input and output statements; programming control structures; data structures: single and multidimensional arrays; character strings; functions; pointers; file structures and representation; 3-hours lab session every week to enhance hands-on experience on topics that are theoretically covered in the course using Gnu C compiler on a Solaris/Sun environment.

Corequisites: CS116

MATH0099 Pre-Math **3 Cr Hr (3,0)** **3 ECTS**

Real numbers and their properties, Solutions of equations and inequalities, Functions, Domain of functions, Operations on functions, Polynomials, Zeros of polynomials, Power, Exponential, Logarithmic, and Trigonometric functions and their graphs, Applications of trigonometry, Analytic Geometry: Lines, circles and parabolas.

Prerequisites: Placement test

MATH101 Calculus I **3 Cr Hr (3,0)** **3 ECTS**

Review of functions, functions, Inverse functions, Inverse trigonometric functions, the concept of limits, Computation of limits, Continuity, Asymptotes, The Derivative, Computation of derivatives, the product and quotient rules, The Chain Rule, Derivatives of Trigonometric, Inverse Trigonometric, Exponential, Logarithmic, and Hyperbolic Functions. Applications of Differentiation: Increasing and Decreasing Functions, Extrema of Functions, Graphs of Functions, Indeterminate Forms and L'Hopital Rule. Antiderivatives, Definite integrals, Fundamental Theorem of Calculus, Integration by Substitutions, Integration by Parts, Applications of integration: Area between curves, Arc length, Volume and Surface Area of Solids of Revolution.

Prerequisites: MATH0099

MATH102 Calculus II **3 Cr Hr (3,0)** **5 ECTS**

Review of Integration, Integration by Trigonometric Substitutions, Integration using Partial Fractions, Improper Integrals. Vectors in 2 and 3 Spaces, The Inner and Cross Products of vectors. Polar Coordinates, Graphs and Arc length of Polar curves. Functions of Several Variables; Domain, Limits, and Continuity. Partial Derivatives, The Chain Rule, The Gradient and Directional Derivatives, Extrema of Functions of Several Variables and Lagrange multipliers. Double Integrals, Area of Plane Region and Volumes of Solids using Double integrals, Triple Integrals, Cylindrical and Spherical Coordinates, Triple Integrals using Cylindrical and Spherical Coordinates.

Prerequisites: MATH101

MATH203 Applied Mathematics for Engineers **3 Cr Hr (3,0)** **5 ECTS**

Vector analysis in Cartesian coordinates. General Curvilinear Coordinates, Vector calculus in general curvilinear coordinates with emphasis on Spherical and Cylindrical coordinates, transformations between different coordinate systems, vector differentiation. Matrices and linear equations; Matrices and Linear Operators; Determinants, Eigenvalues and eigenvectors. Complex Numbers and Complex Variables; Representation of complex numbers, Powers and roots of complex numbers, Functions of a complex variable. Review of Infinite Series; Infinite series of constant terms, Convergence tests, Power series and radius of convergence, Taylor, and Maclaurin series and Fourier series.

Prerequisites: ARB0099, ENGL0099, MATH102

MATH205 Differential Equations **3 Cr Hr (3,0)** **5 ECTS**

Ordinary differential equations; Sturm-Liouville theory, properties of Special Functions, Solution methods including Laplace transform, and Fourier transform. Eigenvalue problems and expansions in orthogonal functions. Partial differential equation: classification, separation of variables, solution by series and transform methods. Models in Applied Mathematics; Applications to illustrate typical problems and methods of applied mathematics in solid and fluid mechanics, fields of physics, deformation and vibration, wave phenomena, diffusion phenomena, heat conduction, chemical and nuclear reactors, and biological processes.

Prerequisites: ARB0099, ENGL0099, MATH102

PHYS103 Physics I **3 Cr Hr (3,0)** **5 ECTS**

Physics and measurement. Motion in one dimension. Vectors. Motion in two dimensions. Force and motion. Kinetic energy and work. Potential energy and conservation of energy. Linear momentum and collisions. Rotation. Rolling and angular momentum.

PHYS104 Physics II **3 Cr Hr (3,0)** **5 ECTS**

Electric Fields. Gauss's Law. Electric Potential. Capacitance and Dielectrics. Current and Resistance. Direct Current Circuits. Magnetic Fields. Sources of Magnetic Field. Faraday's Law.

Prerequisites: PHYS103

PHYS106 General Physics Lab **1 Cr Hr (0,3)** **2 ECTS**

Laboratory exercises that apply physical principles introduced in Physics I and Physics II courses. The lab includes the use of data logging techniques, observations, and scientific reasoning in practical situations.

Prerequisites: PHYS103
Corequisites: PHYS104

MGT314 Human Resource Management **3 Cr Hr (3,0)** **5 ECTS**

Hiring, training, and developing, and retaining employees. Employee benefits, health, safety and security; employee and labor relations. Employee rights, privacy and security, compensation, and performance evaluation. The roles of personnel departments, organizational strategic planners, and line supervisors are considered.

Prerequisites: BSC001

MGT418 Quality Management **3 Cr Hr (3,0)** **5 ECTS**

Total Quality Management (TQM) helps the students to learn to view quality from a variety of functional perspectives, gain a better understanding of the problems associated with improving quality, also quality tools utilized in service and international/environments. This module focuses on the essence, principles, and practices of total quality management (TQM). Some of the ideas and topics that are covered are: process improvement;

process orientation; service quality; human resources; customer satisfaction programs; quality function deployment; process control and capability; role of inspection; economics of quality; productivity measurement; learning and organizational performance measures; and teachings of Deming, Juran, and Crosby.

Prerequisites: BSC001

MGT493 Leadership **3 Cr Hr (3,0)** **5 ECTS**

History, philosophy, theories, and concepts of leadership. This course will differentiate between the roles of the manager and the leader. Skills needed to elicit high commitment and productivity from people and groups. Awareness of one's own values, beliefs, decision-making tendencies and behaviors. Interpersonal skills needed to motivate key actors in the workplace and to manage group dynamics.

Prerequisites: BSC001