GJU

الجامعة الألمانية الأردنية

German Jordanian University

German Jordanian University

School of Sustainable Systems Engineering
Department of Electrical and Energy Engineering
Bachelor of Science in Electrical Engineering

Study Plan 2025

I. Program Objectives

The Electrical and Energy Engineering department's programs emphasize 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. Provide technical knowledge of electrical and energy engineering aspects and principles, along with the required supporting knowledge of mathematics, science and computing fundamentals. Emphasis is made on the specialty areas of Energy and Electrical engineering.
b. Develop the skills needed to perform and design experimental projects. Develop the ability to formulate problems and projects, and to plan a solution process deploying diverse technical knowledge and skills.
c. Develop the ability to organize and present information effectively whether orally, written or visual.
d. Provide sufficient breadth and depth for successful subsequent graduate study and lifelong learning.
e. Provide an appreciation for the broad spectrum of issues arising in professional practice, including teamwork, leadership, safety, ethics, service, economics, and professional organizations.

II. Learning Outcomes

Electrical Engineering provides bachelor's students with an understanding of fundamental engineering and management concepts, methodologies, and technologies as demonstrated by:

a. An ability to apply knowledge of mathematics, science and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs.
d. An ability to function in teams.
e. An ability to identify, formulate and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. A broad education is necessary to understand the impact of electrical engineering solutions in a global and societal context.
i. A recognition of the need for an ability to engage in life-long learning.
j. A knowledge of contemporary issues.
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

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. The 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. General secondary school certificate with a minimum score of 80%

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**	**0**		

- 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 and Accumulation, One ECTS is equivalent to 30 actual workload hours.

IV. Degree Requirements

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

a. Complete the 168-credit hour program.
b. A minimum of 12 credit hours of elective courses are to be taken at a partner university in Germany.
c. Complete Field Training.
d. Complete International Internship.

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

Classification	Credit Hours			ECTS		
	Compulsory	Elective	Total	Compulsory	Elective	Total
University Requirements	21	6	27	25	6	31
School Requirements	37	0	37	69	0	69
Program Requirements	92	12	104	168	20	188
Total	**150**	**18**	**168**	**262**	**26**	**288**

Course Delivery Method	Credit Hours	Percentage
Online Courses	24	14%
Blended Courses	52	31%
Face-to-Face Courses	92	55%
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	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**	**0**		

1.2. Elective: (6 credit hours)

ourse ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
-	University Elective 1	2	2	1	1	BLD	-
-	University Elective 2	2	2	1	1	BLD	-
-	University Elective 3	2	2	1	1	BLD	-
	Minimum required	**6**	**6**	**3**	**3**		

https://www.gju.edu.jo/content/department-basic-education-18102

School Requirements: (37 credit hours)

Course ID	Course Name		Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
					Lect.	Prac.		
CHEM103	General Chemistry I		3	5	3	-	F2F	-
CS116	Computing Fundamentals		3	5	3	-	F2F	-
CS1160	Computing Fundamentals lab		1	2	-	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	ARB0099, ENGL0099, GERL201B1 or GERL201B2
GERL202B2		B2-Track						ARB0099, ENGL0099, GERL201B2
IE0141	Engineering Workshop		1	4	-	3	BLD	-
IE0281	Technical Writing and Engineering Ethics		2	3	2	-	F2F	ENGL1001
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
ME0111	Computer Aided Engineering Drawing		2	4	-	6	BLD	CS116
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	**37**	**65**	**41**	**15**		

2. Program Requirements (104 credit hours)

2.1. Program Requirements (Compulsory): (92 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Type	Prerequisites / Corequisites
				Lect.	Prac.		
EE2101	Electrical Circuits	3	5	3	-	F2F	ARB0099, ENGL0099, PHYS104, MATH205[co]
EE2102	Electrical Circuits Lab	1	2	-	3	BLD	ARB0099, ENGL0099, EE2101, PHYS106
EE2103	Linear Algebra	3	5	3	-	BLD	ARB0099, ENGL0099, MATH102
EE2104	Frequency and System Response	3	5	3	-	F2F	ARB0099, ENGL0099, EE2101
EE2105	Electronics	3	5	3	-	F2F	ARB0099, ENGL0099, EE2101
EE2106	Electronics Lab	1	2	-	3	BLD	ARB0099, ENGL0099, EE2102, EE2105
EE2107	Computer Aided Mathematics for EE	2	4	0	6	BLD	ARB0099, ENGL0099, CS1160, MATH205, EE2103[co]

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

EE3101	Random Variables and Stochastic Processes		3	5	3	-	BLD	MATH102
EE3102	Electromagnetics		3	5	3	-	F2F	MATH203, EE2104
EE3103	Modeling and Simulation of Electrical and Energy Systems		1	2	-	3	BLD	EE3201[co], EE3401[co]
EE3104	Artificial Intelligence in Electrical and Energy Systems		3	5	3	-	F2F	EE2107, EE2103
EE3105	Embedded Systems		3	5	3	-	F2F	CE212
EE3201	Electrical Power and Machines		3	5	3	-	F2F	EE2104, EE3102[co]
EE3202	Electrical Power and Machines Lab		1	2	-	3	BLD	EE2102, EE3201
EE3203	Power Electronics		3	5	3	-	BLD	EE2105, EE3201
EE3401	Communication Systems and IoT Protocols		3	5	3	-	BLD	EE2104
EE3402	Communication Systems and IoT Protocols Lab		1	2	-	3	BLD	EE3401, CE201
EE3403	Digital Communications		3	5	3	-	F2F	EE3401, EE3101[co]
EE3404	Digital Communications Lab		1	2	-	3	BLD	EE3402, EE3403
EE3901	Field Training [a]		0	6	160 hours		F2F	Dept. Approval
EE4901	International Internship [b]		12	30	20 weeks		OL	EE3901, Dept. Approval
EE5101	Control Systems		3	5	3	-	BLD	EE2103, EE3201
EE5202	Power System Generation, Transmission and Distribution		3	5	3	-	F2F	EE2103
EE5203	Power Systems Lab		1	2	-	3	BLD	EE5202
EE5401	Wireless and Mobile Communications		3	5	3	-	BLD	EE3401
EE5402	Wireless and Mobile Communication lab		1	2	-	3	BLD	EE5401, EE3402
EE5403	Digital and Communication Electronics		3	5	3	-	F2F	EE2105, EE3401
EE5404	Quantum Communication and Computing		3	5	3	-	F2F	EE3401
EE5405	Satellite and Optical Communications		3	5	3	-	BLD	EE3401
EE5901	Graduation Project I		1	4	-	3	BLD	EE3901, Dept. Approval
EE5902	Graduation Project II		3	6	-	9	BLD	EE5901
CE212	Digital Systems		3	5	3	-	F2F	CS116, ENGL0099, ARB0099, MATH0099
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
IE0361	Engineering Economics		3	5	3	-	OL	MATH205
	Total		**92**	**178**	**75**	**42**		

[a] The EE3901 field training course should be registered after completing at least 115 credit hours. The minimum number of training hours is 160 hours and should be performed should be connected without any gaps.
[b] The International Internship is prerequisite to all elective courses if registered in Jordan.

2.2. Program Requirements (Electives): (12 credit hours)

A minimum of 12 credit hours of coursework is 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.		
EE4101	Modeling and Simulation	3	5	3	-	F2F	BSC001
EE4102	Instrumentation and Measurements	3	5	3	-	F2F	BSC001
EE4103	Electronic Circuit Design	3	5	3	-	F2F	BSC001
EE4104	Integrated Circuits and Chip Design	3	5	3	-	F2F	BSC001
EE4105	Sensors and Actuators	3	5	3	-	F2F	BSC001
EE4106	Introduction to Optimization	3	5	3	-	F2F	BSC001
EE4107	Special Topics in Electrical Systems	3	5	3	-	F2F	BSC001
EE4108	Special Topics in Electronics	3	5	3	-	F2F	BSC001
EE4202	Special Electrical Machines	3	5	3	-	F2F	BSC001
EE4206	Smart-Grids	3	5	3	-	F2F	BSC001
EE4207	High Voltage Engineering	3	5	3	-	F2F	BSC001
EE4209	Power System Quality	3	5	3	-	F2F	BSC001
EE4210	Power Electronic Applications in Power Systems	3	5	3	-	F2F	BSC001
EE4211	Power System Protection	3	5	3	-	F2F	BSC001
EE4212	Power System Stability	3	5	3	-	F2F	BSC001
EE4213	Power System Reliability	3	5	3	-	F2F	BSC001
EE4214	Power System Integration	3	5	3	-	F2F	BSC001
EE4215	Special Topics in Power Electronics	3	5	3	-	F2F	BSC001
EE4216	Special Topics in Power Systems	3	5	3	-	F2F	BSC001
EE4301	Solar Energy	3	5	3	-	F2F	BSC001
EE4309	Advanced Renewable Energy Systems	3	5	3	-	F2F	BSC001
EE4314	Energy Efficiency, Management, and Laws	3	5	3	-	F2F	BSC001
EE4315	PV Systems	3	5	3	-	F2F	BSC001
EE4316	Wind Energy Systems	3	5	3	-	F2F	BSC001
EE4318	Data Analytics for Power and Energy Systems	3	5	3	-	F2F	BSC001
EE4319	Special Topics Renewable Energy	3	5	3	-	F2F	BSC001
EE4401	Digital Signal Processing	3	5	3	-	F2F	BSC001
EE4402	Satellite Communication Systems	3	5	3	-	F2F	BSC001
EE4403	Multimedia Communications	3	5	3	-	F2F	BSC001
EE4404	5G	3	5	3	-	F2F	BSC001
EE4405	Antennas	3	5	3	-	F2F	BSC001
EE4406	RF and Microwave Engineering	3	5	3	-	F2F	BSC001
EE4407	Optical Fiber Communications	3	5	3	-	F2F	BSC001
EE4408	Wireless Sensor Networks	3	5	3	-	F2F	BSC001
EE4409	Next Generation Network Technologies	3	5	3	-	F2F	BSC001
EE4410	Industrial IoT	3	5	3	-	F2F	BSC001
EE4411	Special Topics in Communication Systems	3	5	3	-	F2F	BSC001
EE4412	Special Topics in Signal Processing	3	5	3	-	F2F	BSC001
EE5201	Power Systems Analysis	3	5	3	-	F2F	BSC001
EE5204	Motor Drives Systems	3	5	3	-	F2F	BSC001

CE342	Microprocessor and Microcomputer Systems	3	5	3	-	F2F	BSC001
CE354	Computer Security	3	5	3	-	BLD	BSC001
CE377	Machine learning	3	5	3	-	F2F	BSC001
CE452	Network Protocols	3	5	3	-	F2F	BSC001
CE521	Robotics	3	5	3	-	F2F	BSC001
CE552	Advanced Computer Networks	3	5	3	-	F2F	BSC001
CE561	Deep Learning	3	5	3	-	F2F	BSC001
CE565	Computer Vision	3	5	3	-	F2F	BSC001
CEE596	Advanced topics in Project Management	3	5	3	-	F2F	BSC001
CS330	Image Understanding	3	5	2	2	F2F	BSC001
CS332	Computer Graphics	3	5	2	2	F2F	BSC001
CS357	Cybersecurity	3	5	3	-	BLD	BSC001
CS416	Systems Programming	3	5	2	2	F2F	BSC001
CS460	Data Mining	3	5	3	-	BLD	BSC001
CS4611	Big Data	3	5	3	-	BLD	BSC001
IE0515	Product Development and Entrepreneurship	3	5	3	-	BLD	BSC001
IE0516	Facilities and Asset Management	3	5	3	-	F2F	BSC001
IE0533	Supply Chain Engineering	3	5	3	-	F2F	BSC001
IE0562	Industrial Cost Analysis	3	5	3	-	BLD	BSC001
MGT418	Quality Management	3	5	3	-	F2F	BSC001
	Total	12	20	12	0		

Study Plan[c] Guide for a B.Sc. Degree in Electrical Engineering

First Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
CHEM103	General Chemistry I	3	5	3	-	F2F	-
CS116	Computing Fundamentals	3	5	3	-	F2F	-
ENGL1001	Upper-Intermediate English	3	3	3	-	F2F	ENGL0099
GERL101B1	German I B1-Track	3	6	9	-	F2F	-
MATH101	Calculus I	3	5	3	-	BLD	MATH0099
PHYS103	Physics I	3	5	3	-	BLD	-
	Total	**18**	**29**	**24**	**0**		

First Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
ARB100	Arabic	3	3	3	-	OL	ARB0099
CS1160	Computing Fundamentals lab	1	2	0	3	BLD	CS116[co]
ENGL1002	Advanced English	3	3	3	-	F2F	ENGL1001
GERL102	German II	3	4	6	-	F2F	GERL101
MATH102	Calculus II	3	5	3	-	F2F	MATH101
ME0111	Computer Aided Engineering Drawing	2	4	-	6	BLD	CS116
PHYS104	Physics II	3	5	3	-	F2F	PHYS103
	Total	**18**	**26**	**18**	**9**		

[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.**		
EE2101	Electrical Circuits	3	5	3	-	F2F	PHYS104, MATH205^{co}
GERL201	German III	3	4	6	-	F2F	GERL102
IE0281	Technical Writing and Engineering Ethics	2	3	2	-	F2F	ENGL1001
MATH203	Applied Mathematics for Engineers	3	5	3	-	F2F	ARB0099, ENGL0099, MATH102
MATH205	Differential Equations	3	5	3	-	F2F	ARB0099, ENGL0099, MATH102
PHYS106	General Physics Lab	1	2	-	3	BLD	PHYS103, PHYS104^{CO}
NE101	National Education (in Arabic)	3	2	3	-	OL	-
	National Education (in English)						
	Total	**18**	**26**	**20**	**3**		

Second Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE2102	Electrical Circuits Lab	1	2	-	3	BLD	ARB0099, ENGL0099, EE2101, PHYS106
EE2103	Linear Algebra	3	5	3	-	BLD	ARB0099, ENGL0099, MATH102
EE2104	Frequency and System Response	3	5	3	-	F2F	ARB0099, ENGL0099, EE2101
EE2105	Electronics	3	5	3	-	F2F	ARB0099, ENGL0099, EE2101
EE2107	Computer Aided Mathematics for EE	2	4	0	6	BLD	ARB0099, ENGL0099, MATH205, CS1160, EE2103^{CO}
CE212	Digital Systems	3	5	3	-	F2F	ARB0099, ENGL0099, CS116, MATH0099
GERL202	German IV	3	6	9	-	F2F	ARB0099, ENGL0099, GERL201
	Total	**18**	**32**	**21**	**9**		

Third Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE3101	Random Variables and Stochastic Processes	3	5	3	-	BLD	MATH102
EE3102	Electromagnetics	3	5	3	-	F2F	MATH203, EE2104
EE3201	Electrical Power and Machines	3	5	3	-	F2F	EE2104, EE3102^{co}
EE3401	Communication Systems and IoT Protocols	3	5	3	-	BLD	EE2104
EE3105	Embedded Systems	3	5	3	-	F2F	CE212
GERL301	German V	3	6	9	-	F2F	GERL202
	Total	**18**	**31**	**24**	**-**		

Third Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE2106	Electronics Lab	1	2	-	3	BLD	ARB0099, ENGL0099, EE2102, EE2105
EE3103	Modeling and Simulation of Electrical and Energy Systems	1	2	-	3	BLD	EE3201CO, EE3401CO
EE3104	Artificial Intelligence in Electrical and Energy Systems	3	5	3	-	F2F	EE2107, EE2103
EE3202	Electrical Power and Machines Lab	1	2	-	3	BLD	EE2102, EE3201
EE3203	Power Electronics	3	5	3	-	BLD	EE2105, EE3201
EE3402	Communication Systems and IoT Protocols Lab	1	2	-	3	BLD	EE3401, CE201
EE3403	Digital Communications	3	5	3	-	F2F	EE3401, EE3101CO
GERL302	German VI	3	6	6	-	F2F	GERL301
	University Elective I	2	2	1	1	BLD	
	Total	**18**	**31**	**16**	**13**		

Third Year							
Summer Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE3901	Field Training	0	6	160 hours		F2F	Dept. Approval
	Total						

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

Fourth Year							
First Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
	Electives	3	5			F2F	
	Electives	3	5			F2F	
	Electives	3	5			F2F	
	Electives	3	5			F2F	
	Total	**12**	**20**				

Fourth Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE4901	International Internship[d]	12	30	20 weeks		OL	EE3901, Dept. Approval
	Total	**12**	**30**				

Prerequisite courses for the German year

Passing the following courses:

- EE3203 Power Electronics
- EE3401 Communication Systems and IoT Protocols

[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.**		
EE5101	Control Systems	3	5	3	-	BLD	EE2103, EE3201
EE5202	Power System Generation, Transmission and Distribution	3	5	3	-	F2F	EE2103
EE5401	Wireless and Mobile Communications	3	5	3	-	BLD	EE3401
EE5403	Digital and Communication Electronics	3	5	3	-	F2F	EE2105, EE3401
EE5901	Graduation Project I	1	4	-	3	BLD	Dept. Approval
IE0361	Engineering Economics	3	5	3	-	OL	MATH205
	University Elective II	2	2	1	1	BLD	
	Total	**18**	**31**	**16**	**4**		

Fifth Year							
Second Semester							
Course ID	**Course Name**	**Credit Hours**	**ECTS**	**Contact Hours**		**Type**	**Prerequisites / Corequisites**
				Lect.	**Prac.**		
EE5203	Power Systems Lab	1	2	-	3	BLD	EE5202
EE3404	Digital Communications Lab	1	2	-	3	BLD	EE3402, EE3403
EE5402	Wireless and Mobile Communication lab	1	2	-	3	BLD	EE3404, EE5401
EE5404	Quantum Communication and Computing	3	5	3	-	F2F	EE3401
EE5405	Satellite and Optical Communications	3	5	3	-	BLD	EE3401
EE5902	Graduation Project II	3	6	-	9	BLD	EE5901
IE0141	Engineering Workshop	1	4	-	3	BLD	-
MILS100	Military Science	3	2	3	-	OL	-
	University Elective III	2	2	1	1	BLD	
	Total	**18**	**30**	**10**	**22**		

VI. Compulsory Courses Offered by Electrical and Energy Engineering Department

EE2101 Electrical Circuits **3 Cr Hr (3,0)** **5 ECTS**

SI units, voltage and current; Ohm's and Kirchhoff's Laws, circuits with dependent sources; simple resistive circuits: series, parallel and delta to wye; techniques of circuit analysis: nodal and mesh analyses, source transformation, Thevenin and Norton equivalents; amplifiers; inductance, capacitance and mutual inductance; natural and step responses of RL and RC circuits; natural and step response of series and parallel RLC circuits; sinusoidal steady state analysis.

Prerequisites: ARB0099, ENGL0099, *PHYS104*
Corequisites: MATH205[co]

EE2102 Electrical Circuits Lab **1 Cr Hr (0,3)** **2 ECTS**

Resistive circuits, potentiometers, superposition, Thevenin theorem, maximum power transfer, RLC current and voltage characteristics, frequency response of RL and RC circuits, series and parallel resonant circuits.

Prerequisites: ARB0099, ENGL0099, EE2101, PHYS106

EE2103 Linear Algebra **3 Cr Hr (3,0)** **5 ECTS**

Introduction to Vectors and Matrices. Vector and matrix derivatives. Systems of linear equations. Vector spaces and subspaces. Independence, bases and dimensions. The fundamental fours spaces. Orthogonality and Gram-Schmidt process. Projection and projection matrices. Linear models and least squares problems. Determinants and their properties. Eigenvalues and eigenvectors. Matrix decompositions such as LU decomposition, Eigen-decomposition, Singular Value Decomposition. Applying these tools in a wide range of engineering applications.

Prerequisites: ARB0099, ENGL0099, *MATH102*
Corequisites: -

EE2104 Frequency and System Response **3 Cr Hr (3,0)** **5 ECTS**

This course focuses on the analysis and modeling of continuous-time signals and electrical systems using time- and frequency-domain techniques. It covers signal properties, linear time-invariant system modeling, convolution, Laplace transforms with Laplace-domain circuit analysis, Fourier series and Fourier transforms, frequency response, and impulse and step responses of electrical circuits. The course also includes the design and analysis of passive and active filters and the introduction of two-port network parameters.

Prerequisites: ARB0099, ENGL0099, EE2101
Corequisites: -

EE2105 Electronics **3 Cr Hr (3,0)** **5 ECTS**

Semiconductor material, covalent bond model, doping, PN junction, the diode (IV-characteristics, reverse behavior, zero and forward biasing, ideal and real diode), Zener diode, Schottky diode, diode circuit analysis, half-wave rectifier circuits, full-wave rectifier circuits, dynamic switching behavior of the diode, diode applications, Bipolar Junction Transistor (BJT) (NPN and PNP transistors, iv-characteristics, DC analysis (Q-point) & AC small-signal analysis), Field- Effect Transistors (FETs) (Junction FET (JFET) transistor, Metal-Oxide Semiconductor FET (MOSFET) transistor) and i-v characteristics of FET transistors, DC analysis (Q-point) & AC small-signal analysis. Ideal Operational Amplifiers (Op-amps) and their applications.

Prerequisites: ARB0099, ENGL0099, EE2101
Corequisites: -

EE2106 Electronics Lab **1 Cr Hr (0,3)** **2 ECTS**

Diode circuits, DC and AC characteristics of BJT and FET amplifiers, operational amplifiers and applications, Lab project.

Prerequisites: ARB0099, ENGL0099, *EE2102, EE2105*
Corequisites: -

EE2107 Computer Aided Mathematics for EE **2 Cr Hr (0,6)** **4 ECTS**

This course introduces computational tools and programming-based workflows that support mathematical modeling and analysis in modern engineering practice. Emphasis is on Python fundamentals and their application to data preprocessing, numerical analysis, and visualization. Core topics include solving algebraic and nonlinear equations, interpolation and curve fitting, numerical differentiation and integration, basic optimization techniques, and matrix-based computations. Learning is reinforced through hands-on laboratory exercises and mini projects using real-world engineering datasets, with an emphasis on reproducible analysis, design, visualization, and technical reporting.

Prerequisites: - ARB0099, ENGL0099, CS1160, MATH205
Corequisites: EE2103

EE3101 Random Variables and Stochastic Processes **3 Cr Hr (3,0)** **5 ECTS**

Fundamentals of probability, sample space, random variables expectations, Bernoulli and Poisson processes, continuous single random variable, PDF, CDF and conditional distributions, famous distributions (Gaussian, uniform, exponential, etc), transformation of random variables, joint random variables operations, joint PDF and joint CDF, random processes temporal characteristics and concepts of stationarity, ergodicity and correlation. Introduction to the basics of statistics, descriptive statistics, and hypothesis testing.

Prerequisites: MATH102
Corequisites: -

EE3102 Electromagnetics **3 Cr Hr (3,0)** **5 ECTS**

Electrostatic fields, magneto-static fields, solution of Laplace's and Poisson's equations, Faraday's law and applications, Maxwell's equations, plane waves: propagation, reflection and refraction, transmission lines.

Prerequisites: MATH203, EE2104
Corequisites: -

EE3103 Modeling and Simulation of Electrical and Energy Systems **1 Cr Hr (0,3)** **2 ECTS**

Introduction to modeling methods and simulation techniques for electrical and energy systems. Covers component modeling, system optimization, and computational tools, with applications to thermal and electrical systems.

Prerequisites:
Corequisites: EE3201^{co}, EE3401^{co}

EE3104 Artificial Intelligence in Electrical and Energy Systems **3 Cr Hr (3,0)** **5 ECTS**

Introduction to AI and machine learning methods for modeling, monitoring, control, optimization, and decision-making in modern electrical and energy engineering applications. The course covers data-driven fundamentals (data preparation, feature engineering, model validation), supervised and unsupervised learning, and selected deep learning approaches, with emphasis on practical engineering workflows, interpretability, and reliability. The course highlights various communication, networking, power and energy applications such as wireless channel/traffic characterization, adaptive resource allocation, signal classification, load and energy generation forecasting and management, condition monitoring and predictive maintenance, and smart grids.

Prerequisites: EE2107, EE2103
Corequisites: -

EE3105 Embedded Systems **3 Cr Hr (3,0)** **5 ECTS**

This course focuses on the design and implementation of embedded systems using modern microcontrollers and microprocessors. Topics include instruction set architecture (ISA), processor organization, memory systems, interrupts, and on-chip peripherals. Students develop low-level firmware, interface sensors and actuators, analyze performance, and design integrated embedded systems that combine hardware and software to meet application requirements

Prerequisites: CE212
Corequisites: -

EE3201 Electrical Power and Machines **3 Cr Hr (3,0)** **5 ECTS**

Average, reactive and complex power, power measurements; polyphase circuits, Transformers, DC machines, induction motors, synchronous machines.

Prerequisites: EE2104, EE3102^{co}

Corequisites: -

EE3202 Electrical Power and Machines Lab **1 Cr Hr (0,3)** **2 ECTS**

Transformers, DC motors and generators, induction motors, three-phase synchronous generator and motor, AC series motor, lab project.

Prerequisites: EE2102, EE3201

Corequisites: -

EE3203 Power Electronics **3 Cr Hr (3,0)** **5 ECTS**

Power semiconductor devices: types, drive circuits, protection circuits, and power loss calculation; AC-DC converters: uncontrolled and fully-controlled single-phase and three-phase rectifiers, half-controlled rectifiers; DC-DC converters: step-down, step-up, and step-down/up converters; DC-AC converters: single-phase and three-phase inverters; AC-AC converters: cycloconverters, ac voltage controllers.

Prerequisites: EE2105, EE3201

Corequisites: -

EE3401 Communication Systems and IoT Protocols **3 Cr Hr (3,0)** **5 ECTS**

This course introduces the fundamental principles of communication systems and modern Internet of Things (IoT) applications. It begins with a review of basic signals and systems, followed by core topics in analog and digital communications, including amplitude and angle modulation, signal spectra, signal-to-noise ratio, sampling, quantization, line coding. The architecture, layers, and design principles of IoT systems, device-to-device communication, network protocols, and cloud integration. Major IoT communication technologies such Wi-Fi, Bluetooth Low Energy, LoRaWAN, 5G/6G IoT, ZigBee, NB-IoT, and industrial protocols, the trade-offs in terms of energy efficiency, coverage, scalability, interoperability, and security. Some practical case studies will be demonstrated as smart cities, healthcare, industrial automation, environmental monitoring, and smart energy systems.

Prerequisites: EE2104

Corequisites: -

EE3402 Communication Systems and IoT Protocols Lab **1 Cr Hr (0,3)** **2 ECTS**

This laboratory provides practical, hands-on experience through implementation and measurement on real hardware. Students build and test basic analog and digital communication experiments including AM/FM concepts, spectral analysis, SNR measurements, sampling and quantization effects, and basic line-coding. The lab also emphasizes embedded IoT prototyping: interfacing sensors with microcontrollers, configuring device-to-device links, and deploying IoT connectivity using technologies such as Wi-Fi, BLE, LoRaWAN, ZigBee.

Prerequisites: EE3401, CE201

Corequisites: -

EE3403 Digital Communications **3 Cr Hr (3,0)** **5 ECTS**

This course introduces the fundamental principles of digital communication systems. Topics include basic information theory concepts, the binary symmetric channel, and introductory source coding principles. Signal representation in noise, matched filtering, and optimum receiver design in the presence of additive white Gaussian noise (AWGN). Probability of error analysis.

Prerequisites:EE3401

Corequisites: EE3101^{co}

EE3404 Digital Communications lab **1 Cr Hr (0,3)** **5 ECTS**

This laboratory provides hands-on experimental experience in digital communication systems using hardware kits integrated with data acquisition and control software. Students construct and test fundamental digital communication building blocks, including binary data sources, line coding, baseband signal generation, and

channel models. Experiments focus on signal transmission in noise, implementation of matched filters, and optimum receiver operation in the presence of AWGN. Students measure and compare bit error

Prerequisites: EE3402, EE3404
Corequisites: -

EE3901 Field Training **160 hours** **6 ECTS**

Students must complete 160 hours of field training in approved industries in Jordan.

Prerequisites: Dept. Aproval
Corequisites: -

EE4901 International Internship **12 Cr Hr (0,0)** **30 ECTS**

A training period of six months to be spent in the industry in Germany, under a follow up of academic faculty in Jordan and in Germany. Periodic reports and a final report need to be submitted for evaluation and an oral examination is required.

Prerequisites: Passing 115 CrHr
Corequisites: -

EE5101 Control Systems **3 Cr Hr (3,0)** **5 ECTS**

This course emphasizes modeling, analysis, and design of control systems for electrical engineering applications. Building on prior coursework in signals and systems and electrical machines, it covers transfer functions, block diagrams, signal flow graphs, and state-space representations of electrical circuits, power electronic converters, and electromechanical systems. Time-domain and frequency-domain analysis, root locus techniques, and compensation design (PI, PID, and lead–lag controllers) are applied to closed-loop control of electrical drives, power systems, and resonant systems, supporting core electrical engineering design competencies.

Prerequisites: EE2103, EE3201
Corequisites: -

EE5202 Power System Generation, Transmission and Distribution **3 Cr Hr (3,0)** **5 ECTS**

Substation design, distribution systems, transmission systems, transformers, high voltage cables, introduction to power system protection, circuit breakers, switch gear, introduction to power quality, wiring and grounding.

Prerequisites: EE2103
Corequisites:

EE5203 Power Systems Lab **3 Cr Hr (3,0)** **2 ECTS**

Transmission line performance under different operating conditions, load characteristics, real and reactive power flow and control for a transmission line, characteristics of different types of sequence components, balanced and unbalanced faults, power system transients and stability.

Prerequisites: EE5202
Corequisites:

EE5401 Wireless and Mobile Communications **3 Cr Hr (3,0)** **5 ECTS**

Evolution from 4G LTE to 5G NR and anticipated 6G paradigms. Topics include massive MIMO, mmWave and THz communications, network slicing, non-terrestrial networks (NTN), AI-driven resource allocation, ultra-reliable low-latency communications (URLLC), and integrated sensing and communication. Students will design and simulate next-generation wireless links using MATLAB/Simulink and explore future trends such as reconfigurable intelligent surfaces (RIS) and holographic communications

Prerequisites: EE3401
Corequisites: -

EE5402 Wireless and Mobile Communication lab **1 Cr Hr (0,3)** **2 ECTS**

A/D and D/A conversion. Sampling. Quantization. Line coding. Digital modulation. PSK, QAM, and PAM. SNR measurement. BER calculation. Eye diagram. Channel coding. Optimum receiver. simulating, analyzing, and testing 5G communications systems. The lab will address 5G channel modeling, physical layer components, signal reception, and will aim to build an end-to-end 5G communication system.

Prerequisites: EE3404, EE5401

Corequisites: -

EE5403 Digital and Communication Electronics **3 Cr Hr (3,0)** **5 ECTS**

Introduction to the fundamentals of digital and communication electronics. Topics include general properties of digital circuits, BJT and FET device operation, classic logic families TTL and MOS-based logic (NMOS, PMOS, CMOS), and basic D/A and A/D converters. The course also covers noise concepts, amplitude and angle modulators and demodulators, AM transmitters, superheterodyne and FM receivers, and an introduction to digital modulation and multiplexing circuits.

*Prerequisites:*EE2105, EE3401
Corequisites: -

EE5404 Quantum Communication and Computing **3 Cr Hr (3,0)** **5 ECTS**

Introduces quantum information science with applications in secure communication and computation. Topics include qubits, quantum superposition, entanglement, quantum gates, quantum key distribution (QKD), post-quantum cryptography, and basic quantum algorithms (e.g., Grover's, Shor's). Students will simulate quantum systems using frameworks such as MATLAB Quantum Toolbox and analyze use cases for quantum communication networks.

Prerequisites: EE3401
Corequisites: -

EE5405 Satellite and Optical Communications **3 Cr Hr (3,0)** **5 ECTS**

Fundamental principles of satellite and optical communication systems. Topics include basic orbital concepts, satellite subsystems, coverage and footprints, link budget fundamentals, propagation effects, and an overview of modulation and multiple access techniques. The course also introduces fiber-optic communication systems, covering optical sources and detectors, single-mode and multimode fibers, transmission media, attenuation, dispersion, and noise effects.

Prerequisites: EE3401
Corequisites: -

EE5901 Graduation Project I **1 Cr Hr (0,3)** **4 ECTS**

This course provides students with the opportunity to prepare and execute an engineering project under faculty supervision. Working in teams, students will select and define a project scope, review the relevant theory and background, and develop an understanding of the practical applications. Emphasis is placed on teamwork, project management, and awareness of ethical and professional issues in engineering practice. The course culminates in a final written report and formal presentation demonstrating the project's outcomes.

Prerequisites: Dept. Approval
Corequisites: -

EE5902 Graduation Project II **3 Cr Hr (0,9)** **6 ECTS**

This course focuses on the practical implementation of the project approved in the initial phase of the graduation project sequence. Under faculty supervision, students apply engineering principles, analysis, and design to realize their proposed solutions. The course concludes with a comprehensive final report and a formal presentation summarizing the project results and contributions.

Prerequisites: EE5901
Corequisites: -

VII. Elective Course Offered by Electrical and Energy Engineering Department

EE4101 Modeling and Simulation **3 Cr Hr (3,0)** **5 ECTS**

This course introduces modeling and simulation techniques for analyzing electrical and energy engineering systems. It focuses on developing component- and system-level models, selecting appropriate modeling assumptions, and translating physical behavior into mathematical and computational representations. Topics include numerical simulation workflows such as discretization, solving algebraic and differential equation models, parameter estimation, and model validation. Emphasis is placed on using simulation to predict system behavior, evaluate performance under different operating conditions, and support engineering design decisions, with practical case studies and software-based implementation.

Prerequisites: BSC001
Corequisites: -

EE4102 Instrumentation and Measurements **3 Cr Hr (3,0)** **5 ECTS**

Introduction to the fundamentals of engineering instrumentation and measurement. Topics include measurement principles and standards, calibration, accuracy and uncertainty analysis, and sensors/transducers for common physical quantities (e.g., electric, temperature, pressure, flow, displacement, and motion). It also covers signal processing (amplification and filtering), noise and interference mitigation, and basic data acquisition concepts such as sampling, quantization, and digitization.

Prerequisites: BSC001
Corequisites: -

EE4103 Electronic Circuit Design **3 Cr Hr (3,0)** **5 ECTS**

Feedback amplifiers, oscillators, power amplifiers, current mirrors, active loads, differential amplifiers, active filters, internal structure of operational amplifiers, integrated analog circuits and applications.

Prerequisites: BSC001
Corequisites: -

EE4104 Integrated Circuits and Chip Design **3 Cr Hr (3,0)** **5 ECTS**

Introduces principles and methodologies of IC design for digital and mixed-signal systems. Topics cover CMOS technology, digital logic design, layout, timing analysis, analog building blocks, and low-power design strategies. Students will learn to use industry-standard EDA tools (Cadence, Synopsys, or open-source alternatives) to create, simulate, and verify integrated circuits from schematic to layout.

Prerequisites: BSC001

EE4105 Sensors and Actuators **3 Cr Hr (3,0)** **5 ECTS**

Sensing and actuation in system instrumentation, Interfacing circuits, Application scenarios of sensors and actuators, Instrumentation process and steps, Application examples, Data acquisition and processing, Digital transducers, Sensor technologies.

Prerequisites: BSC001

EE4106 Introduction to Optimization **3 Cr Hr (3,0)** **5 ECTS**

This course introduces core optimization principles and techniques. It emphasizes converting real problems into well-defined optimization models and solving them using both analytical tools and numerical algorithms. Topics include unconstrained optimization, first- and second-order optimality conditions, gradient-based methods, convexity and introductory convex optimization, and constrained optimization using Lagrange multipliers and KKT conditions. Algorithms such as gradient descent, Newton's method, line search, penalty/barrier methods, and basic linear programming are presented alongside practical implementation using numerical computing tools. The course highlights applications drawn from real-world scenarios.

Prerequisites: BSC001

Corequisites: -

EE4107 Special Topics in Electrical Systems **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Electrical Systems.

Prerequisites: BSC001
Corequisites: -

EE4108 Special Topics in Electronics **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Electronics.

Prerequisites: BSC001
Corequisites: -

EE4202 Special Electrical Machines **3 Cr Hr (3,0)** **5 ECTS**

Linear Electric machines: comparison with rotating machines; linear induction motors: simplified electromagnetic field theory, force equation, characteristics; superconducting AC generators and motors; variable reluctance motors: performance and characteristics; printed circuit motors.

Prerequisites: BSC001
Corequisites: -

EE4206 Smart-Grids **3 Cr Hr (3,0)** **5 ECTS**

This course presents a new concept in power systems, by integrating Power systems with Power electronics, Communications and information technology. In addition, the concept of involving intelligent control using SCADA system will be presented.

Prerequisites: BSC001
Corequisites: -

EE4207 High Voltage Engineering **3 Cr Hr (3,0)** **5 ECTS**

Generation and measurement of high voltage, electrostatic field and field stress control, electrical breakdown in gases, solids and liquids, non-destructive insulation test techniques, over-voltages and insulation coordination.

Prerequisites: BSC001
Corequisites: -

EE4209 Power System Quality **3 Cr Hr (3,0)** **5 ECTS**

Power quality concepts, wiring and grounding issues, voltage sags, voltage variations, transients, harmonics, longer duration voltage variation, distributed generation and power electronics, instrumentation and analyzers.

Prerequisites: BSC001
Corequisites: -

EE4210 Power Electronic Applications in Power Systems **3 Cr Hr (3,0)** **5 ECTS**

Semiconductor devices for power engineering applications, common power electronic circuits, impact of power electronics loads on power quality, HVDC converter plant, transmission plant control strategies, flexible AC transmission: conventional and advanced devices, shunt compensation, static VAR compensation, series compensation, angle compensation, quadrature boosters, unified power flow controller.

Prerequisites: BSC001
Corequisites: -

EE4211 Power System Protection **3 Cr Hr (3,0)** **5 ECTS**

Power system protection, fault analysis, instrument transformers, overcurrent protection, distance protection,

differential protection, pilot protection, generator protection, motor protection, transmission line protection, transformer protection, bus protection, radial reactor and shunt capacitor protection.

Prerequisites: BSC001
Corequisites: -

EE4212 Power System Stability **3 Cr Hr (3,0)** **5 ECTS**

Power system stability concepts, the classical machine model, modeling of synchronous machines, modeling of loads, excitation system types, dynamic models of excitation system, response of a power network to disturbances, small signal stability, voltage stability.

Prerequisites: BSC001
Corequisites: -

EE4213 Power System Reliability **3 Cr Hr (3,0)** **5 ECTS**

Power system reliability concepts, modern random processes methods, the universal generating function method, Monte Carlo simulation, reliability of generation systems, reliability assessment of transmission lines, reliability assessment of transformers, and reliability of distribution systems.

Prerequisites: BSC001
Corequisites: -

EE4214 Power System Integration **3 Cr Hr (3,0)** **5 ECTS**

This course introduces the principles and challenges of integrating power electronic converters, renewable energy sources, energy storage, and distributed generation into modern power systems. Topics include grid connection requirements, power quality, stability, protection, and basic grid codes, with applications in smart grids, microgrids, and electric power networks.

Prerequisites: BSC001
Corequisites: -

EE4215 Special Topics in Power Electronics **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Power Electronics.

Prerequisites: BSC001
Corequisites: -

EE4216 Special Topics in Power Systems **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Power Systems.

Prerequisites: BSC001
Corequisites: -

EE4301 Solar Energy **3 Cr Hr (3,0)** **5 ECTS**

This course explores solar thermal and photovoltaic systems, focusing on heat transfer processes, materials, and design methodologies. Topics include selective coatings, phase change materials, and transparent insulation, as well as testing and performance evaluation of solar collectors. Applications such as solar water heating, absorption cooling, thermal power generation, and photovoltaic-hybrid units are examined. Students will use software tools for system simulation and design, while also considering financial and environmental impacts. Case studies and practical exercises provide applied experience in analyzing and developing solar energy systems.

Prerequisites: BSC001
Corequisites: -

EE4309 Advanced Renewable Energy Systems **3 Cr Hr (3,0)** **5 ECTS**

Analysis of alternative and renewable energy systems; methods of integrating these solutions with society; sustainable energy; principles, possibilities, and limits of alternative and renewable energy.

Prerequisites: BSC001
Corequisites: -

EE4314 Energy Efficiency, Management, and Laws **3 Cr Hr (3,0)** **5 ECTS**

This course explores the technical and physical processes of energy use across the residential, commercial, industrial, and transport sectors. It introduces economic tools for evaluating and justifying energy efficiency investments, alongside "whole-system" design and analysis approaches. Policy frameworks, legal considerations, and environmental requirements are examined to support the effective implementation and management of energy efficiency measures.

Prerequisites: BSC001
Corequisites: -

EE4315 PV Systems **3 Cr Hr (3,0)** **5 ECTS**

Study of solar radiation, PV cell principles, and system components. Topics include design and analysis of stand-alone and grid-connected PV systems, performance evaluation, and economic considerations. Laboratory work covers PV module testing and small-scale system design.

Prerequisites: BSC001
Corequisites: -

EE4316 Wind Energy Systems **3 Cr Hr (3,0)** **5 ECTS**

Introduction to wind energy conversion systems, covering wind resource assessment, aerodynamics of wind turbines, power curves, and system components. Emphasis on design and analysis of onshore and offshore wind farms, integration with electrical grids, and environmental and economic considerations. Laboratory work includes performance evaluation of small-scale wind turbines and simulation of wind power systems.

Prerequisites: BSC001
Corequisites: -

EE4318 Data Analytics for Power and Energy Systems **3 Cr Hr (3,0)** **5 ECTS**

This course introduces data analytics methods and workflows for power and energy systems. It covers data acquisition and preprocessing (cleaning, missing data, outliers, normalization), exploratory analysis and visualization, and feature engineering for time-series measurements such as load, voltage/current, power quality, and renewable generation. Topic covers statistical modeling and machine learning techniques used in power and energy applications, with emphasis on model validation, performance metrics, and interpretability.

Prerequisites: BSC001
Corequisites: -

EE4319 Special Topics Renewable Energy **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Renewable Energy.

Prerequisites: BSC001
Corequisites: -

EE4401 Digital Signal Processing **3 Cr Hr (3,0)** **5 ECTS**

Digital Signal Processing begins with a discussion of the analysis and representation of discrete-time signal systems, including discrete-time convolution, difference equations, the z-transform, and the discrete-time Fourier transform. The course proceeds to cover digital network. FIR and IIR digital filters design. The fast Fourier transform algorithm for computation of the discrete Fourier transform.

Prerequisites: BSC001
Corequisites: -

EE4402 Satellite Communication Systems **3 Cr Hr (3,0)** **5 ECTS**

History of satellites. Orbital and geostationary satellites. Mechanical fundamentals for satellites. Orbital patterns. Look angles. Orbital spacing. Radiation pattern. Satellite system. Link models. Uplink model. Down link model. Transponder. Link budget equations and calculations. Digital modulation and channel coding techniques used in satellites. Losses and attenuation of waves between satellites and earth. Impact of weather conditions.

Prerequisites: BSC001
Corequisites: -

EE4403 Multimedia Communications **3 Cr Hr (3,0)** **5 ECTS**

Introduction to audio and video signals, audio and video Signal Compression, audio/video processing tools, computer graphic tools and Video Production tools, Design fundamentals: Points, lines, design and creativity, Multimedia Processors, Multimedia Networks and Applications: Audio and Video Conferencing. Multimedia application over the Intranet and the Internet. In the aspect of multimedia networking, special considerations for sending multimedia over the Internet and wireless networks, such as video adaptation, error resilience, error concealment, and quality of service will be discussed. Note: the course will encourage the usage of open access software such as Audacity, Speex, and FFMPEG.

Prerequisites: BSC001
Corequisites: -

EE4404 5G **3 Cr Hr (3,0)** **5 ECTS**

Evolution of wireless systems from 1G, 2G, 3G, 4G and 5G. Understand the basic knowledge of 5G core network. 5G development and evolution. 5G network architecture and key technologies. 5G new technology convergence and innovative applications. 5G basic service capabilities and applications. 5G industry applications, services, and marketing.

Prerequisites: BSC001
Corequisites: -

EE4405 Antennas **3 Cr Hr (3,0)** **5 ECTS**

Antenna parameters: gain, directivity, efficiency, input impedance, radiation pattern. Theory of transmitting and receiving antennas: reciprocity, equivalence, and induction theorems. Linear wire antennas: dipoles and monopoles. Loop and traveling-wave antennas. Antenna arrays: linear and phased arrays. Aperture antennas, reflector antennas, and microstrip antennas. Computer aided design: student projects using antenna simulation tools.

Prerequisites: BSC001
Corequisites: -

EE4406 RF and Microwave Engineering **3 Cr Hr (3,0)** **5 ECTS**

Microwave applications (terrestrial and satellite communications, radar, remote sensing, wireless communications) and their system and component requirements. Review of Maxwell's equations. Propagation modes of transmission lines (TEM, waveguide, micro strip), S-parameter matrix modeling of discontinuities, junctions and circuits (impedance transformers, directional couplers, hybrids, filters, circulators, solid-state amplifiers and oscillators). Microwave computer aided design examples.

Prerequisites: BSC001
Corequisites: -

EE4407 Optical Fiber Communications **3 Cr Hr (3,0)** **5 ECTS**

Components and system design of optical fiber communication. Types of fibers (single- and multi-mode and step-index and graded-index fibers), how they work, phenomena that degrade signals and how to mitigate them (attenuation, modal dispersion, group-velocity dispersion), light sources, detectors, amplifiers, networks, and systems. Wavelength-Division Multiplexing. Introduction to optical wireless communication.

Prerequisites: BSC001
Corequisites: -

EE4408 Wireless Sensor Networks **3 Cr Hr (3,0)** **5 ECTS**

Wireless Sensor Networks definition, applications, major components and architecture, clustering protocols, routing protocols, wireless communication protocols, implementation platforms, power saving modes. Interrupts, Security.

Prerequisites: BSC001

Corequisites: -

EE4409 Next Generation Network Technologies **3 Cr Hr (3,0)** **5 ECTS**

Explores the architectures, protocols, and enabling technologies shaping modern and future communication networks. It covers key concepts in 5G and beyond (B5G/6G), including radio access evolution, core network design, network slicing, edge/cloud-native networking, and software-defined and virtualized networking (SDN/NFV).The course also introduces automation and AI/ML-driven network management, intent-based networking, and performance/QoS/QoE engineering. Security, privacy, and resilience are emphasized alongside emerging topics such as massive IoT connectivity, ultra-reliable low-latency communication, open RAN, and integration of non-terrestrial networks (e.g., satellites).

Prerequisites: BSC001
Corequisites: -

EE4410 Industrial IoT **3 Cr Hr (3,0)** **5 ECTS**

IIoT definition, requirements, communication protocol specifications. IIoT wired and wireless communication protocols such as: EIA-232 Interface Standard, EIA-485 Interface Standard, Current loop and EIA-485 converters, Modbus, ProfiBus, WirelessHART, ISA100.11a, WIA-PA and OPC, Scada systems. IIoT applications such as: preventive maintenance, objects training and monitoring, IIoT role in Industry 4.0 and next generation networks.

Prerequisites: BSC001
Corequisites: -

EE4411 Special Topics in Communication Systems **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Communication Systems.

Prerequisites: BSC001
Corequisites: -

EE4412 Special Topics in Signal Processing **3 Cr Hr (3,0)** **5 ECTS**

A course on special topics in Signal Processing.

Prerequisites: BSC001
Corequisites: -

EE5201 Power Systems Analysis **3 Cr Hr (3,0)** **5 ECTS**

Fault analysis, symmetrical components, unsymmetrical faults, transient stability, economic dispatch and operation.

Prerequisites: BSC001
Corequisites: -

EE5204 Motor Drives Systems **3 Cr Hr (3,0)** **5 ECTS**

DC-motor drives using controlled AC-DC converters; DC-motor drives using DC-DC converters; frequency-controlled induction-motor drives; slip energy recovery; synchronous motor drives using inverters and cycloconverters; variable reluctance drives: switched reluctance and stepper-motor drives using bridge inverters.

Prerequisites: BSC001
Corequisites: -

VIII. Course Offered by Other Departments

CEE596 Advanced topics in Project Management **3 Cr Hr (3,0)** **5 ECTS**

The course requires candidates to study in detail the way in which the principles of the whole project life cycle including design, production and operation in construction can be integrated. It embraces study of the general principles of systems integration and their application in a construction manufacture context. It also entails study of the fundamental principles of simultaneous engineering and addresses the issue of integration through a technology driven approach; and any advanced topic in project management the instructor may choose.

Prerequisites: BSC001
Corequisites: -

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: ARB0099

CE212 Digital Systems **3 Cr Hr (3,0)** **5 ECTS**

Fundamentals of digital electronics, Binary number system; Boolean algebra, logic operations, algebra and gates, digital circuits analysis, gate-level and block level design of digital circuits, adders, subtractors, comparators, multiplexers, decoders, analysis, design and applications of sequential circuits: flip-flops, registers, counter, and their design procedures, RAM and ROM memory elements.

Prerequisites: CS116, ARB0099, ENGL0099, MATH0099

Corequisites: -

CE342 Microprocessor and Microcomputer Systems **3 Cr Hr (3,0)** **5 ECTS**

Introduction to theoretical concepts of 8-bit and 16-bit microprocessors including microprocessor architecture, memory organization, instruction set, input/output organization, and interrupts. Design of microcomputer systems, address maps, system bus, memory maps, peripheral I/O, memory-mapped I/O, interrupt-driven I/O, interface devices, and general-purpose programmable peripheral devices.

Prerequisites: BSC001

Corequisites: -

CE354 Computer Security **3 Cr Hr (3,0)** **5 ECTS**

Security of networked computer systems; secure network configuration and user management; handling of attacks; Tools for secure network management; System management; System administration; System programming for security; Security: local attacks; network attacks; Firewalls; Security of web servers, ftp servers and mail servers; Virtual private networks, Cryptography, encryption and decryption techniques, primary key and digital certificate principles, Public Key Cryptography and the RSA Algorithm.

Prerequisites: BSC001

Corequisites: -

CE377 Machine learning **3 Cr Hr (3,0)** **5 ECTS**

In this course, students will be introduced to the fundamental principles, techniques, and practical applications of machine learning. It encompasses both the theoretical foundations and hands-on implementations, enabling students to build a strong foundation in this transformative field. Throughoutthis course, students will delve into an in-depth exploration of a wide array of machine learning models, unraveling the intricacies of their implementation and showcasing their extensive applications. Machine learning models serve as valuable tools across various domains, including data mining, the creation of analytical models, and their relevance in fields such as security, scientific research, education, healthcare, and more. Our primary objective is to empower students with the knowledge and skills necessary to comprehend the diverse landscape of machine learning models, understand their theoretical foundations, and effectively apply them within the realm of engineering across a variety of domains. Students will apply their knowledge of machine learning techniques using Python to solve real-world predictive analysis problems. They will work on a series of hands-on assignments and projects that cover various aspects of machine learning, including data pre-processing, feature engineering, model selection, and

evaluation. Students will have gained practical experience in building and evaluating machine learning models to make data-driven predictions and decisions.

Prerequisites: BSC001
Corequisites: -

CE452 Network Protocols **3 Cr Hr (3,0)** **5 ECTS**

Topics include the TCP/IP networking protocol architectures, layering, encapsulation, PDUs; sliding window algorithms, flow and error control, and the HDLC and PPP protocols; the OSI network layer organization, virtual circuits and datagrams, routing and congestion control algorithms, the X.25 and Frame Relay protocols and, internetworking, IPv4 and the evolving IPv6 internetworking protocols, and the RIP, OSPF, ES-IS, and IS-IS routing protocols, session layer dialog control and activity management, queuing, , packet scheduling, network security protocols; IPSec and VPNs, performance analysis, testing, correctness, SNMP, Wireless network protocols, Multi-Protocol Label Switching (MPLS), multimedia and real time network protocols.

Prerequisites: BSC001
Corequisites: -

CE521 Robotics **3 Cr Hr (3,0)** **5 ECTS**

Introduction to basics of modeling, design, planning, and control of robot systems. Topics include robotics foundations in kinematics, dynamics, control, motion planning, trajectory generation, programming, and design.

Prerequisites: BSC001
Corequisites: -

CE552 Advanced Computer Networks **3 Cr Hr (3,0)** **5 ECTS**

High-speed local networks; metropolitan area networks; bridges; routers; gateways; TCP/IP; application services; IP addressing; IP forwarding, encapsulation, and fragmentation; Address Resolution (ARP& RARP); IP next generation (IPv6); Inter Control Message Protocol (ICMP). Routing Algorithms, MPLS networking technology, VPNs, Network applications and services, Multimedia over internet, Network performance, and Network design. A set of laboratory experiments will provide hands-on experience in related topics.

Prerequisites: BSC001
Corequisites: -

CE561 Deep learning **3 Cr Hr (3,0)** **5 ECTS**

In this course, students will be introduced to the fundamental principles, techniques, and practical applications of deep learning. It encompasses both the theoretical foundations and hands-on implementations, enabling students to build a strong foundation in this transformative field. Throughout this course, students will delve into an in-depth exploration of a wide array of deep learning models, unraveling the intricacies of their implementation and showcasing their extensive applications. Deep learning, a branch of machine learning concerned with the development and application of modern neural networks. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. Deep learning is behind many recent advances in AI, including Siri's speech recognition, Facebook's tag suggestions and self-driving cars. We will cover a range of topics from basic neural networks, convolutional and recurrent network structures, deep unsupervised and reinforcement learning, and applications to problem domains like speech recognition and computer vision. Prerequisites: a strong mathematical background in calculus, linear algebra, probability and random variables, as well as programming in Python.

Prerequisites: BSC001

CE565 Computer Vision **3 Cr Hr (3,0)** **5 ECTS**

This course covers various algorithms and methods that enable a machine to understand images and videos. The topics covered in this course include image formation, feature detection, segmentation, multiple view geometry, camera geometry, 3-D reconstruction, recognition and learning, and video processing.

Prerequisites: BSC001

CHEM103 General Chemistry I **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, acidbase, 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.

Prerequisites: -
Corequisites: -

CS116 Computing Fundamentals **3 Cr Hr (3,0)** **5 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. In the last 2 weeks students implement a course project that combines and covers the course topics in one application. The project is carried out during lecture and lab times as well as at home.

Prerequisites: -
Corequisites:

CS1160 Computing Fundamentals lab **1 Cr Hr (0,3)** **2 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. In the last 2 weeks students implement a course project that combines and covers the course topics in one application. The project is carried out during lecture and lab times as well as at home.

Prerequisites: -
Corequisites: CS1160

CS330 Image Understanding **3 Cr Hr (2,2)** **5 ECTS**

This course is an introduction to fundamental concepts in image understanding. This course explores several algorithms for extracting useful semantic content from image data. In general, the course theme spans over three main topics: image processing, features and matching, geometry in vision, and recognition. In particular, the course will include algorithms and techniques related to linear filters, edge detection, image pyramids, SIFT, Harris Corner detection, feature selection, camera models, homography, stereo vision, image search, fast retrieval, image classification, objection detection, HOG detector.

Prerequisites: BSC001
Corequisites: -

CS332 Computer Graphics **3 Cr Hr (2,2)** **5 ECTS**

Basic concepts of computer graphics, general features of graphics hardware, raster graphics versus vector graphics, drawing primitive objects: lines, poly-lines, polygons, circles, ellipses, curves; filling methods: scan-line fill and flood fill; Basic two-dimensional (2D) geometric transformations: translation, rotation, scaling and reflection; 2D composite transformations, 2D viewing: clipping window and windowing transformation; basic three-dimensional (3D) geometric transformations: translation, scaling, rotation and reflection; composite 3D geometric transformations, viewing a 3D scene: setting a 3D viewing- coordinate reference, transformation from world to viewing coordinates; projection transformations, 3D object representations: lines, planes, polyhedral, curved surfaces, spheres, ellipsoids; visible-surface detection methods, illumination models and surface-rendering methods, shadow mapping, transparency and surface rendering, interactive graphics.

Prerequisites: BSC001
Corequisites: -

CS357 Cybersecurity **3 Cr Hr (3,0)** **5 ECTS**

This course covers an essential range of topics for securing modern enterprises. Course topics include Cryptographic Tools, user authentication, database and cloud Security, malicious software, denial of service attacks, intrusion detection, firewalls and intrusion prevention systems, IT security management and risk assessment, human resources security, legal and ethical aspects, enterprise roles, security metrics, risk management, standards and regulations, physical security, and cybercrime issues and investigation.

Prerequisites: BSC001
Corequisites: -

CS416 Systems Programming **3 Cr Hr (2,2)** **5 ECTS**

System-level UNIX API's: Process manipulation; IO operations; Use of OS functionality; System- level programming in C; Shell programming; Unix system services: file system, process and thread management, inter-process communication: pipes, shared memory, and message queues, semaphores; Network programming, and synchronization; Microsoft Windows and UNIX TCP and UDP Communications; Connection-Oriented Client-Server Architecture; Remote procedure calls and COM overview.

Prerequisites: BSC001
Corequisites: -

CS460 Data Mining **3 Cr Hr (3,0)** **5 ECTS**

The course introduces students to data mining, by studying their principles, algorithms, implementation methodology, and applications. It provides a comprehensive introduction to data mining, including data selection, cleaning, coding, using different pattern recognition techniques, and reporting; and introduces students to the applications of data mining by using commercial tools for creating business applications.

Prerequisites: BSC001
Corequisites: -

CS4611 Big Data **3 Cr Hr (3,0)** **5 ECTS**

The key objective of this course is to familiarize the students with most important information technologies used in manipulating, storing, and analyzing big data. The course includes introducing students to the basic tools for statistical analysis (e.g., R and Python) and also mastering big data processing frameworks (e.g., Hadoop and Spark). Furthermore, students will learn so-called NoSQL storage solutions exemplified by Cassandra for their critical features: speed of reads and writes, and ability to scale to extreme volumes. Students will learn about memory resident databases (VoltDB, SciDB) and graph databases (Ne4J).

Prerequisites: BSC001

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. 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 a focus on individual sounds, word stress, 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: ENGL0098

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
Corequisites: -

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

Advanced English, 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
Corequisites: -

GERL101B1 German I **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.

Prerequisites: -
Corequisites: -

GERL102B1 German II **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 direct needs.

Prerequisites: ARB0099, ENGL0099, *GERL101*
Corequisites: -

GERL201B1 German III **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, *GERL102*
Corequisites: -

GERL202B1 German IV **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, *GERL201*
Corequisites: -

GERL301B1 German V **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: ARB0099, ENGL0099, *GERL202*
Corequisites: -

GERL302B1 German VI **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: GERL301
Corequisites: -

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.

Prerequisites: -
Corequisites: -

IE0281 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: ENGL1001
Corequisites: -

IE0361 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: MATH205
Corequisites: -

IE0515 Product Development and Entrepreneurship **3 Cr Hr (3,0)** **5 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: BSC001

IE0516 Facilities and Asset Management **3 Cr Hr (3,0)** **5 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: BSC001

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: BSC001

IE0562 Industrial Cost Analysis **3 Cr Hr (3,0)** **5 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: BSC001

MATH0099 Pre-Math **3 Cr Hr (3,0)** **5 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
Corequisites: -

MATH101 Calculus I **3 Cr Hr (3,0)** **5 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
Corequisites: -

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: MATH102
Corequisites: -

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*
Corequisites: -

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*
Corequisites: -

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

The use of computer aided software in drawing such as AutoCAD. Geometric constructions. 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
Corequisites: -

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

MILS100 Military Science **3 Cr Hr (3,0)** **2 ECTS**

History of the Jordanian Arab Army. United Nations Peace Keeping Forces. Preparation of the nation for defense and liberation. History of the Hashemite Kingdom of Jordan and its development

Prerequisites: -
Corequisites: -

NE101, NEE101: National Education **3 Cr Hr (3,0)** **2 ECTS**

In a context of striving towards democracy like the one Jordan enjoys today, the meaning and practice of active and responsible citizenship becomes more crucial. It is often argued that democracy requires "democrats" to flourish, and become well established. Democrats are those women and men who recognize pluralism, inclusion, positive engagement, and participation as the main values that govern their interaction with the state as citizens and with each other as diverse people of different interests. In this course you will be able to understand your rights and responsibilities as Jordanian citizen expand your knowledge about the frameworks, and processes that regulates citizen-state relationships as well as the basic necessary skills for you to practice your citizenship rights in a civic manner.

Prerequisites: -
Corequisites: -

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.

Prerequisites: -
Corequisites: -

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 the Magnetic Field, and Faraday's Law.

Prerequisites: PHYS103
Corequisites: -

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.

Prerequisites: PHYS103
Corequisites: PHYS104