German Jordanian University

School of Sustainable Systems and Engineering (SSSE)

Department of Civil and Environmental Engineering

Bachelor of Science in Civil and Environmental Engineering

Study Plan 2023

I. Program Vision

An innovative Civil and Environmental Engineering Department that is recognized and sought after by students and employers at national and international levels and that contributes to scientific and technological development through innovative research and social engagement.

II. Program Mission

To provide high quality applied education, technical knowledge and practical skills to our students, allowing them both competence and self-confidence. They will be able to effectively tackle engineering issues, provide leadership and to face current and future challenges through continued learning. Research in the department will be at high standards and geared to solving pressing issues facing both the country as well as the wider region.

III. Program General Description

Civil and environmental engineers are those who help society to function. The work of civil engineers is everywhere. They are responsible for the infrastructure such as Roads, Bridges, Buildings, and facilities that provide clean water to drink, clean air to breath. The future of the civil and environmental Engineering professions requires the cooperation of multiplicity of disciplines to produce “Engineering for Sustainability” model. Therefore, we educate the students in a multidisciplinary environment to address engineering fundamentals and technologies for green buildings, new materials for smart infrastructural systems to ensure meeting the growing industry needs.

The Department of Civil and Environmental Engineering conducts cutting-edge research and education in vital areas, such as:

- Structural Engineering
- Transportation Engineering
- Sustainable infrastructures
- Well-designed and well-operated buildings
- Water systems.
- Environmental Engineering
- Geotechnical Engineering
- Project Management

The department offers incomparable opportunities for students to experience groundbreaking local civil and environmental engineering projects through a participation in a local training for 160 hours and an internship that takes place in Germany and Extends for

20 weeks.

The Department of Civil and Environmental engineering offers two academic tracks the students can choose to follow one after the third year of study; they are:

- Sustainable Structures and smart mobility Track: which includes areas of emphasis in Structural, Highway, Traffic, and Transportation engineering, applying the sustainability concept in the design and materials choice and the Building Information Modeling (BIM. Furthermore, introducing the concept smart cities. Geotechnical and Project Management Engineering topics are also covered.
- Environmental Engineering and Sustainable Development Track: which includes areas of emphasis in Water and Waste Water Engineering, Nexus and Environmental Engineering and its sustainable development, in addition to Geotechnical and Project Management Engineering.

The students in each track should complete 173 credit hours (CHs), which include 23 CHs as specific track requirements (12 CHs are studied in a German university + 11 CHs at GJU) in addition to 98 CHs as common department compulsory courses. All students are required to achieve 12 CHs as Internship in a German company.

Staff members are fully dedicated for the education of more than 200 undergraduate students.

IV. Program Objectives

Within a few years of graduation, the graduates of the Civil Engineering Department will:

- Become a competent civil engineers;
- Engage in graduate studies, continued education, and professional development;
- Contribute to problem solving through new ideas and innovations;
- Advance to leadership positions in the profession.

V. Program Learning Outcomes (PLOs)

Upon the completion of the Civil and Environmental Engineering Program, the student will be able to:

PLO 1: Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

PLO 2: Apply engineering design to produce cost-effective solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, and environmental factors

PLO 3: Communicate effectively, orally as well as in writing, on complex engineering activities such as being able to comprehend and write effective reports, design documentation, make effective presentations, and give and receive clear instructions.

PLO 4: Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of professional and sustainable engineering solutions in global, economic, environmental, and societal contexts

PLO 5: Function effectively in a team, provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

PLO 6: Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

PLO 7: Acquire and apply new knowledge as needed, using appropriate learning strategies.

PLO 8: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

PLO 9: Recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments

PLO 10: Demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

Teaching method can be Online, Physical, or Blended

VI. Framework for B.Sc. Degree (Credit Hours)

Classification	Credit Hours			ECTS		
	Compulsory	Elective	Total	Compulsory	Elective	Total
University Requirements	21	6	27	31	6	37
School Requirements	34	0	34	55	0	55
Track Requirements	11	0	11	17	0	17
Program Requirements	89	12	101	137	20	157
Total	**155**	**18**	**173**	**240**	**26**	**266**

1. University Requirements: (27 credit hours)

1.1. Prerequisite courses (6 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Contact Hours		Prerequisites / Co-requisites
				Lect	Lab	
ARB099	Arabic 99[a]	0	0	-	-	-
ENGL099	English II[a]	0	0	-	-	
	Total	**0**	**0**	**0**	**0**	

1.2. Compulsory: (21 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites
					Lect	Lab	
ARB100	Arabic	3	3	Online	3	-	ARB099
ENGL101	English III	1	3	Physical	3	-	ENGL099
ENGL102	English IV	1	3	Physical	3	-	ENGL101
ENGL201	English V	2	3	Physical	3	-	ENGL102
ENGL202	English VI	2	3	Physical	3	-	ENGL201
GERL101B1	German I B1 track	3	6	Physical	9	-	-
GERL102B1 GERL102B2	German II B1 track German II B2 track	3 3	6 6	Physical	9 9	- -	GERL101B1 GERL101B1
MILS100	Military Science	3	2	Online	3	-	-
NE101 NEE101	National Education National Education (English)	3	2	Online	3	-	-
	Total	**21**	**31**		**39**	**0**	

1.3. University Electives: (6 Credit Hours) (two courses out of the following)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites
					Lect	Lab	
BE302	Business Entrepreneurship	3	3	Online	3	-	-
DES101	Arts' Appreciation	3	3	Online	3	-	-
EI101	Leadership and Emotional Intelligence	3	3	Online	3	-	-
IC101	Intercultural Communications	3	3	Online	3	-	-
PE101	Sports and Health	3	3	Online	3	-	-
SE301	Social Entrepreneurship and Enterprises	3	3	Online	3	-	-
SFTS101	Soft Skills	3	3	Online	3	-	-
TW303	Technical and Workplace Writing	3	3	Online	3	3	-
	Total	**6**	**6**		**6**	**0**	

[a] Not required for students who pass placement test

2. School Requirements: (34 Credit Hours)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites (#)
					Lect	Lab	
GERL201B1 GERL201B2	German III B1 track German III B2 track	3 3	4 4	Physical	6 6	- -	GERL102B1 GERL102B2
GERL202B1 GERL202B2	German IV B1 track German IV B2 track	3 3	6 6	Physical	9 9	- -	GERL201B1 GERL201B2
CS116	Computing Fundamentals	3	6	Physical	3	-	-
CS1160	Computing Fundamentals Lab	1	0	Blended	-	3	#CS116
CHEM103	General Chemistry I	3	5	Physical	3	-	
CHEM106	General Chemistry lab	1	0	Blended	-	3	#CHEM103
MATH101	Calculus I	3	5	Blended	3	-	-
MATH102	Calculus II	3	5	Physical	3	-	MATH101
MATH203	Applied Mathematics for Engineers	3	5	Physical	3	-	MATH102
PHYS103	Physics I	3	5	Blended	3	-	-
PHYS104	Physics II	3	5	Physical	3	-	PHYS103
PHYS106	General Physics Lab	1	2	Blended	-	3	#PHYS104
IE0141	Engineering Workshops	1	2	Blended	-	3	ME111
MATH205	Differential equations	3	5	Physical	3	-	MATH102
	Total	**34**	**55**		**39**	**12**	

3. Program Requirements (118 credit hours)

3.1. Program Requirements (Compulsory): (89 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites (#)
					Lect	Lab	
GERL301B1 GERL301B2	German V B1 track German V B2 track	3 3	6 6	Physical	9 9	0	GERL202B1 GERL202B2
GERL302REG GERL302INT GERL302B2	German VI Regular German VI Intensive German VI B2 track	3 3 3	6 6 6	Physical	6 9 6	0	GERL301B1 GERL301B1 GERL301B2
CEE101	General Chemistry II	3	5	Physical	3	0	CHEM103
CEE201	Statics	3	5	Physical	3	0	PHYS103 & MATH101
CEE2020	**Engineering Geology and Lab**	**3**	**4**	**Physical**	**2**	**3**	
CEE2050	**Civil and Environmental Data Analysis and Lab**	**3**	**4**	**Physical**	**2**	**3**	**MATH101**
CEE221	Applied Structural Mechanics	3	4	Physical	3	0	CEE201
CEE3310	**Surveying and Lab**	**3**	**4**	**Blended**	**2**	**3**	**CEE2050**
CEE2130	**Fluid Mechanics and Hydraulics and Lab**	**4**	**5**	**Physical**	**3**	**3**	**CEE201**
CEE3110	**Hydrology and Open Channel Flow and Lab**	**4**	**5**	**Blended**	**4**	**0**	**CEE2020**
CEE324	Structural Analysis	3	5	Physical	3	0	CEE221
CEE333	Highway and Traffic Engineering	3	5	Blended	3	0	
CEE3410	**Geotechnical Engineering and Lab**	**4**	**5**	**Physical**	**3**	**3**	**CEE221**
CEE3510	**Building Materials and Lab**	**3**	**5**	**Physical**	**2**	**3**	**#CEE3515**

CEE 3350	Transportation Engineering	2	3	Physical	2	0	
CEE325	Applied Dynamics of Structures	3	5	Blended	3	0	CEE221
CEE323	Reinforced Concrete (1)	3	5	Physical	3	0	CEE324 & CEE351
CEE362	Professional Skills and Career Ethics	2	3	Online	2	0	ENGL102
CEE363	Civil Engineering Computer Aided Drawing	2	3	Blended	0	6	
CEE390	Field Training in Jordan	0	0	Physical	0	160 Hrs	Passing 90 CHs
CEE372	International Internship in Germany	12	18	Physical	0	20 Weeks	Passing 115 CHs
CEE522	Steel Structures	3	5	Blended	3	0	CEE321
CEE547	Foundation Engineering	2	3	Blended	2	0	CEE323 & CEE341
CEE500	Environmental Engineering and Sustainability Concepts	3	4	Blended	3	0	CEE311
CEE561	Contracts, Specifications and Quantity Surveying	3	5	Blended	3	0	CEE323 & CEE331
CEE562	Engineering Economy & Construction Management	3	5	Blended	3	0	CEE323 & CEE333
CEE5980	Graduation project 1	1	2	Blended	0	3	CEE372 & passing 120 cr
CEE5990	Graduation project 2	2	3	Blended	0	6	CEE5980
	Total	**89**	**137**		**77**	**36**	

3.2.1 Program Requirements (Smart Mobility and Sustainable Structures Track Compulsory): (11 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites (#)
					Lect	Lab	
CEE5510	**Smart Construction Technology**	**3**	**5**	**Blended**	**3**	**0**	**CEE351**
CEE529	Modeling Structural Systems	3	4	Blended	2	3	CEE323
CEE555	Sustainable Infrastructures and Smart Cities	3	5	Blended	3	0	CEE551
CEE556	Building Information Modeling	2	3	Blended	1	3	CEE529
	Total	**11**	**17**		**9**	**6**	

3.2.2 Program Requirements (Environmental Engineering and Sustainable Development Track Compulsory): (12 credit hours)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites (#)
					Lect	Lab	
CEE519	Hydraulic Structures	3	5	Blended	3	0	CEE311
CEE5001	Solid Waste Management and circular economy	2	3	Blended	3	0	CEE341
CEE515 CEE516	Water and Wastewater Treatment Engineering and its lab	4	6	Physical	3	3	CEE311
CEE5002	Water Food Energy Ecosystem Nexus	2	3	Blended	3	-	CEE500
	Total	**11**	**17**		**12**	**3**	

3.3 Program Requirements (Electives[b]): (12 credit hours chosen from the following list based on assigned track)

Course ID	Course Name	Credit Hours	ECTS	Teaching method	Contact Hours		Prerequisites / Co-requisites (#)
					Lect	Lab	
CEE501	Irrigation Engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE502	Introduction to Biotechnology	3	5	Blended	3	-	CEE311, BSC001
CEE503	Environmental and Water Microbiology	3	5	Blended	3	-	Dept. approval, BSC001
CEE504	Disposal logistics	3	5	Blended	3	-	Dept. approval, BSC001
CEE505	Pollution Control of the Aquatic Environment	3	5	Blended	3	-	CEE311, BSC001
CEE506	Water Supply and Wastewater collection	3	5	Blended	3	-	CEE311, CEE341, BSC001
CEE507	International Environmental Law	3	5	Blended	3	-	Dept. approval, BSC001
CEE508	Process Engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE509	Process Operation	3	5	Blended	3	-	Dept. approval, BSC001
CEE510	Advanced Wastewater treatment	3	5	Blended	3	-	CEE515, BSC001
CEE512	Air Pollution Control	2	4	Blended	2	-	CEE500, BSC001
CEE513	Air Pollution Control lab	1	2	Blended	0	3	#CEE512
CEE514	Water resources Engineering	3	5	Blended	3	-	CEE213, CEE311, BSC001
CEE518	Environmental unit process and operation	3	5	Blended	3	-	CEE515, BSC001
CEE313	Water Chemistry	2	4	Blended	2	3	CEE101, BSC001
CEE315	Environmental Impact Assessment	2	4	Blended	2	-	Dept. approval, BSC001
CEE479	Advanced topics in Environmental engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE570	Drinking water abstraction and distribution	3	5	Blended	3	-	CEE311, BSC001
CEE571	Groundwater Modeling and dynamics	3	5	Blended	3	-	Dept. approval, BSC001
CEE572	Environmental and Water Law and Policy	3	5	Blended	3	-	Dept. approval, BSC001
CEE573	Heat and Mass transfer	3	5	Blended	3	-	MATH203, BSC001
CEE574	Water and Wastewater Reuse	3	5	Blended	3	-	CEE515, BSC001
CEE591	Advanced topics in water and environmental engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE597	Advanced Topics in Water Engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE520	Rehabilitation of Structures	3	5	Blended	3	-	CEE323, BSC001
CEE523	Advanced reinforced concrete	3	5	Blended	3	-	CEE323, BSC001
CEE524	Pre-stressed concrete	3	5	Blended	3	-	CEE323, BSC001
CEE526	Earthquake Engineering	3	5	Blended	3	-	CEE323, CEE325, BSC001
CEE425	Timber structures	3	5	Blended	3	-	CEE324, BSC001
CEE527	Advanced Steel Structures	3	5	Blended	3	-	CEE522, BSC001
CEE528	Structural Systems	3	5	Blended	3	-	CEE324, BSC001
CEE429	Advanced Topics in Structural engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE530	Traffic safety and management	3	5	Blended	3	-	CEE333, BSC001
CEE534	Highway Maintenance and Planning	3	5	Blended	3	-	CEE333, BSC001

CEE535	Urban Mobility & Public Transportation	3	5	Blended	3	-	CEE333, BSC001
CEE536	Railway Engineering	3	5	Blended	3	-	CEE333, BSC001
CEE537	Airport Engineering	3	5	Blended	3	-	CEE333, BSC001
CEE593	Advanced topics in Transportation engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE542	Dam Engineering	3	5	Blended	3	-	CEE323, CEE341, BSC001
CEE5430	Geographic Information Systems	3	5	Blended	2	-	CEE331, BSC001
CEE5435	Geographic Information Systems Lab	0	0	Blended	-	3	#CEE5430
CEE545	Soil Dynamics	3	5	Blended	3	-	CEE341, BSC001
CEE546	Soil and Rock Exploration	3	5	Blended	3	-	CEE341, BSC001
CEE594	Advanced Topics in Geotechnical Engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE550	Computer Application in Civil Engineering	3	5	Blended	3	-	Dept. approval, BSC001
CEE551	Building Construction	3	5	Blended	3	-	CEE351, BSC001
CEE452	Construction Machines	3	5	Blended	3	-	CEE351, BSC001
CEE553	Building Physics	3	5	Blended	3	-	CEE351, BSC001
CEE595	Advanced Topics in Construction	3	5	Blended	3	-	Dept. approval, BSC001
CEE596	Advanced topics in Project Management	3	5	Blended	3	-	Dept. approval, BSC001
ARCH403	Special Topics in Architecture II	2	5	Blended	2	-	Dept. approval, BSC001
ARCH426	Environmental Psychology and Sociology	3	5	Blended	3	-	Dept. approval, BSC001
ARCH451	Design and Build	3	5	Blended	3	-	Dept. approval, BSC001
ARC453	Building and Site Documentation	3	5	Blended	3	-	Dept. approval, BSC001
ARCH457	Advanced Construction Systems	3	5	Blended	3	-	Dept. approval, BSC001
ARCH554	Project Management and Site Organization II	3	5	Blended	3	-	Dept. approval, BSC001
ARCH571	Architectural Environmental Systems	3	5	Blended	3	-	Dept. approval, BSC001
ARCH262	Utility Planning and Design I	3	5	Blended	3	-	Dept. approval, BSC001
ARCH362	Utility Planning and Design II	3	5	Blended	3	-	Dept. approval, BSC001
ARCH361	Structural Systems II	3	5	Blended	3	-	Dept. approval, BSC001
ENE534	Low Carbon Buildings	3	5	Blended	3	-	Dept. approval, BSC001
ENE531	Environmental and Energy Engineering	3	5	Blended	3	-	Dept. approval, BSC001
ENE528	Energy Storage	3	5	Blended	3	-	Dept. approval, BSC001
ENE431	Energy Conversion	3	5	Blended	3	-	Dept. approval, BSC001
CEE480	Independent Studies	3	5	Blended	3	-	Dept. approval, BSC001
CEE481	Special topics	1	2	Blended	1	-	Dept. approval, BSC001
CEE482	Special topics	2	4	Blended	2	-	Dept. approval, BSC001
CEE483	Special topics	3	5	Blended	3	-	Dept. approval, BSC001

[b]XXXX0000 International Internship is a prerequisite for all elective courses

VII. Study Plan[c] Guide for the Bachelor's Degree in (Civil and Environmental Engineering)

First Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL098	English I*	0	0		
GERL101	German I	3	6		
CHEM103	General Chemistry I	3	5		
CHEM106	General Chemistry lab	1	0		CHEM103
MATH101	Calculus I	3	5		
CS116	Computing fundamentals	3	6		
CS1160	Computing Fundamentals Lab	1	0		CS116
PHYS103	Physics I	3	5		
ARB100	Arabic	3	3	ARB099	
	Total	**20**	**30**		

First Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL099	English II*	0	0		
GERL102	German II	3	6	GERL101	
MATH102	Calculus II	3	5	MATH101	
PHYS104	Physics II	3	5	PHYS103	
PHYS106	General Physics Lab	1	2		PHYS104
CEE101	General Chemistry II	3	5	CHEM103	
NE101	National Education	3	2	ARB099	
----	University Elective	3	3		
	Total	**19**	**28**		

Second Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL101	English III*	1	3	ENGL099	
GERL201	German III	3	4	GERL102	
MATH203	Applied Mathematics for Engineers	3	5	MATH102	
CEE201	Statics	3	5	MATH101 & PHYS103	
CEE2020	Engineering geology and lab	3	4		CEE2025
CEE2025	Engineering Geology lab	0	0		CEE2020
CEE2050	Civil and Environmental Data Analytics and lab	4	5	MATH101	CEE2055
CEE2055	Civil and Environmental Data Analytics Lab	0	0		CEE2050
	Total	**17**	**26**		

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

Second Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL102	English IV*	1	2	ENGL101	
GERL202	German IV	3	6	GERL201	
MATH205	Differential equations	3	5	MATH102	
MILS100	Military Sciences	3	2		
CEE2130	Fluid mechanics and Hydraulics and Lab	4	6	CEE201	CEE2135
CEE2135	Fluids and Hydraulics Lab	0	0		CEE2130
CEE221	Applied Structural Mechanics	3	4	CEE201	
CEE3310	Surveying and Lab	3	4	CEE2050	CEE3315
CEE3315	Surveying lab	0	0		CEE3310
	Total	**20**	**29**		

Third Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
GERL301	German V	3	6	GERL202	
IE0141	Engineering Workshop	1	2		
CEE3110	Hydrology and open channel flow	4	5	CEE2130	
CEE324	Structural analysis	3	4	CEE221	
CEE333	Highway and traffic engineering	3	5	CEE3310	
CEE3410	Geotechnical engineering and lab	4	5	CEE2020 & CEE221	CEE3415
CEE3415	Geotechnical engineering lab	0	0		CEE3410
ENGL202	English VI*	2	3	ENGL201	
	Total	**20**	**30**		

Third Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
ENGL201	English V*	2	3	ENGL102	
GERL302	German VI	3	5	GERL301	
CEE325	Dynamics of Structures	3	4	CEE221	
CEE3340	Pavement Materials and Design and lab	3	5	CEE3510	CEE3345
CEE3345	Pavement Materials and Design Lab				CEE3340
CEE323	Reinforced Concrete (1)	3	5	CEE324 & CEE3510	
CEE390	Field Training in Jordan	0	0		
CEE363	Civil Engineering Computer Aided Drawing	2	3		
	Total	**16**	**25**		

Fourth Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
	Department Elective	3	5	BSC0001	
	Department Elective	3	5	BSC0001	
	Department Elective	3	5	BSC0001	
	Department Elective	3	5	BSC0001	
CEE3510	Building materials and Lab	3	5		CEE3515
CEE3515	Building materials lab	0	0		CEE3510
CEE362	Professional Skills and Career Ethics	2	3	ENGL102	
	Total	**17**	**28**		

Fourth Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
CEE372	International Internship	12	18	Passing 115 CHs	
	Total	**12**	**18**		

German year prerequisites are:

1. A minimum GPA of 61.0%
2. Successful completion of 90 credit hours excluding all German language courses
3. Passing GERL302 German VI and B1 German language test (all 4 language skills) conducted by Goethe Institute or another approved provider
4. ENGL201 English V, and Arabic 99
5. Passing three out of the four following courses:
   - (CEE2130 , Fluid mechanics and Hydraulics)
   - (CEE3410, Geotechnical engineering)
   - (CEE333, Highway and traffic engineering)
   - (CEE323, Reinforced concrete 1)

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

Sustainable Structures and smart mobility Track

Sustainable Structures and smart mobility Track Fifth Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**		**Prerequisites**	**Co-requisite**
CEE547	Foundation engineering	2	3	CEE3410 & CEE323	
CEE561	Contracts, Specifications and Quantity Surveying	3	4	CEE331 & CEE323	
CEE500	Environmental engineering and sustainability concepts	3	4	CEE3110	
CEE529	Modeling Structural Systems	3	5	CEE323	
CEE5980	Graduation project (1)	1	2	CEE372	
CEE5510	Smart Construction Technology	3	5	CEE3510	
	Total	**15**	**23**		

Sustainable Structures and smart mobility Track Fifth Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**	**ECTS**	**Prerequisites**	**Co-requisite**
CEE522	Steel structures	3	5	CEE324	CEE522
CEE562	Engineering Economy & Construction Management	3	4	CEE333 & CEE323	
CEE555	Sustainable Infrastructures and smart cities	3	5	CEE551	
CEE556	Building Information Modeling	2	3	CEE529	
----	University Elective	3	3		
CEE5990	Graduation project (2)	2	3	CEE5980	
	Total	**16**	**23**		

Environmental Engineering and Sustainable Development Track

Environmental Engineering and Sustainable Development Track Fifth Year					
First Semester					
Course ID	**Course Name**	**Cr Hr**		**Prerequisites**	**Co-requisite**
CEE547	Foundation engineering	2	3	CEE3410 & CEE323	
CEE561	Contracts, Specifications and Quantity Surveying	3	4	CEE3310 & CEE323	
CEE500	Environmental engineering and sustainability concepts	3	4	CEE3110	
CEE519	Hydraulic Structures	3	5	CEE3110	
CEE5980	Graduation project (1)	1	2	CEE372	
----	University Elective	3	3		
	Total	**15**	**21**		

Environmental Engineering and Sustainable Development Track Fifth Year					
Second Semester					
Course ID	**Course Name**	**Cr Hr**		**Prerequisites**	**Co-requisite**
CEE522	Steel structures	3	5	CEE324	
CEE562	Engineering Economy & Construction Management	3	4	CEE333 & CEE323	
CEE515	Water and wastewater Treatment Engineering	3	5	CEE3110	
CEE516	Water and Waste water Treatment Engineering Lab	1	2		CEE515
CEE5001	Solid Waste Management and circular economy	2	3	CEE3410	
CEE5990	Graduation project (2)	2	3	CEE5980	
CEE5002	Water Food Energy Ecosystem Nexus	2	3	CEE500	
	Total	**16**	**25**		

VIII. Compulsory Courses Offered by Civil and Environmental Engineering Department

CEE101 General Chemistry II **3 Cr Hr (3,0)** **5 ECTS**

Structure; Bonding and Molecular Properties of organic Compounds; Alkanes and Cycloalkanes; Stereochemistry of Alkanes and Cycloalkanes; Alkenes and alkynes; Stereochemistry; Alkyl Halides and their Reactions; Aromatic Compounds and their Reactions. Alcohols; ethers; thiols; Aldehydes and ketones; Carboxylic acids and derivatives; Amines.

Prerequisites: CHEM103

CEE201 Statics **3 Cr Hr (3,0)** **5 ECTS**

Basic concepts of mechanics; vectors; Statics of particles; Rigid bodies and force systems; equilibrium of rigid bodies; Analysis of trusses and frames; Distributed forces; centroids and moments of inertia; Shear force and Bending moment diagrams for beams.

Prerequisites: PHYS103, MATH101

CEE2020 Engineering geology and Lab **3 Cr Hr (2,3)** **4 ECTS**

Earth science as it relates to human use of the planet; global and local scales; nature of earth; types of materials of which the earth is made (minerals and rocks); the processes that effect the earth's surface (endogenic and exogenic); natural hazards; and environmental issues; the nature of earth materials and their relevance to engineering problems. **Integrated with the lab to cover practical** ways of characterizing and identifying minerals and rocks; the use of maps and field excursions

Prerequisites: CEE2050, CEE2055

CEE2050 Civil and Environmental Data Analytics and Lab **4 Cr Hr (3,3)** **5 ECTS**

The types of data set collected in civil and environmental engineering applications, how to clean, organize and analyze environmental data, basics of statistical inference, analysis of trends, covariance and correlation analysis, and introduction to spectral analysis, Numerical Methods for the solution of systems of linear algebraic and differential equations, Matrices and their properties, Matrix factorization, Gauss elimination algorithm, Eigenvalues and eigenvectors, Euler and Runge-Kutta methods and their properties for solving ordinary differential equations. This course is integrated with lab to cover Software and tools (Matlab and Excel) to plot and explore civil and environmental data, statistical applications, numerical analysis applications.

Prerequisites: MATH101

CEE2130 Fluid mechanics and Hydraulic and Lab **4 Cr Hr (3,3)** **4 ECTS**

Fluid mechanics for civil and environmental engineering students. The concepts of fluid properties, hydrostatics pressure, hydrostatics forces on plane and curved surfaces, continuity, energy, and momentum equations.

Flow in complex pipe systems; theory and operations of centrifugal pumps; flow measurements; unsteady flows Computer models for hydraulic analysis (EPANet, WaterCAD, etc.). **This course is integrated with the lab to cover the practical part** to cover the practical knowledge of Center of pressure on a plane surface; stability of a floating body; Venturi and orifice meters; impact of jets; flow over rectangular notches; flow over a weirs; head loss through pipes; critical depth and specific energy; flow under a sluice gate; roughness of open channel; hydraulic jump; performance of impulse and reaction turbines; performance characteristics of a centrifugal pump.

Prerequisites: CEE201

CEE221 Applied Structural Mechanics **3 Cr Hr (3,0)** **4 ECTS**

Types of Structures and Loadings, Internal forces for determinate beams and simple frames: NFD, SFD, BMD, Stresses and axial Strain, Mechanical Properties of Materials, axially loaded truss members and RC

columns, Stresses in Beams (Shear and Bending), Centroid and Moment of Inertia of RC sections and steel sections, Deflection of RC beams, Euler Buckling, and Thermal properties (u-value calculations)
Prerequisites: CEE201

CEE3110 Hydrology and open channel flow **4 Cr Hr (3,1)** **5 ECTS**

The course covers the different elements of the hydrological cycle and the hydrologic budget; Evaporation; Infiltration; Transpiration; Precipitation: point precipitation, aerial precipitation; Runoff and open channel flow, rapidly and gradually varied flow; Hydrographs; Watershed characteristics; Frequency analysis; Aquifers and groundwater recharge; Darcy's law; Well hydraulics, low impact development principles, non-point source pollution, best management practices (point, linear and area BMPs).
Prerequisites: CEE2130

CEE324 Structural Analysis **3 Cr Hr (3,0)** **4 ECTS**

Analysis of statically determinate structures by manual calculation, analysis of trusses, beams and frames, draw bending moments, shear force and normal force diagrams, load cases and moment envelopes, Influence lines, Displacements. Analysis of statically indeterminate structures; Force and displacement method, moment distribution methods. Computer program packages for structural analysis.
Prerequisites: CEE221

CEE325 Dynamics of Structures **3 Cr Hr (3,0)** **4 ECTS**

Kinetics of Particles, Linear and Nonlinear dynamic analysis (SDOF), Principles of Vibrations of structures, Seismic and Wind Loads on Structures, Equivalent Lateral Force Analysis, Modal Response Spectra Analysis, and Computer Applications.
Prerequisites: CEE221

CEE323 Reinforced Concrete 1 **3 Cr Hr (3,0)** **4 ECTS**

Properties of concrete and steel; ultimate strength design method, analysis and design of singly RC rectangular beams; doubly RC beams; T-section RC beams; design of continuous beams; design of RC beams for shear; bond requirements; development length and bar cutoffs; one-way solid and one-way ribbed slabs; design of short columns..
Prerequisites: CEE324, CEE351

CEE331 Surveying and Lab **3 Cr Hr (2,3)** **4 ECTS**

Introduction and basic principles of surveying, linear measurements, errors in surveying operations, angles measurements, tape measurements, coordinate geometry, traverses, leveling, leveling of profiles and cross-sections, contour lines, earthwork areas and volumes computations, mass-haul diagram. **This course is integrated with the lab to cover the practical part** including Distance measurement using tapes and pacing, measuring wheel and level instruments, chaining across obstacles, building Layout, leveling operations, leveling applications (elevations computations using automatic levels, location and setting out details, making maps and grids, trigonometric leveling, making contour maps), area measurement using planimeter, total station.
Prerequisites: CEE2050

CEE333 Highway and Traffic Engineering **3 Cr Hr (3,0)** **5 ECTS**

Traffic engineering studies (travel time, speed, volume, parking), highway classification, highway elements, characteristics of vehicle and road users, principles of route location, setting out and design of horizontal and vertical alignments, design of cross-section elements, sight distance, attainment of super elevation,

roadway drainage systems, roadways layout.
Prerequisites: CEE331

CEE3340 Pavement Materials and Design and Lab **3 Cr Hr (2,3)** **5 ECTS**

Production and use of asphalt materials, asphalt cement, cutback asphalts, emulsified asphalt, aggregates for bituminous mixtures, properties and uses of bituminous materials and aggregate, tests on aggregate, soils and base materials in pavement design, asphalt binder testing and evaluation, use of additives in bituminous mixtures, pavement sustainability, reclaimed asphalt pavement. **This course is integrated with the lab to cover the practical part including** Tests on asphalt binders (penetration, softening point, flash and fire points, ductility; rotational viscosity, solubility and specific gravity), tests on aggregate (sieve analysis, specific gravity, absorption, flat and elongated particles, coarse aggregate angularity, fine aggregate angularity, sand equivalent and soundness), aggregate blending; tests on hot mix asphalts include: Marshall mix design; extraction; skid resistance. Marshall Mix Design, extraction of binder, and skid resistance
Prerequisites: CEE351

CEE3410 Geotechnical Engineering **4 Cr Hr (3,3)** **6 ECTS**

Index and classification of soils; water flow in soils (one and two dimensional water flow); soil stresses; soil compaction; distribution of stresses in soil due to external loads; consolidation and consolidation settlement; shear strength of soils; slope stability. **This course is integrated with the lab to cover the practical part including** Water content of soils; specific gravity; grain size distribution; consistency limits of soils; compaction test; field density test; coefficient of permeability of soils (constant and falling head); consolidation test; direct shear test; unconfined compression test; tri-axial test.
Prerequisites: CEE2020, CEE221

CEE3510 Building Materials and Lab **3 Cr Hr (2,3)** **5 ECTS**

Cement (types; manufacture; properties and hydration); aggregates; mixing water; fresh concrete properties; hardened concrete (strength; strength development; shrinkage; creep; durability); handling and placing of concrete; concrete mix design by ACI method; bricks and bricks works. **This course is integrated with the lab to cover the practical part including** Introduction to testing & specifications; concrete and mortar tests; aggregate testing; fresh and hardened concrete testing; non-destructive tests; design & testing of concrete mixes; brick testing
Prerequisites:---

CEE362 Professional Skills and Career Ethics **2 Cr Hr (2,0)** **3 ECTS**

Skills that are essential to an engineer's career. Fundamental technical and mathematical skills, written and oral communication skills needed by a civil and environmental engineer to correspond in a clear and concise way. Essential leadership and organization skills, in addition to problem solving and decision-making skills. The role of ethics in the engineering practice, particularly civil and environmental engineering.
Prerequisites: ENGL102

CEE363 Civil Engineering Computer Aided Drawing **2 Cr Hr (1,6)** **5 ECTS**

Fundamentals of civil engineering drawings. An Introduction to drawing in the environmental, geotechnical, transportation, and structural sub-disciplines of civil engineering. Topics include, Symbols used in Civil Engineering drawing: Doors, Windows and Staircases Drawings. Comprehensive Drawing of Residential building, (Layout, plan, elevation and sectional elevation). Drawings of reinforced concrete and steel members, shop drawing, Preparation of Layout planning for different Civil Engineering Projects.

Prerequisites: ME0111

CEE372 International internship in Germany **12 Cr Hr (0,0)** **18 ECTS**

In the second semester of the fourth academic year of the program, the student is expected to find a place

in German industry in order to gain industrial experience. This can be done by preparing a good resume and by contacting and applying to as many German civil or water industrial companies as possible.
Prerequisites: Passing 115 Cr Hrs

CEE390 Field training in Jordan **0 Cr Hr (0,0)** **0 ECTS**

In the second semester of the fourth academic year of the program, the student is expected to find a place in German industry in order to gain industrial experience. This can be done by preparing a good resume and by contacting and applying to as many German civil or water industrial companies as possible.
Prerequisites: Passing 90 Cr Hrs

CEE500 Environmental engineering and sustainability concepts **3 Cr Hr (3,0)** **4 ECTS**

Concepts related to environmental engineering, including the fundamental laws of mass and energy and Environmental systems and applications (water resources and water/ wastewater treatment, air pollution and control, and solid waste management). Concepts of sustainability and its incorporation in environmental engineering systems, sustainable development goals, Sustainable design for environmental systems (Green Engineering, the complex environmental issues related to sustainable engineering, concepts and analytical methods/models, and resources for evaluating and comparing sustainability implication of engineering activities, develop sustainable engineering solutions. Environmental assessment for engineering processes and activities will be introduced (Environmental impact assessment and Life cycle assessment).
Prerequisites: CEE311

CEE5001 Solid Waste Management and circular economy **2 Cr Hr (2,0)** **3 ECTS**

Solid Waste characterization, collection and transfer, disposal, source reduction and reuse recycling and resource recovery, integrated solid waste management concepts, resource, and environmental economics, linear versus circular economy, CE use for ISWM. Technical, social, economic, and institutional elements of the sustainable solid waste management; relation of solid waste management to the sustainable development goals to be established. Certain case studies where principles of circular economy are applied to be introduced
Prerequisites: CEE3410

CEE5002 Water Food Energy Ecosystem Nexus **2 Cr Hr (2,0)** **3 ECTS**

The knowledge of nexus and the link between water, energy, food, and ecosystem. The WEFE nexus framework, water, energy, food, and ecosystem synergies. The concept of Ecological footprints, tools of calculating these footprints using life cycle assessment. The tools to allow for optimal water -energy resources utilization for food production with implication on the ecosystem taken into consideration. Climate change and its mitigation.
Prerequisites: CEE500

CEE515 Water and wastewater Treatment engineering **3 Cr Hr (3,0)** **5 ECTS**

The needs for water quality and how to achieve it by drinking water treatment; wastewater treatment; other water-quality control strategies (principles and theory).
Prerequisites: CEE311

CEE516 Water and wastewater Treatment engineering Lab **1 Cr Hr (0,3)** **2 ECTS**

Water and Wastewater analysis: acidity; alkalinity; chloride; hardness; Ammonia; dissolved oxygen; biochemical oxygen demand; chemical oxygen demand; coliform bacteria; solids determination; coagulation; and softening.
Prerequisites: CEE311

CEE519 Hydraulic structures **3 Cr Hr (3,0)** **5 ECTS**

Aspects of the design of hydraulic structures. Design of various hydraulic structures, such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works. Analyze and design structures, such as the seepage and uplift theories and the hydraulic jump.
Prerequisites: CEE311, CEE323

CEE522 Steel Structures **3 Cr Hr (3,0)** **5 ECTS**

Properties of structural steel; load resistant factor design (LRFD) method; design of tension members; design of concentric compression elements; design of beams; design of beam-column elements; design of column base plates; simple welding and bolting connections.
Prerequisites: CEE324

CEE529 Modeling Structural Systems **3 Cr Hr (2,3)** **4 ECTS**

Using Structural Analysis and Design Software to perform: Analysis of Beams, Analysis of 2D Trusses, Analysis of 2D Frames, Load combinations, Live Load cases, Deflections, Structural Elements and Load transfer, Analysis and Design of Continues Beams, Analysis of 3D structures and Design check, Wind and Earthquake Loadings, and Structural Detailing.
Prerequisites: CEE323

CEE531 Transportation Engineering **3 Cr Hr (3,0)** **ECTS**

This course will introduce the student to the fundamentals of transportation engineering from planning and design to operations. The multimodal nature of transportation will be demonstrated by studying non-highway modes. Topics to be covered: Transportation Systems and their Function; Transportation planning; Trip generation; capacity and LOS; traffic control and MUTCD intersection and interchange design; signalized intersections; public transportation; and its overview.
Prerequisites: CEE333

CEE532 Pavement materials and Design and Lab **3 Cr Hr (2,3)** **5 ECTS**

deals with the most important aspects of flexible and rigid pavements. Upon completion of the course, the student should have a working knowledge of designing asphalt and concrete pavements, soil properties including (sub-grades, bases, and sub-bases), sub-drainage installation, pavement materials and common uses, quality control of materials, and pavement maintenance and rehabilitation Analysis of stresses in flexible and rigid pavement; Design methods of highway flexible and rigid pavements; Overlay design; MEPDG design method, Computer applications. **This course is integrated with the lab to cover the practical part** to conduct standard tests for asphalt pavement design and paving materials for undergraduate teaching, as well as advanced research-oriented experiments for assessing the engineering properties and behaviors of new paving materials. It is also well-equipped to support research activities in the areas of transportation and highway engineering.
Prerequisites: CEE334

Prerequisites: CEE531

CEE547 Foundation Engineering **2 Cr Hr (2,0)** **3 ECTS**

Apply the principles of geology and soil mechanics to the design and analysis of foundations of various structures, such as columns and walls of buildings, bridges, retaining structures, and others. Design of shallow foundations and axially loaded pile foundations. Lateral earth pressure theories and the design of various retaining structures. Selection of proper foundations or characteristics of foundations for different soils. Theoretical and empirical design methods for stability and settlement.
Prerequisites: CEE323, CEE3410

CEE5510 Smart Construction Technology **3 Cr Hr (3,0)** **5 ECTS**

Construction industry and the latest methods used in construction; Construction technology in civil engineering; Construction systems and their applications. Layouts, fabrications, assembly, and installation of structural units. How a building is constructed from the beginning planning to the completion of roof. Activities to be incorporated to reinforce the lessons.

Prerequisites: CEE351

CEE555 Sustainable Infrastructures and smart cities **3 Cr Hr (3,0)** **5 ECTS**

Introduction to Sustainability, Resilience, and Climate Change, Moving Sustainability Forwards (Advocacy, awareness, stakeholder engagement, social inclusion, and equity), Resilient Urban Planning (Climate Mitigation, Climate Adaptation & Disaster Risk Planning), Integrative Design for Building Efficiency, Building Life Cycle Assessment Concepts (Embodied Carbon), Concepts and Strategies of Urban Green Infrastructure Design, Core Concepts and Strategies of Green Building Rating Systems, Different Sustainable Design, Prerequisites and Strategies: Connectivity and Smart Transportation, Sustainable Site Management, Water Efficiency (indoor & outdoor), Energy Efficiency in Buildings, Building Health and Wellness (Indoor Environment Quality), Material and Resources Efficiency, Green Materials Supply Chain.

Prerequisites: CEE551

CEE556 Building Information Modeling **2 Cr Hr (1,2)** **3 ECTS**

Fundamentals of Autodesk Revit in a lab format with hands-on learning essential skills to communicating ideas effectively in professional practice. Students will learn how to set up a new building information model; create a basic floor plan; work with basic building elements (walls, floors, ceilings, roofs, space frames, curtain walls, stairs and railings); create sections, elevations; add annotations including dimensions, text, tags, schedules and legends; and share designs by working in teams, creating architectural visualization renderings and plotting finished drawings. Students are also be introduced to the basics of quantity surveying, clashes, troubleshoot, design, and improvise within the program. Also, how to extract useful and elegant information from the model, and understanding how to manage 2D output to producing high-quality drawings, and to communicate ideas effectively.

Prerequisites: CEE529

CEE561 Contracts; Specifications and Quantity Surveying **3 Cr Hr (3,0)** **5 ECTS**

Contracting process; elements of contracts; tendering; bids; Types of contracts: lump sum, unit price, and cost plus contracts; Engineering service contracts; The FIDIC conditions of contracts; interim and final payments certification; testing and inspection; variation orders; termination of contracts; claims and arbitration; Specifications; prescription and performance specifications; key specifications of major civil works; Performing quantity takeoffs of major civil works: excavations, concrete, reinforced steel, lumber, masonry, tiles, plastering, sanitary, and painting. Principles of electro/mechanical works.

Prerequisites: CEE323, CEE331

CEE562 Engineering Economy & Construction Management **3 Cr Hr (3,0)** **5 ECTS**

Time value of money, interest formula, depreciation models, tax effects, rate of return, cash flow; project evaluation methods, replacement analysis, break even analysis economic studies for decision-making under risk. The course also 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; scheduling techniques (CPM and PERT); and resource allocation decisions.

Prerequisites: CEE323, CEE333

CEE5980 Graduation Project 1 **1 Cr Hr (1,0)** **2 ECTS**

Students will pick a particular problem in civil and environmental engineering; and carry out a literature survey of the problem then suggest an alternate solution to the problem. They must show a good ability in effectively applying the fundamentals of mathematics; physics; chemistry; engineering; etc…; in finding the

alternate solution. This course should help the students in assessing their strengths and weaknesses in applying fundamental principles to real life problems.
Prerequisites: CEE372

CEE5990 Graduation Project 2 **2 Cr Hr (2,0)** **3 ECTS**

Students will continue with the problem in civil and environmental engineering in CEE591; carry out an extensive study and suggest alternate solutions to the problem. They must show ability in effectively applying the fundamentals of mathematics; physics; chemistry; engineering; etc.; in finding the alternate solutions.
Prerequisites: CEE591

IX. Elective Course Offered by Civil and Environmental Engineering Department

CEE501 Irrigation Engineering **3 Cr Hr (3,0)** **ECTS**

Fundamentals to the design of an irrigation system incorporating safe wastewater applications. System addressing a complex problem of water in the natural and constructed environment. Case study revolutionizes each year; generally drawn from a challenge confronting the region. Water balance concepts for tracking substances in the water systems. Field project to quantify the flux of pollutants from a local watershed outlet to the ocean; an aquifer or water body. Sociotechnical systems associated with human use of water as a resource and the hazards posed by too much or too little water. Potable and non-potable water use and conservation. Irrigation; rural and urban water supply systems; storm water management; and flood damage mitigation. Emphasis is on engineering design.
Prerequisites: CEE311, BSC001

CEE502 Introduction to Biotechnology **3 Cr Hr (3,0)** **5 ECTS**

Basic concepts of biotechnology: Biomass characterization; Biomass growth and kinetics. Bioconversion systems: types of biomass; which are currently considered for conversion into bioenergy conversion pathways available to turn biomass into bio-products. Identify energy potentials of biomass and biogas. Biofuels and Combustions Engines.
Prerequisites: Dept. Approval, BSC001

CEE503 Environmental and Water Microbiology **3 Cr Hr (3,0)** **5 ECTS**

The diverse roles of microorganisms in natural and artificial environments; Fundamental aspects of microbial physiology and ecology; Specific areas of focus include definition and basic notions; classifications system of microorganisms energetic and yield; enzymes; growth kinetics; pathogenicity; metabolic; microbial/environmental interactions; biogeochemical cycles and microbial count techniques; Topics on the role of microorganisms in waste treatment processes within different environmental systems; Pathways used by microbes for degradation; transformation; and synthesis of different chemicals in the environment; Theory and practice of sterilization; Action of antimicrobial agents.
Prerequisites: Dept. Approval, BSC001l

CEE504 Disposal Logistics **3 Cr Hr (2,3)** **5 ECTS**

The process of planning; implementing and controlling the efficient; cost effective flow and storage of waste including disposal collection; transportation; handling and storage.
Prerequisites: Dept. Approval, BSC001

CEE505 Pollution Control of the Aquatic Environment **3 Cr Hr (3,0)** **5 ECTS**

Effects of domestic and industrial water pollution on the physical; chemical and biological characteristics of natural waters; associated environmental determinants of human disease; toxicology and epidemiology of chronic disease.
Prerequisites: CEE311, BSC001

CEE506 Water Supply and Wastewater Collection **3 Cr Hr (3,0)** **5 ECTS**

The design of reservoirs; conduits; water distribution systems; well fields; sewers; and drains. Included is a study of population growth and its effects on water supply requirements and sewage flows as well as techniques for analyzing rainfall; runoff; fluid flow; reservoir sitting; and groundwater flows.
Prerequisites: CEE311, CEE3410, BSC001

CEE507 International Environmental Law **3 Cr Hr (3,0)** **5 ECTS**

An overview of the history and current application of laws and rules used to protect the environment; the general framework of legislation and includes specific discussions of regulations as they are enforced at international; national; state and local levels. The Environmental Regulations course is concerned with

Industry and its relationship with the environment and community and the impact of environmental regulations on Industry decision-making. Topics include waste minimization; pollution prevention; hazardous; special; industrial and municipal solid waste control; the Clean Air Act; and Clean Water Act; and the Occupational. Safety and Health Act and how it relates to environmental regulations.
Prerequisites: Dept. Approval, BSC001

CEE508 Process Engineering **3 Cr Hr (3,0)** **5 ECTS**

The fundamental hydraulic processes, which underpin water treatment systems. Process engineering fundamentals; fluid mixing and flow; mass balance; mass transfer and elementary chemical reactor theory; flow sheeting and unit operations are discussed as key concepts. The relevant hydraulic principles and algebraic relationships governing process design and performance; and the opportunity to apply governing equations to examples provided and demonstrate their proper usage.
Prerequisites: Dept. Approval, BSC001

CEE509 Process Operation **3 Cr Hr (3,0)** **5 ECTS**

The principles of treatment plants operations. Unit operations related to production; treatment; disposal; and recycling). Principles of unit operations (mass and energy balance). Mechanical; thermal; chemical; and biological processes. Heat and mass transfer. Chemical and biological reactors. scope; limits; and methods of secondary and advanced treatment; solids handling; disinfection; reclamation of wastewater; through readings; discussions; analysis; and laboratory study. Specifically designed for individuals seeking employment or already employed in the wastewater field. Advanced wastewater treatment systems; including secondary and tertiary treatment; solids handling; disinfection; reclamation of wastewater; and laboratory study.
Prerequisites: Dept. Approval, BSC001

CEE510 Advanced Wastewater treatment **3 Cr Hr (3,0)** **5 ECTS**

Characteristics of wastewater. Principles of wastewater treatment process design, operation and economics. Unit operations. Biological treatment systems and oxidation kinetics. Advanced wastewater treatment and reuse. Sludge treatment processes, including public health engineering, wastewater disposal systems, and wastewater contamination indicators. Topics include wastewater quality parameters; unit operations in treatment of wastewater. Experimental and practical projects are given to the students in the above topics. Wastewater treatment Plant design: case study. Use of renewable energy in water and wastewater treatment.
Prerequisites: CEE515, BSC001

CEE512 Air Pollution Control
CEE513 Air Pollution Control Lab. **3 Cr Hr (2,3)** **5 ECTS**

Air pollution control law and regulations. Air pollution measurement; Emission estimates. Meteorology for air pollution control engineers. Air pollution concentration models. Designing air pollution control systems and equipment. Combustion and control systems (Particulate pollutants; primary particulates; Vocs; SOx and NOx). Air pollutants and global climate. **This course is integrated with the lab to cover the practical part including** Air pollutants measurement methods and used devices: Particulate Matter, Carbon Monoxide, Sulfur Oxides and Nitrogen Oxides devices. The efficiency for an air pollutant control device (Cyclone). Design a software to estimate the emissions and predict the maximum concentration based on Gaussian Plume Model.

Prerequisites: CEE500, BSC001

CEE514 Water resources engineering **3 Cr Hr (3,0)** **5 ECTS**

Water laws. Reservoirs; dams; and reservoir basins; Hydro- power generation; Flood estimation; routing and control; Engineering economy in water resources planning; Introduction to system engineering in water resources; Topics in arid and semi-arid region water resources; Desertification water conservation techniques; reuse of water; remote sensing and arid water resources; Linear programming and its applications in water resources.
Prerequisites: CEE213, CEE311, BSC001

CEE518 Environmental Unit process and operation **3 Cr Hr (3,0)** **5 ECTS**

Characterization of water and wastewater; Design of water distribution networks and sewerage systems; Design of water treatment systems; Wastewater Treatment design; Storm drainage design; Landfill design; Design basics of non-conventional treatment methods including: absorbers; aeration towers and membrane processes; processing of sludge; and water.

Prerequisites: CEE515, BSC001

CEE313 Water Chemistry
CEE314 Water Chemistry Lab. **3 Cr Hr (2,3)** **5 ECTS**

Chemical species in the natural waters; Organic compounds in water; Organic pollutants and their measurement tests; toxic and hazardous compounds; Basic aqueous equilibria; the structure; behavior and fate of major classes of chemicals that dissolve in water; redox reactions and acid base reactions: carbonate systems; alkalinity; Hardness of water. **This course is integrated with the lab to cover the practical part including** Turbidity test; TS and TDS tests; Conductivity test; Acidity; alkalinity; Hardness; chloride measurement; Dissolved oxygen; BOD an d COD tests

Prerequisites: CEE101, BSC001

CEE315 Environmental Impact Assessment **2 Cr Hr (2,0)** **5 ECTS**

Introduction into environmental impact assessment (EIA) involving an examination of: legislative/policy frameworks (In Jordan and elsewhere); theoretical underpinnings; the role of impact assessment in planning and decision making; methods and techniques for the assessment of impacts; implementation challenges; and the future directions for EIA. Analysis of various measures of environmental quality .Impacts on different types of resources Benefit-cost consideration in environmental impact assessment. Methodologies that identify the human and social consequences of man-made alterations pollution and resource limitation in the natural environment. Impact of engineering projects on food production lands and water.

Prerequisites: Dept. Approval, BSC001

CEE479 Advanced topics in Environmental Engineering **3 Cr Hr (3,0)** **5 ECTS**

A very well-structured advanced course in the area of environmental engineering, covering topics which are not offered in other courses.

Prerequisites: Dept. Approval, BSC001

CEE570 Drinking Water Abstraction and Distribution **3 Cr Hr (3,0)** **5 ECTS**

Applied water hydraulics; water storage tanks; backflow and cross-connections; valves; water mains; meters; pumps and motors; and system operating equipment. Principles of electricity; OHM's Law; and the Power equation will be presented. Disinfection methods; sampling procedures; ground water wells; distribution system operations; water quality parameters; and the public health aspects of a potable water supply.

Prerequisites: CEE311, BSC001

CEE571 Groundwater Modeling and dynamics **3 Cr Hr (3,0)** **5 ECTS**

Groundwater modeling and dynamics of flow; including groundwater recharge; saturated and unsaturated flow; the nature of aquifer materials and the various types of porosity and permeability. Equations that govern the movement of groundwater; the techniques used to evaluate aquifer properties; specifically the different types of pumping tests. Students will also be utilizing groundwater modeling software; specifically MODFLOW. Emphasis on utilizing this knowledge and skills in the sustainable management of aquifer systems.

Prerequisites: Dept. Approval, BSC001

CEE572 Environmental and water law and policy **3 Cr Hr (3,0)** **5 ECTS**

An overview of the history and current application of laws and rules used to protect the environment. This course outlines the general framework of legislation and includes specific discussions of regulations as they are enforced at international, national, state and local levels. The Environmental Regulations course is concerned with Industry and its relationship with the environment and community and the impact of environmental regulations on Industry decision-making. Topics include waste minimization, pollution

prevention, hazardous, special, industrial and municipal solid waste control, the Clean Air Act, and Clean Water Act, and the Occupational Safety and Health Act and how it relates to environmental regulations. Act and how it relates to environmental regulations.
Prerequisites: Dept. Approval, BSC001

CEE573 Heat and Mass Transfer **3 Cr Hr (3,0)** **5 ECTS**

A fundamental course in heat transfer processes and an introduction to mass transfer. Topics include equations of energy conservation, conduction, convection, radiation; equations for chemical species conservation, diffusion, macroscopic balances. Emphasis on problem solving, especially for purposes of design.
Prerequisites: MATH203, BSC001

CEE574 Water and Wastewater Reuse **3 Cr Hr (3,0)** **ECTS**

Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludge; land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social and regulatory issues. Case studies and field trip(s) are planned.
Prerequisites: CEE515, BSC001

CEE591 Advanced topics in Water and Environmental Engineering **3 Cr Hr (3,0)** **5 ECTS**

A very well-structured advanced course in the area of water engineering, covering topics which are not offered in other courses.
Prerequisites: Dept. Approval, BSC001

CEE597 Advanced topics in Water Engineering **3 Cr Hr (3,0)** **5 ECTS**

A very well-structured advanced course in the area of water engineering, covering topics which are not offered in other courses.
Prerequisites: Dept. Approval, BSC001

CEE523 Advanced reinforced concrete **3 Cr Hr (3,0)** **5 ECTS**

Analysis and design of RC shear Walls; design of retaining walls and water tanks; Waffle slabs; corbels and brackets; design of deep beams. Design of combined and mat foundations; computer applications.
Prerequisites: CEE323, BSC001

CEE524 Pre-stressed Concrete **3 Cr Hr (3,0)** **5 ECTS**

Introduction to pre-stressed concrete; types and concepts of pre-stressed concrete; pre- stressing methods; types of concrete and pre-stressing steel; flexural analysis using elastic stresses; flexural strength analysis; partial pre-stressing. Flexural design of beams; Design based on strength requirements; flexural crack control; loss of pre-stress force; Pre-cast and composite members.
Prerequisites: CEE323, BSC001

CEE526 Earthquake Engineering **3 Cr Hr (3,0)** **5 ECTS**

Seismology and the causes of occurrence of earthquake and its characterization; seismic structural systems; Time-History analysis; Code seismic provisions for RC structures; Code seismic provisions for steel structures; Introduction to Base isolations.
Prerequisites: CEE323, CEE325, BSC001

CEE425 Timber structures **3 Cr Hr (3,0)** **5 ECTS**

Timber as a structural material, mechanical properties (strength and stiffness), durability; unidirectional components (solid timber, glued-laminated timber, LVL). Typical structural systems for timber structures. Basic design and verification of timber structures, design rules and tools. Details and joint design. Glulam and arch structures. Stability and bracing systems. Basic ultimate and serviceability state requirements.
Prerequisites: CEE324, BSC001

CEE527 Advanced steel structures **3 Cr Hr (3,0)** **5 ECTS**

Bolted and welded connections, Building Connections, Rigid Steel frames, elastic and plastic design

methods, supports of rigid frames, composite design.
Prerequisites: CEE522, BSC001

CEE528 Structural systems **3 Cr Hr (3,0)** **5 ECTS**

Overview of various structural systems used in the construction of buildings. Building types; from single-family houses to high-rise buildings to multi-use facilities. Load transfer for building. Case studies from a structural viewpoint, in which the rationale for the structural system is analyzed, and then a systematic construction process is followed from start to completion of the project.
Prerequisites: CEE324, BSC001

CEE429 Advanced topics in Structural engineering **3 Cr Hr (3,0)** **5 ECTS**

A very well-structured advanced course in the area of structural engineering, covering topics which are not offered in other courses.
Prerequisites: Dept. Approval, BSC001

CEE530 Traffic safety and management **3 Cr Hr (3,0)** **5 ECTS**

Analysis of highway design alternatives and control strategies with respect to accident probabilities, statistical models for safety analysis, accident countermeasure selection and evaluation methodology, risk management, transportation networks, network equilibrium concepts, estimation of origin-destination matrix, traffic management measures, traffic control techniques, traffic simulation, application of Control and Optimization software (e.g. TRANSYT-7F, SIDRA, etc.)
Prerequisites: CEE333, BSC001

CEE535 Urban Mobility & Public Transportation **3 Cr Hr (3,0)** **5 ECTS**

Introduction to urban planning, land use planning and urban transportation planning, urban mobility definitions and challenges, private car ownership models, evolution and role of urban public transportation modes, technological characteristics of different modes, urban and intercity public transportation modes (capacity, service quality, and cost), methods for data collection and analysis, performance monitoring, route and network design, frequency determination (bus, BRT, light rail, etc), impact of pricing policy and service quality on ridership, PPP in public transportation, fare policy and technology, marketing and operations management.
Prerequisites: CEE333, BSC001

CEE593 Advanced topics in Transportation engineering **3 Cr Hr (3,0)** **5 ECTS**

Transportation data collection and analysis techniques, activity-based analysis modeling techniques, freight transportation, externalities and energy, future modes of transportation (passengers & freight), airport planning, seaport operations including container terminals.
Prerequisites: Dept. Approval, BSC001

CEE542 Dam Engineering **3 Cr Hr (3,0)** **5 ECTS**

Planning and design of dams in the context of hydropower development; Basics in dam engineering for civil engineers, including concrete and embankment dams, soil mechanics for dams and concrete technology for dams; Type of dams and their characteristics; how dam sites are selected and evaluated; how to investigate dam foundation; basics of soil mechanics; settlement, seepage and aspects of stress in relation to dams and dam foundation; basics of concrete property and dam concrete challenges; how to identify and quantify different loads on dams.
Prerequisites: CEE323, CEE3410, BSC001

CEE543 Geographic Information systems **2 Cr Hr (2,0)** **ECTS**

Fundamentals of geographic information systems (GIS). Geographic and spatial data types. Data models and structures. Projections and transformations. Attribute-based operations and spatial operations. Surfaces and near neighbors. Essential elements of GIS data structure; data acquisition; data processing; database management; and analysis and manipulation. Emphasis on product generation. Application of GIS in water and environmental engineering. Training on Arc GIS software.
Prerequisites: CEE331, BSC001

CEE544 Geographic Information systems Lab. **1 Cr Hr (0,3)** **5 ECTS**

This lab aims to develop skills necessary to interpret and utilize spatial data to generate valuable information. Lab will include hydrologic modeling within GIS, querying, map making, handling raster and vector data, proximity analysis and buffering, overlay analysis, intra-layer interpretation, placement exercises, digitizing, georeferencing, raster and vector analysis, surface analysis.
Co-requisites: CEE543

CEE594 Advanced topics in geotechnical engineering **3 Cr Hr (3,0)** **5 ECTS**

Permeability and seepage, consolidation theory, secondary compression, three-dimensional consolidation, settlement analysis, stress-strain-strength behavior of soils: drained and undrained conditions for cohesive and cohesionless soils, anisotropy of soils, classes of stability; and any advanced topic in geotechnical engineering the instructor may choose.
Prerequisites: Dept. Approval, BSC001

CEE551 Building Construction **3 Cr Hr (3,0)** **5 ECTS**

Methods and techniques used in building construction projects; the construction process from idea conception to project closeout; including building and material codes; materials and methods; material quantity surveys; and construction procedures; Primary emphasis will be on structural steel, reinforced concrete, masonry, wood, and combined structural systems; building exterior and interior finishing systems; the use of construction drawings, scales, orthographic views, symbols, sections, and graphical interpretation, specific to the building construction industry to include structural steel detailing, reinforced concrete detailing, masonry sections, wood sections, and schedules for interior finishes and accessories.
Prerequisites: CEE351, BSC001

CEE452 Construction machines **3 Cr Hr (3,0)** **5 ECTS**

Factors affecting the selection of construction equipment; Descriptions, operating methods, production rates, unit costs related to excavating equipment; Power shovels, draglines, clam shells, and trenching machines; Engineering fundamentals; Moving construction equipment, including trucks, wagons, scrapers, dozers, soil-stabilization and compaction equipment; Belt conveyors; compaction and drilling equipment; pile driving equipment, pumps and crushers.
Prerequisites: CEE351, BSC001

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: Dept. Approval, BSC001

ARCH 403 Special Topics in Architecture II **2 Cr Hr (2,0)** **5 ECTS**

This course allows specialized or in-depth study of a subject supplementing architecture. Student interest and instructor expertise help determine the topic, to be announced in the classroom.

Prerequisites: Dept. Approval, BSC001

ARCH 426 Environmental Psychology and Sociology **3 Cr Hr (3,0)** **5 ECTS**

The course emphasizes environmental psychology and sociology in architecture and design. It specifically addresses meaning of perception, Gestalt theory, principles of perception in visual arts, and criticism schools in architecture and arts. The course touches on psychological, behavioral, social, and cultural inputs using comparative analysis. It provides understanding of the different spatial typologies, order, relationships, and arrangement in relation to place making and preferences.

Prerequisites: Dept. Approval, BSC001

ARCH 451 Design and Build **3 Cr Hr (3,0)** **5 ECTS**

This course presents an option for students who want to design and build from their own ideas of architecture. The course starts as a three-week design project of the students' choosing, with directions from the professor with regard to scope and feasibility of construction. During this first phase, students design and produce detailed drawings of a conceived piece of architecture that they later build together. For the remaining seven weeks, the students engage in material selection and acquisition, and construction of their design. They team out to learn the construction process of buildings.

Prerequisites: Dept. Approval, BSC001

ARC 453 Building and Site Documentation **3 Cr Hr (3,0)** **5 ECTS**

This course aims to provide the students with the skills and abilities to document buildings and sites including the physical documentation as well as the narrative stories that reflect the history, significance and meaning of a specific building or site. It is a field-project oriented using conventional and advanced technologies, different types of thematic surveys, inventories, fieldwork, and research

Prerequisites: Dept. Approval, BSC001

ARCH 457 Advanced Construction Systems **3 Cr Hr (3,0)** **5 ECTS**

This course presents advanced building construction systems: suspension structures, geodesic domes, folded plates, space frames, single and multi-layer systems; shells; folded plates; pneumatic systems; choice of structural systems and construction materials; assessment of their potentials and limitations; and basic principles of structural design.

Prerequisites: Dept. Approval, BSC001

ARCH 554 Project Management and Site Organization II **3 Cr Hr (3,0)** **5 ECTS**

The course focuses on the project management processes, organizational structure, construction project participants, organizing and leading the construction project, project delivery methods, project chronology, construction services during design, bidding and procurement, construction closeout, project planning and scheduling, project cost estimate, controlling project time, cost and quality, job site administration, principles of programming office and field works; linear planning; network planning; critical path in supervision and follow-up; pinpointing and controlling critical points; revising and updating the network through checking operations, time schedules, cost, management of workers and working systems, contractual documents, general and special conditions, and safety issues on the construction sites.

Prerequisites: Dept. Approval, BSC001

ARCH 571 Architectural Environmental Systems **3 Cr Hr (3,0)** **5 ECTS**

The course provides an analysis of the physical environment with a focus on climate: the atmosphere and its related phenomena, e.g., the greenhouse effect, air pollution and acid rains; energy sources (renewable and non–renewable); environmental controls at the levels of the building, neighborhood, city and region; natural and mechanical environmental controls; sustainable ecological design: open and closed systems; the development of “hi- tech” and “eco-tech” and their introduction into architectural expression; and studies of model cases.

Prerequisites: Dept. Approval, BSC001

ARCH 262 Utility Planning and Design I **3 Cr Hr (3,0)** **5 ECTS**

The course introduces the operation and design of building systems for climate control, water and drainage, life safety. It also highlights the design of heating, ventilating, and air conditioning (HVAC) systems for buildings. Systems are analyzed for their effect on building form, construction cost and operating efficiency.

Prerequisites: Dept. Approval, BSC001

ARCH 362 Utility Planning and Design II **3 Cr Hr (3,0)** **5 ECTS**

The course concerns the basic principles of structural design, with particular emphasis on the design of reinforced concrete structures and steel. The course aims to provide the student with the essential knowledge of structural systems behavior, choice of structural systems and choice of construction materials. The course is structured on soft-numerical teaching methods where emphases are given to the

morphology and behavior rather than on detailed calculations

Prerequisites: Dept. Approval, BSC001

ARCH 361 Structural Systems II **3 Cr Hr (3,0)** **5 ECTS**

The course concerns the basic principles of structural design, with particular emphasis on the design of reinforced concrete structures and steel. The course aims to provide the student with the essential knowledge of structural systems behavior, choice of structural systems and choice of construction materials. The course is structured on soft-numerical teaching methods where emphases are given to the morphology and behavior rather than on detailed calculations.

Prerequisites: Dept. Approval, BSC001

ENE534 Low Carbon Buildings **3 Cr Hr (3,0)** **ECTS**

The fundamentals of conventional energy sources used in buildings; renewable technology; policies and drivers that are leading to the more widespread uptake of low carbon building technologies; low carbon building codes, global policies and planning from the past, present and future. Integrated design: urban microclimate design, passive architectural interventions, active interventions. Low carbon buildings design and operation.

Prerequisites: Dept. Approval, BSC001

ENE531 Environmental and Energy Engineering **3 Cr Hr (3,0)** **5 ECTS**

Application of scientific and engineering principles to an understanding of environmental issues associated with human activity. Mass and energy transfer, environmental chemistry, water and air pollution, pollutant transport modeling, pollution management, and risk assessment, and global atmospheric change. Introduction to the physical, chemical, and biological systems relating to the quality of water, land and air environments. Topics relating energy to environmental engineering will be addressed; these topics include carbon production, heat and energy transfer and thermal pollution.

Prerequisites: Dept. Approval, BSC001

ENE528 Energy Storage **3 Cr Hr (3,0)** **ECTS**

Thermal and electric storage is crucial for the implementation of renewable energy technologies because of the fluctuating nature of the renewable energy resources. Energy storage allows better management for energy use from renewable energy systems, in which the available energy will be used only when required. The energy storage course will introduce renewable energy engineering students to the different energy storing technologies with emphasis on electrical and thermal energies storage. Furthermore, energy storage strategies for system optimization will be covered in this course.

Prerequisites: Dept. Approval, BSC001

ENE331: Energy Conversion **3 Cr Hr (3,0)** **5 ECTS**

This course covers three aspects of energy: Energy resources, Energy Conversion, Development, and environment. Energy Sources: Fossil fuels including, petroleum, coal, oil shale and tar sand, natural gas and hydrogen power. Renewable energy sources including: solar, wind, biomass, hydroelectric and geothermal. Energy Conversion: Conversion of thermal energy into electrical power including thermoelectric converters and fuel cells, thermoelectric systems, electric generators and alternators. Development and environment: implications for sustainable development: Technical, economic, ethical and philosophical aspects of sustainable development, Environment and sustainable development at urban, national and international levels.

Prerequisites: Dept. Approval, BSC001

CEE480 Independent Studies **3 Cr Hr (3,0)** **5 ECTS**

Allows the student to explore a topic of interest under the close supervision of a faculty member. The course may include directed readings, applied work, assisting a faculty member with a research project, carrying out an independent research project, or other activities

Prerequisites: Dept. Approval, BSC001

CEE481 Special Topics **3 Cr Hr (3,0)** **5 ECTS**

Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to civil engineering and its applications. The course content must be commensurate with one credit hour.

Prerequisites: Dept. Approval, BSC001

CEE482 Special Topics **3 Cr Hr (3,0)** **ECTS**

Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to civil engineering and its applications. The course content must be commensurate with two credit hour.

Prerequisites: Dept. Approval, BSC001

CEE483 Special Topics **3 Cr Hr (3,0)** **5 ECTS**

Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to civil engineering and its applications. The course content must be commensurate with three credit hour.

Prerequisites: Dept. Approval, BSC001

X. Courses offered by Other Schools

ARB099 Arabic **0 Cr Hr (3,0)** **0 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: -

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

ENGL099 English II **0 Cr Hr (3,0)** **0 ECTS**

Students will focus on English at a pre-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include such things as comparatives and superlatives, quantifiers, possessive adjectives and pronouns, vocabulary building, role-play activities for speaking, reading comprehension and writing short descriptive paragraphs.

Prerequisites: -

ENGL101 English III **1 Cr Hr (3,0)** **3 ECTS**

Students will focus on English at an intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include collocations, tense review, affirmative, negative statements, synonyms and antonyms, time clauses, conditionals, active and passive forms, reported speech, phrasal verbs, reading comprehension with detailed questions, vocabulary and writing developed descriptive and opinion essays.

Prerequisites: ENGL099

ENGL102 English IV **1 Cr Hr (3,0)** **3 ECTS**

Students will focus on English at an upper-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. Model verb review, silent letters and proper pronunciation, jobs and careers, requests and offers, more phrasal verbs with vocabulary building, relative clauses and relative pronouns, narrative tenses for writing exercises, wishes and regrets, reading and comprehending longer passages with direct and inference questions of medium difficulty, hypothesizing, and writing fully developed descriptive, argumentative and analytical essays of 350 words.

Prerequisites: ENGL101

ENGL 201 English V **2 Cr Hr (3,0)** **3 ECTS**

Students will focus on English at an Advanced level. Students will analyze and produce 2 – 3 page essays with an emphasis on argumentation and persuasion working both independently and cooperatively to gather, evaluate, and synthesize necessary information. 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.

.
Prerequisites: ENGL102

ENGL 202 English VI **2 Cr Hr (3,0)** **3 ECTS**

Students will continue to focus on English at an Advanced level. Students will analyze and produce 4 – 5 page essays emphasizing argumentative, persuasive and discursive styles of writing, working both independently and cooperatively to gather, evaluate, and synthesize necessary information. Students will integrate the practice of critical thinking and reading into the writing process. Class activities include interactive lectures, small group and class discussions, informal debates, mini-conferences, 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 stronger and more intensive literary terms and concepts than in 201.

Prerequisites: ENGL 201

ENGL 202 English VI **2 Cr Hr (3,0)** **3 ECTS**

Students will continue to focus on English at an Advanced level. Students will analyze and produce 4 – 5 page essays emphasizing argumentative, persuasive and discursive styles of writing, working both independently and cooperatively to gather, evaluate, and synthesize necessary information. Students will integrate the practice of critical thinking and reading into the writing process. Class activities include interactive lectures, small group and class discussions, informal debates, mini-conferences, 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 stronger and more intensive literary terms and concepts than in 201.

Prerequisites: ENGL 201

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

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

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

Prerequisites: Intensive pre-course (only for 1st semester of an academic year)

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

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

- Understand and use familiar, everyday expressions and very simple sentences and structures related to areas of most immediate relevance according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level A1.2 (basic users).
- Introduce herself/himself and others, express likes and dislikes, fill out a personal form, ask questions and give answers in present and past tense, set private and official appointments, describe people and things, ask for directions, express frequency and quantity in a basic way both orally and in writing.

- Communicate with native speakers on a very basic level if those involved in the conversation speak slowly and clearly and, if need be, are willing to support the non-native speaker.

Prerequisites: GERL101B1

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

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

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

Prerequisites: GERL102B1

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

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

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

Prerequisites: GERL201B1

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

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

- Understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc. according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B1.1 and B1.2 (independent user).
- Deal with most situations likely to arise whilst traveling in an area where German is spoken, produce simple connected texts on topic which are familiar or of personal interest, describe experiences and events, dreams, hopes and ambitions, statistics, and briefly give reasons and explanations for opinions and plans.
- Understand the main point of many radio or TV programmes on current events and topics, understand the description of events, feelings and wishes in personal letters, write personal letters/texts describing experiences and impressions, write straightforward connected texts on topics which are familiar or of personal interest.
- Communicate with native speakers about essential points and ideas in familiar contexts and about topics of personal or partially professional interest.

- Follow a lecture or talk within her/his field, provided the subject matter is familiar and the presentation straightforward and clearly structured.
- Understand simple technical information, such as operating instructions for everyday equipment.
- Understand all characteristics of the official B1 exam according to the CEFR and use a variety of strategies to overcome obstacles while solving said exam and all its components.

Prerequisites: GERL202B1

GERL302REG German VI Regular **3 Cr Hr (6,0)** **6 ECTS**

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

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

Prerequisites: GERL301B1

GERL302INT German VI Intensive **3 Cr Hr (9,0)** **6 ECTS**

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

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

Prerequisites: GERL301B1

GERL102B2 German II B2 track **3 Cr Hr (9,0)** **6 ECTS**

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

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

Prerequisites: GERL101B1

GERL201B2 German III B2 track **3 Cr Hr (6,0)** **4 ECTS**

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

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

Prerequisites: GERL102B2

GERL202B2 German IV B2 track **3 Cr Hr (9,0)** **6 ECTS**

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

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

- Understand all characteristics of the official B1 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and all its components.

Prerequisites: GERL201B2

GERL301B2 German V B2 track **3 Cr Hr (9,0)** **6 ECTS**

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

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

Prerequisites: GERL202B2

GERL302B2 German VI B2 track **3 Cr Hr (6,0)** **6 ECTS**

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

- Understand and produce rather complex texts on both concrete and abstract topics, including technical discussions in her/his field of specialisation and according to the discretionary standards in the *Common European Framework of Reference for Languages* (CEFR) at the level B2.2 (independent user).
- Interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party.
- Understand standard spoken language, live or broadcast, on both familiar and unfamiliar topics normally encountered in personal, social, academic or vocational life.
- Show a highly controlled degree of grammatical control without making errors which cause misunderstanding and with the growing ability to correct most of her/his mistakes.
- Follow essentials of lectures, talks, reports and other forms of academic/professional presentation which are propositionally and linguistically complex.
- Understand announcements and messages on concrete and abstract topics spoken in standard dialect at normal speed.
- Scan quickly through long texts, locating relevant details and understand and exchange complex information and advice on the full range of matters related to her/his occupational role.
- Understand all characteristics of the official B2 exam according to the CEFR and use different strategies to overcome obstacles while solving said exam and its different components.
- Successfully manage the application process for a six months internship in Germany which is part of the obligatory 'German Year' for all GJU students. The process consists of finding and understanding a suitable add in accordance with the students' major, writing a convincing CV and cover letter, and mastering an effective and mostly fluent interview, departing spontaneously, taking initiatives, expanding ideas with little help or prodding from the interviewer.
- Successfully manage the most significant situations which the student, in accordance with the currently studied major, encounters during her/his theoretical and practical semester in Germany.

This process is being achieved within a technical language training focussing on action orientated and communicative scenarios like following lectures, taking notes, summarizing academic and technical texts, writing official emails and texts related to academic and vocational encounters, holding presentations, communicating both verbally and in writing with professors, university staff, students as well as with colleagues and customers during an internship.

- Understand the concept of general intercultural phenomena, reflect and understand the differences between culture and cultural standards in Jordan and in Germany, understand the concept of 'culture shock' and potentially cope with its different stages, reflect about appropriate and inappropriate behaviour in Germany as well as understand the concepts of open-mindedness and 'culture clash'.

Prerequisites: GERL301B2

BE302 Business Entrepreneurship **3 Cr Hr (3,0)** **3 ECTS**

The course focuses on critical skills necessary to develop appropriate financing strategies for new venture creation and growth. Students will use case studies and team projects in course studies. Three primary topics are covered: first, an overview of the entrepreneurial finance process and involved players; second, performing business valuations; and third, securities law with emphasis on developing term sheets and private placement memorandums. Student teams will complete a valuation and mock securities offering for an existing small to mid-size business. Financial valuations and terms sheets developed by student teams will be presented to a panel of venture capital professionals for evaluation and critique
Prerequisites: English101

DES101 Arts Appreciation **3 Cr Hr (3,0)** **3 ECTS**

An introductory course designed for non-art students to give them the basic knowledge of arts and simple approaches to the understanding of the history, development, elements, criticism, esthetics and materials of different art forms (visual, aural and performing arts). A comparative approach between the different arts is given to enhance the students' global understanding of arts and to give them the ability to look at art works and form their own opinions. The course is combined with examples of audio and visual arts.

Prerequisites: ARB099, ENGL101

IC101 Intercultural Communication **3 Cr Hr (3,0)** **3 ECTS**

This course is designed to provide prospective students (whose majors have an international flavor) with tools that offer powerful possibilities for improving the communication process. We will examine the process of sending and receiving messages between people whose cultural background could lead them to interpret verbal and nonverbal signs differently. We will learn about the diversity of these cultural differences and at the same time learn how we might overcome them. Our efforts to recognize and surmount cultural differences will hopefully open up business opportunities throughout the world and maximize the contribution of all the employees in a diverse workforce
Prerequisites: English101

MILS100 Military Science **3 Cr Hr (3,0)** **3 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: ---

NE101 National Education **3 Cr Hr (3,0)** **3 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: ---

SE301 Social Entrepreneurship and Enterprises **3 Cr Hr (3,0)** **3 ECTS**

This course will serve as an introduction to the field of social entrepreneurship and social enterprises. Through lectures, field visits, analyses of relevant literature, case studies and exercises, this course will explore social entrepreneurship's potentials, opportunities and limitations. The topics will cover Defining Social Entrepreneurship. Contextualizing Social Entrepreneurship (need, motives, forms, criteria). Role of Leadership, Creativity and Innovation. Locating SE on the profit/non-profit continuum. SE in the larger fields of development, social change, community activism. Social Enterprises (Missions, Markets, Finances). Ethical business and corporate social responsibility.
Prerequisites: English101

SFTS101 Soft Skills **3 Cr Hr (3,0)** **3 ECTS**

This course is designed to help develop strong oral and written communication skills. The student will be given opportunities to practice writing and editing professional correspondence and technical reports. Additionally, the student will compose and deliver oral presentations. Assignments will include the use of inductive and deductive approaches to conveying a variety of messages. The course emphasis the use of software tools to prepare presentations, stress management, confidence, and sensitivity to others. It also stresses on resume writing and conducting interviews.
Prerequisites: English101

EI101 Leadership and Emotional Intelligence **3 Cr Hr (3,0)** **ECTS**

In this course, students will be introduced to the concept of Emotional Intelligence as a means to improve self-management and relationship management. The operative concepts are applied to social, family, academic and professional relationships with an emphasis on leadership implications. The majority of the curriculum is based upon the book by Daniel Goleman entitled: "Leadership: The Power of Emotional Intelligence," and covers leadership styles and their appropriate applications, the emotional intelligence model, and neurological aspects of the limbic system. The class is a lecture format which encourages student participation.
Prerequisites: ---

PE101 Sports and Health **3 Cr Hr (3,0)** **ECTS**

The course focuses on providing students with information related to Sport, fitness and health culture, Voluntary work Nutrition, First Aid. It covers also Special physical preparation and general sports cultural issues.
Prerequisites: ---

TW303 Technical and Workplace Writing **3 Cr Hr (3,0)** **ECTS**

Technical and Workplace Writing course focuses on essentials; it introduces students to professional and technical writing through a straightforward structure, adding knowledge while practicing different forms and skills. Since this course is a practical one, the course offers the "how" (instructions) and the "what" (examples) with discussion topics and exercises designed to make instruction straightforward. Students are exposed to certain genres, such as web page design, summaries, proposals, user guides, and job application materials. This is why this course is designed with a student/worker in mind, who would greatly benefit from the techniques of writing presented throughout the course.
Prerequisites: ---

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

Physics 103 is concerned with mechanics, the study of motion. Mechanics, in turn, consists of two major areas; kinematics and dynamics. Mechanics is basic to the understanding all the other areas of physics. Only three simple laws (Newton's laws of motion) and two fundamental conservation principles (the conservation of energy and the conservation of momentum) are needed to describe almost all the motion that we observe in our everyday world. The purpose of Physics 103 is to gain some understanding of these basic laws and principles and to learn how to apply them to physical happenings that occur in our daily life

and work. The basic method of study will be to define the concepts, discuss and demonstrate the principles and laws, and to test and refine understanding by problem solving.
Prerequisites: ---

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

To provide you with theoretical knowledge about Electricity & Magnetism. Many courses to come during your study will depend directly or indirectly on this course.
Prerequisites: PHYS103

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

Developing a good understanding of a few important concepts in Mechanics, Electricity, and Magnetism. Learning to apply these concepts to familiar and unfamiliar situations and Gaining the ability to reason qualitatively and quantitatively. This lab consists of 12 experiments, six in Mechanics and six in Electricity and Magnetism.
Co-requisites: PHYS104

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

This course introduces the student to the calculus of single-valued functions. Topics include: limits, continuity, rates of change, rules for differentiating, differentials and local linear approximations, maxima and minima problems, L'Hôpital's rule, related rates, logarithmic and implicit differentiation, inverse trigonometric and hyperbolic functions, Rolle 's Theorem, the mean-value theorem, and applications of derivatives and integrals. An overview of integration, basic techniques for integration, algebraic techniques of integration and applications of integrations are also included.
Prerequisites: PreMATH099

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

Sequences and series, power series, convergence theorems: integral, ratio, and alternating - series tests, Polar coordinates, and functions, integration and differentiation of polar functions, Vectors in three-dimensional space, spherical and cylindrical coordinates, Vector-valued functions, Partial derivatives, Multiple integrals, Topics in vector calculus.
Prerequisites: MATH101

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

Vector analysis in Cartesian coordinates; Curvilinear coordinates and transformations to Cartesian, Spherical, and Cylindrical coordinates; line integrals, surface integrals, Green's theorem, Gauss's divergence theorem, and Stokes's theorem. Scalar and vector potential. Review of Series. Linear Algebra; Matrices and linear equations; Matrices and Linear Operators; Determinants, Eigenvalues and eigenvectors. Complex Numbers and Complex Variable; Representation of complex numbers, DeMoivre's formula, Powers and roots of complex numbers, Functions of complex variable.

Prerequisites: MATH102

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

First-order ordinary differential equations, Second-order ordinary differential equations, System of ODEs. Solution Techniques including Laplace transforms, Fourier series: 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, dynamics and vibrations, wave phenomena, diffusion phenomena, heat conduction, and biological processes
Prerequisites: MATH102

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

Prerequisites: ---

CHEM106 General Chemistry lab **1 Cr Hr (0,1)** **ECTS**

Laboratory safety, first aid. Measurement and proper use of laboratory glassware. Density measurement. Classification of matter: Basic separation techniques. Precipitation reaction. Limiting reactant. Determination of acetic acid in vinegar. Quantitative titration of an antacid tablet. Determination of ions in hard water using EDTA. Molecular weight of a volatile liquid. Kinetic study of reaction of peroxydisulfate and iodide ions. Calorimetry.
Co-requisites: CHEM103

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

General safety, materials, and their classifications, measuring devices and their accuracy, basic household plumbing and electricity, fits and tolerances, theoretical background for the practical exercises including fitting, forging, carpentry, casting, welding, mechanical saws, shearers, drills, lathes, milling machines, shapers, and grinders.

Prerequisites: ---

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

Basic computer skills, programming concepts, algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations

Prerequisites: ---

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

ab session every week to offer hands-on experience on the topics that are covered in CS116, which are: algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.

Co-requisites: CS116