German Jordanian University

School of Applied Technical Sciences

Department of Industrial Engineering

Bachelor of Science in Industrial Engineering

Study Plan

2014

INDUSTRIAL ENGINEERIGN DEPARTMENT

I.   Program Objectives

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

i. To define, analyze, and solve complex problems within and between enterprises.
ii. To discover, understand, and incorporate appropriate new technologies in the design and operation of enterprises.
iii. To lead/ manage design, development, and improvement efforts that benefit customers, employees, and stakeholders.
iv. To function in culturally diverse teams, communicate in a professional manner, and uphold the ethical standards of the engineering profession.

II.   Learning Outcomes

IE Graduating baccalaureate students will possess an understanding of fundamental industrial engineering and management concepts, methodologies, and technologies as demonstrated by:

a) An ability to apply knowledge of mathematics, probability and statistics, science, engineering, and engineering economy.
b) An ability to design and conduct experiments involving risk and uncertainty, as well as to analyze and interpret data.
c) An ability to design a system, component, or process to meet desired needs.
d) An ability to function on culturally diverse, multi-disciplinary teams.
e) An ability to identify, to formulate, and to solve engineering problems involving physical, human, and economic parameters.
f) An understanding of professional and ethical responsibility.
g) An ability to communicate effectively.
h) An ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering and management practice.

III.   Assessment of Learning Outcome

The above outcomes can be assessed as follows:

− Outcome *a* includes understanding fundamental mathematics, probability and statistics, physics, engineering science, engineering management, and engineering economy. Performance of this outcome is achieved when students show their knowledge of relevant concepts, and build and execute appropriate models. Student achievement of this learning outcome is assessed by passing exams set for the classes in the above fields, performing capstone projects in these fields and by self-evaluation of the classes offered.

− Outcome *b* includes understanding fundamental design of experiments, which includes factor selection, randomization techniques and fundamental designs, graphical and statistical analysis, and interpretation of the results. Performance of this outcome is achieved when students show their knowledge of relevant concepts, and build, execute and analyze data from appropriate models. Student achievement of this learning outcome is

assessed by passing exams set for the classes in the above fields, performing capstone projects in these fields and by self-evaluation of the classes offered.

− Outcome *c* includes successfully integrating awareness, analysis, and synthesis to identify, assess, and address a well-defined problem and/or opportunity need. Performance of this outcome is achieved when students show their understanding of design context and system design process, and show their ability in executing the system design process and explaining the results. Student achievement of this learning outcome is assessed by performing capstone projects in these areas and by surveys from industries regarding graduate students performance.

− Outcome *d* includes effective teamwork in assigned projects regardless of the composition, background, or characteristics of the assigned team members. Performance of this outcome is achieved when students show appreciation to the value of member's contribution to team success, understanding the team roles, and ability to take responsibility. Student achievement of this learning outcome is assessed by successfully participating in various teams while attending applied classes and by surveys from industries regarding graduate students performance.

− Outcome *e* includes successfully integrating awareness, analysis, and synthesis to address an open ended problem and/or opportunity (having physical, human and economic parameters) within an enterprise. Performance of this outcome is achieved when students show their understanding of design context and system design process, and show the ability to execute the system design process, and explain the results. Student achievement of this learning outcome is assessed by performing capstone projects in these areas and by surveys from industries regarding graduate students performance.

− Outcome *f* includes an understanding of professional and ethical responsibility in the conduct of relationships with peers, faculty, and clients. Performance of this outcome is achieved when students show awareness of professional ethics, understanding context, and ability to discern impact. Student achievement of this learning outcome is assessed by reviews and assessment from professors and by surveys from industries regarding graduate students performance.

− Outcome *g* includes an ability to produce effective oral, written, and graphical communications. Performance of this outcome is achieved when students show their ability to determine appropriate content, appropriately organize material for audience, and appropriately use style/mechanics and exhibit professionalism in speech. Student achievement of this learning outcome is assessed by reviewing project reports, project presentation and by reviewing exit (graduating) surveys from student.

− Outcome *h* includes an awareness, analysis, and synthesis of contemporary industrial engineering and management tools in the context of addressing a problem or opportunity. Performance of this outcome is achieved when students show awareness of IE techniques, skill sets and tools, understanding of problem context and opportunities, ability to apply appropriate techniques, skills and tools, and ability to interpret results. Student achievement of this learning outcome is assessed by instructor evaluation and by student self-assessment of their engineering abilities.

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

Classification	Credit Hours		
	Compulsory	Elective	Total
University Requirements	21	6	27
School Requirements	37	-	37
Program Requirements	103	12	115
Total	**161**	**18**	**179**

1. University Requirements: (27 Credit Hours)

1.1. Compulsory: (21 Credit Hours)

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

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

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Lab	
DES101	Arts' Appreciation	3	3	-	-
EI101	Leadership and Emotional Intelligence	3	3	-	-
IC101	Intercultural Communications	3	3	-	-
SE301	Social Entrepreneurship and Enterprises	3	3	-	-
SFTS101	Soft Skills	3	3	-	-
TW303	Technical and Workplace Writing	3	3	-	-
BE302	Business Entrepreneurship	3	3	-	-
PE101	Sports and Health	3	3	-	-
	Total	**6**	**6**	**-**	

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[a] Not Required for students who passed the placement test

2. School Requirements: (37 Credit Hours)

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Lab	
CS116	Computing Fundamentals	3	3	-	-
CS1160	Computing Fundamentals Lab	1	-	3	Corequisite: CS116
ENE211	Electrical Circuits I	3	3	-	PHYS104
ENE213	Electrical Circuits Lab	1	-	3	ENE211
GERL201	German III	3	6	-	GERL102
GERL202	German IV	3	6	-	GERL201
IE121	Workshop	1	-	3	-
MATH099	Pre-Math[a]	0	3	-	-
MATH101	Calculus I	3	3	-	MATH099
MATH102	Calculus II	3	3	-	MATH101
MATH203	Applied Mathematics for Engineers	3	3	-	MATH102
MATH205	Differential Equations	3	3	-	MATH102
ME111	Computer Aided Engineering Drawing	3	2	3	CS116, CS1160
PHYS103	Physics I	3	3	-	-
PHYS104	Physics II	3	3	-	PHYS103
PHYS106	General Physics Lab	1	-	3	PHYS103, Corequisite: PHYS104
Total		**37**	**41**	**15**	

3. Program Requirements (115 Credit Hours)

3.1. Program Requirements (Compulsory): (103 Credit Hours)

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Lab	
IE211	Probability and Statistics	3	3	-	MATH102
IE212	Applied Statistics	3	3	-	IE211
IE223	Materials Science	3	3	-	IE121
IE224	Materials and Mechanics Lab	1	-	3	IE223, Corequisite: TME213
IE261	Work Measurement and Standards	3	2	3	IE211
IE312	Quality Control	3	3	-	IE212
IE325	Manufacturing Processes	4	3	3	IE121, TME213
IE326	Elements of Machine Design	3	3	-	TME213
IE3315	Operations Research	4	3	3	MATH203
IE332	Production Planning and Inventory Control	3	3	-	IE3315
IE371	Engineering Economics	3	3	-	MATH205
IE381	Simulation	3	2	3	IE212
IE382	Engineering Marketing	3	3		IE212
IE391	Field Training	-	-	160 hr	Dept. Approval
IE491	International Internship	12	-	20 weeks	IE391
IE541	Industrial Automation	4	3	3	ME343
IE562	Ergonomics	3	2	3	IE261
IE582	Facilities Layout	3	3	-	IE332
IE583	Supply Chain Management	3	3	-	IE332
IE591	Graduation Project I	3	-	9	IE491, min 124 CH
IE592	Graduation Project II	3	-	9	IE591
ME211	Statics and Dynamics	3	3	-	PHYS103, MATH102
ME223	Thermofluids	3	3	-	MATH205
ME323	Thermofluids Lab	1	-	3	ME223
ME343	Automatic Control Systems	4	3	3	MATH205, ME211, ENE211
ME346	Instrumentation and Measurements	2	2	-	ENE211, MATH205
ME347	Instrumentation and Measurements Lab	1	-	3	Corequisite: ME346
ME534	Electrical Machines and Control	3	3	-	ENE211
ME535	Electrical Machines and Control Lab	1	-	3	ENE211
TME213	Mechanics of Materials	3	3	-	ME211
BM371	Numerical Methods for Engineers	3	2	3	CS116, MATH203, MATH205
GERL301	German V	3	9	-	GERL202
GERL302	German VI	3	9	-	GERL301
MGT525	Project Management	3	3	-	IE371
	Total	**103**	**85**	**54**	

3.2. Program Requirements (Electives[b]): (12 Credit Hours)

A minimum of 12 credit hours of engineering coursework are required. This list is considered to be open for modifications on the base of the decision of the school council before registration.

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
			Lecture	Lab	
Group 1. Statistics and Quality Management					
IE512	Quality Management Systems	3	3	-	IE212, IE312
IE513	Six Sigma	3	3	-	IE212, IE312
IE514	Design of Experiment	3	3	-	IE212
IE515	Quality Engineering	3	3	-	IE212, IE312
IE516	Forecasting and Advanced Regression	3	3	-	IE212, IE312
IE519	Special Topics in Statistics and Quality Management	3	3	-	Dept. Approval
Group 2. Manufacturing and Engineering Materials					
IE523	Tool and Die Design and Manufacturing	3	3	-	IE325
IE524	Polymers Engineering	3	3	-	IE223
IE525	Non-Traditional Manufacturing	3	3	-	IE325
IE529	Special Topics in Manufacturing and Engineering Materials	3	3	-	Dept. Approval
Group 3. Optimization					
IE536	Optimization Theory	3	3	-	IE3315, BM371
IE538	Multi-Criteria Decision Making	3	3	-	IE3315, BM371
IE5399	Special Topics in Optimization and Mathematics	3	3	-	Dept. Approval
Group 4. Informatics and Mathematics					
IE544	Integer Programming	3	3	-	IE3315, BM371
IE545	Nonlinear Programming	3	3	-	IE3315, BM371
IE546	Fuzzy Logic and Neural Networks	3	3	-	BM371
IE547	Design of Industrial Information Systems	3	3	-	BM371
IE548	CAD/CAM/CIM systems	3	3	-	IE325, IE332
IE549	Special Topics in Informatics	3	3	-	Dept. Approval
Group 5. Reserved.					

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[b] IE491 International Internship is prerequisite for all elective courses

Course ID	Course Title	Credit Hours	Contact Hours		Prerequisite
Group 6. Ergonomics					
IE563	Ergonomic Product Design and Evaluation	3	3	-	IE562
IE564	Occupational Biomechanics	3	3	-	IE562
IE565	Occupational Health and Safety	3	3	-	IE562
IE569	Special Topics in Ergonomics	3	3	-	Dept. Approval
Group 7. Economics and Finance					
IE571	Cost Accounting	3	3	-	IE371
IE572	Micro and Macroeconomics	3	3	-	IE371
IE573	Economics and Financial Modeling	3	3	-	IE371
IE574	Advanced Engineering Economics	3	3	-	IE371
IE575	Finance and Capital Investment	3	3	-	IE371
IE576	Risk Management	3	3	-	IE371
IE579	Special Topics in Economics and Finance	3	3	-	Dept. Approval
Group 8. Operations Management and Managerial Sciences					
IE585	Human Resource Management	3	3	-	IE371
IE586	Leadership	3	3	-	IE371
IE587	Product Development	3	3	-	IE332
IE588	Lean Manufacturing	3	3	-	IE212, IE332
IE589	Special Topics in Operations Management and Managerial Sciences	3	3	-	Dept. Approval
Group 9. Miscellaneous					
IE597	Special Topics MI	1	1	-	Dept. Approval
IE598	Special Topics MII	2	2	-	Dept. Approval

V. Study Plan^c Guide for the Bachelor Degree in Industrial Engineering

First Year				
First Semester				
Course ID	**Course Title**	**Cr. Hr.**	**Prerequisites**	**Corequisite**
IE121	Workshop	1	-	-
ARB100	Arabic	3	ARB099	-
ENGL101	English III	1	ENGL099	-
CS116	Computing Fundamentals	3	-	-
CS1160	Computing Fundamentals Lab	1	-	CS116
GERL101	German I	3	-	-
MATH101	Calculus I	3	MATH099	-
PHYS103	Physics I	3	-	-
	Total	**18**		

First Year				
Second Semester				
Course ID	**Course Title**	**Cr. Hr.**	**Prerequisites**	**Corequisite**
ME111	Computer Aided Engineering Drawing	3	CS116, CS1160	-
ME1110	Computer Aided Engineering Drawing Lab	0	-	ME111
ENGL102	English IV	1	ENGL101	-
GERL102	German II	3	GERL101	-
MATH102	Calculus II	3	MATH101	-
MILS100	Military Science	3	-	-
NE101	National Education	3	-	-
PHYS104	Physics II	3	PHYS103	-
PHYS106	General Physics Lab	1	PHYS103	PHYS104
	Total	**20**		

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

Second Year				
First Semester				
Course ID	**Course Title**	**Cr. Hr.**	**Prerequisites**	**Corequisite**
IE211	Probability and Statistics	3	MATH102	-
IE223	Materials Science	3	IE121	-
ME211	Statics and Dynamics	3	PHYS103, MATH102	-
ENE211	Electrical Circuits I	3	PHYS104	-
ENGL201	English V	2	ENGL102	-
GERL201	German III	3	GERL102	-
MATH203	Applied Mathematics for Engineers	3	MATH102	-
	Total	**20**		

Second Year				
Second Semester				
Course ID	**Course Title**	**Cr. Hr.**	**Prerequisites**	**Corequisite**
IE212	Applied Statistics	3	IE211	-
IE224	Materials and Mechanics Lab	1	IE223	TME213
IE261	Work Measurement and Standards	3	IE211	
IE2610	Work Measurement and Standards Lab	0	-	IE261
TME213	Mechanics of Materials	3	ME211	-
ENGL202	English VI	2	ENGL201	-
ENE213	Electrical Circuits Lab	1	ENE211	
GERL202	German IV	3	GERL201	-
MATH205	Differential Equations	3	MATH102	-
	Total	**19**		

Third Year				
First Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
IE312	Quality Control	3	IE212	-
IE325	Manufacturing Processes	4	IE121, TME213	-
IE3250	Manufacturing Processes Lab	0	-	IE325
IE3315	Operations Research	4	MATH203	
IE33150	Operations Research Lab	0	-	IE3315
BM371	Numerical Methods for Engineers	3	CS116, MATH203, MATH205	-
BM3710	Numerical Methods for Engineers Lab	0		BM371
ME223	Thermofluids	3	MATH205	-
GERL301	German V	3	GERL202	-
	Total	20		

Third Year				
Second Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
IE326	Elements of Machine Design	3	TME213	-
IE332	Production Planning and Inventory Control	3	IE3315	-
IE371	Engineering Economics	3	MATH205	-
IE381	Simulation	3	IE212	-
IE3810	Simulation Lab	0	-	IE381
IE382	Engineering Marketing	3	IE212	-
IE391	Field Training	0	Dept. Approval	-
ME323	Thermofluids Lab	1	ME223	-
GERL302	German VI	3	GERL301	-
	Total	19		

Fourth Year				
First Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
	Technical Elective	3	-	-
	Technical Elective	3	-	-
	Technical Elective	3	-	-
	Technical Elective	3	-	-
	Total	12		

Fourth Year				
Second Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
IE491	International Internship[d]	12	IE391	-
	Total	12		

German year prerequisites are:

- A minimum GPA of 60.0%
- Successful completion of 90 credit hours excluding all German language courses
- Passing GERL302 German VI, ENGL201 English V, and Arabic 99
- Passing four out of the five following courses:
    - IE223 Materials Science
    - IE261 Work Measurement and Standards
    - IE312 Quality Control
    - IE325 Manufacturing Processes
    - IE332 Production Planning and Inventory Control

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

Fifth Year				
First Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
IE562	Ergonomics	3	IE261	-
IE5620	Ergonomics Lab	0	-	IE562
ME534	Electrical Machines and Control	3	ENE211	
IE591	Graduation Project I	3	IE491, min 124 CH	-
ME343	Automatic Control Systems	4	MATH205, ME211, ENE211	-
ME3430	Automatic Control Systems Lab	0		ME343
ME346	Instrumentation and Measurements	2	ENE211, MATH205	-
ME347	Instrumentation and Measurements Lab	1	-	ME346
	University Elective	3	-	-
	Total	**19**		

Fifth Year				
Second Semester				
Course ID	Course Title	Cr. Hr.	Prerequisites	Corequisite
IE541	Industrial Automation	4	ME343	-
IE5410	Industrial Automation Lab	0	-	IE541
IE582	Facilities Layout	3	IE332	-
IE583	Supply Chain Management	3	IE332	-
IE592	Graduation Project II	3	IE591	-
ME535	Electrical Machines and Control Lab	1	ME534	
MGT525	Project Management	3	IE371	-
	University Elective	3	-	-
	Total	**20**		

VI. Course Identification Convention

Example: IE371
Program: IE is the code for Industrial Engineering
Level: The first number (3) represents the level of the course in the study plan
Field: The second number (7) represents the group number of the course
Sequence: The third number (1) represents a unique serial number of the course in its group

		Course ID	Course Title
Group 1	Statistics and Quality Management	IE211	Probability and Statistics
		IE212	Applied Statistics
		IE312	Quality Control
		IE512	Quality Management Systems
		IE513	Six Sigma
		IE514	Design of Experiment
		IE515	Quality Engineering
		IE516	Forecasting and Advanced Regression
		IE519	Special Topics in Statistics and Quality Management
Group 2	Manufacturing Processes and Engineering Materials	IE121	Workshop
		IE223	Materials Science
		IE325	Manufacturing Processes
		IE326	Elements of Machine Design
		IE523	Tool and Die Design and Manufacturing
		IE524	Polymers Engineering
		IE525	Non-Traditional Manufacturing
		IE529	Special Topics in Manufacturing and Engineering Materials
Group 3	Optimization	IE3315	Operations Research
		IE332	Production Planning and Inventory Control
		BM371	Numerical Methods for Engineers
		IE536	Optimization Theory
		IE538	Multi-Criteria Decision Making
		IE5399	Special Topics in Optimization and Mathematics
Group 4	Informatics and Mathematics	IE541	Industrial Automation
		IE544	Integer Programming
		IE545	Nonlinear Programming
		IE546	Fuzzy Logic and Neural Networks
		IE547	Design of Industrial Information Systems
		IE548	CAD/CAM/CIM systems
		IE549	Special Topics in Informatics
Group 5	Left empty		

Group 6	Ergonomics	IE261	Work Measurement and Standards
		IE562	Ergonomics
		IE563	Ergonomic Product Design and Evaluation
		IE564	Occupational Biomechanics
		IE565	Occupational Health and Safety
		IE569	Special Topics in Ergonomics
Group 7	Economics and Finance	IE371	Engineering Economics
		IE571	Cost Accounting
		IE572	Micro and Macroeconomics
		IE573	Economics and Financial Modeling
		IE574	Advanced Engineering Economics
		IE575	Finance and Capital Investment
		IE576	Risk Management
		IE579	Special Topics in Economics and Finance
Group 8	Operations Management and Managerial Sciences	IE381	Simulation
		IE382	Engineering Marketing
		IE582	Facilities Layout
		IE583	Supply Chain Management
		IE585	Human Resource Management
		IE586	Leadership
		IE587	Product Development
		IE588	Lean Manufacturing
		IE589	Special Topics in Operations Management and Managerial Sciences
Group 9	Applied and Misc.	IE391	Field Training
		IE491	International Internship
		IE591	Graduation Project I
		IE592	Graduation Project II
		IE597	Special Topics MI
		IE598	Special Topics MII

VII.   Description of Courses offered by the Industrial Engineering Department

IE121: Workshop   **1 Cr (0,3)**

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

Prerequisites: -

IE211: Probability and Statistics   **3 Cr (3,0)**

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

Prerequisites: MATH102

IE212: Applied Statistics   **3 Cr (3,0)**

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

Prerequisites: IE211

IE223: Materials Science   **3 Cr (3,0)**

Classification and study of engineering materials, their structure, properties, and behavior; typical metals and alloys, plastics and rubber, and ceramic materials; equilibrium phase diagrams, and manipulation of properties and behavior by adjustment of composition and processing variables, heat treatment; responses of engineering materials to stress and environmental variables; plastic deformation and mechanical properties.

Prerequisites: IE121

IE224: Materials and Mechanics Lab   **1 Cr (0,3)**

Studying the properties of engineering materials and the relationship between these properties and atomic structure, cross-sectional sample preparation, optical microscopy, heat treatment, corrosion behavior, tensile and compression strength, hardness testing, impact testing, creep behavior, and fatigue behavior.

Prerequisites: IE223
Corequisite: TME213

IE261: Work Measurement and Standards   **3 Cr (2,3)**

Methods of work measurements and work analysis including the development of operations charts, workstation design, line balancing, measuring labor performance, motion and time studies, work sampling, and developing time standards.

Prerequisites: IE211

IE312: Quality Control   **3 Cr (3,0)**

Quality improvement in the modern business environment, cost of quality, statistical process control, process capability analysis, engineering process control, and acceptance sampling.

Prerequisites: IE212

IE325: Manufacturing Processes   **4 Cr (3,3)**

Introduction to the mechanical behavior of materials, typical stress-strain diagrams and yield criteria. Traditional manufacturing processing of materials, including bulk deformation processes (i.e., rolling, forging, extrusion and drawing), sheet metal forming as well as selected topics in joining processes and metal-cutting processes.

Prerequisites: IE121, TME213

IE326: Elements of Machine Design   3 Cr (3,0)

Design of various mechanical elements including fasteners, springs, bearings, gears, clutches, and shafts. Stress analysis and failure under steady and variable loading.

Prerequisites: TME213

IE3315: Operations Research   4 Cr (3,3)

Linear programming formulation, optimization using simplex, duality and sensitivity analysis. Transportation models, networks models, Integer programming, Markov chains, Game Theory, and Introduction to nonlinear programming and heuristics.

Prerequisites: MATH203

IE332: Production Planning and Inventory Control   3 Cr (3,0)

Forecasting, supply chain, capacity planning, aggregate planning, inventory control models, master production scheduling, Material Requirement Planning (MRP), production scheduling, introduction to lean systems.

Prerequisites: IE3315

IE371: Engineering Economics   3 Cr (3,0)

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

Prerequisites: MATH205

IE381: Simulation   3 Cr (2,3)

Basic concepts of discrete-event simulation modeling. Simulation languages, input data analysis, selecting the input probability distribution and goodness-of-fit tests. Generating random variables. Modeling and analysis applications using simulation software such ARENA, AutoMod, and ProModel. Output analysis for terminating and steady state simulations. Model verification and validation.

Prerequisites: IE212

IE382: Engineering Marketing   3 Cr (3,0)

Market response models, sector decisions and direction, location decisions, strategic decisions based on market analysis, new product decisions, pricing and marketing decisions.

Prerequisites: IE212

ME391: Field Training   0 Cr (0,0)

160 hours of training at a company in Jordan.

Prerequisites: Dept. Approval

ME491: International Internship   12 Cr (0,0)

Twenty-weeks of internship at a company in Germany.

Prerequisites: ME391

IE541: Industrial Automation   4 Cr (3,3)

The course is articulated in two main parts. The first explains concepts, features, elements, design and analysis of production systems and introduces significant performance indexes and quantitative models applied to manufacturing systems. Topics include single station manufacturing cells; manual assembly systems; automated production lines; automated assembly systems; cellular manufacturing; flexible manufacturing systems, and automated material handling and storage systems.

The second part instructs on concepts, features, elements, and applications of automation and control technologies. Topics include sensors, actuators, electro-mechanical control systems, pneumatic and electro-pneumatic systems, programmable logic control, robotic systems, and computer numerical control. Laboratory exercises focus on a practical introduction to various automation technologies.

Prerequisites: ME343

IE562: Ergonomics   **3 Cr (2,3)**

Human anthropometrics measurements, design of man-machine system, models of human performance under physical and mental work are covered. Work environment design. Accidents and hazards recognition and elimination.

Prerequisites: IE261

IE571: Cost Accounting   **3 Cr (3,0)**

Financial statements, traditional costing, activity-based costing, differential financial analysis for decision making, profit-volume-cost analysis. Fundamental pricing issues: price setting, accounting models and methods, objectives, strategies, tactics and product cost.

Prerequisites: IE371

IE582: Facilities Layout   **3 Cr (3,0)**

Strategic facilities planning, location selection. Product, process and schedule design. Flow, space and activity relationships, personnel requirements. Material handling. Layout, computer-aided layout. Warehouses.

Prerequisites: IE332

IE583: Supply Chain Management   **3 Cr (3,0)**

Supply chain basics, supply chain performance, basics of financial statement, supply chain drivers and metrics, designing distribution networks, demand forecasting in a supply chain, aggregate planning in a supply chain, planning and managing inventories in a supply, designing warehouses and material handling systems, designing and planning transportation networks, pricing and revenue management in a supply chain, introduction to Enterprise Resource Planning (ERP), business processes cycle, data structure for supply chain management, master data, and transaction data.

Prerequisites: IE332

IE512: Quality Management Systems   **3 Cr (3,0)**

Quality improvement philosophies, Total Quality Management (TQM) pillars, principles, and tools. ISO 9000 requirements and certification. Benchmarking, Quality Function Deployment (QFD), Six-Sigma, and national and international quality awards.

Prerequisites: IE212, IE312

IE513: Six Sigma   **3 Cr (3,0)**

The six sigma process improvement strategy of Define, Measure, Analyze, Improve, and Control (DMAIC). Integrates and deploys statistical methods and other six sigma problem solving via the DMAIC framework.

Prerequisites: IE212, IE312

IE514: Design of Experiment   **3 Cr (3,0)**

Application of analysis of variance and experimental design for engineering studies. Includes general design methodology, single-factor designs, randomized blocks, factorial designs, fractional replication, confounding, mixture design, response surface methods, and Taguchi methods.

Prerequisites: IE212

IE515: Quality Engineering   **3 Cr (3,0)**

An introduction to the modern practice of quality engineering concepts, systems, strategies, and tools to both manufacturing and service industries. Topics include advanced techniques related to statistical process control, international quality standards, quality data management, and automatic inspection.

Prerequisites: IE212, IE312

IE516: Forecasting and Advanced Regression   **3 Cr (3,0)**

A study of the forecasting methods, including smoothing techniques, time series analysis, Box-Jenkins, and ARIMA models. Advanced regression includes nonlinear regressions models and logistics regression.

Prerequisites: IE212, IE312

IE519: Special Topics in Statistics and Quality Management   **3 Cr (3,0)**

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

Prerequisites: Dept. Approval

IE523: Tool and Die Design and Manufacturing — 3 Cr (3,0)

Tools, jigs, and fixtures design. Classification of dies, principles of die design, main parameters to be considered in die design, sheet metal forming dies, forming dies. Materials manufacturing, heat treatment, and surface finish.

Prerequisites: IE325

IE524: Polymers Engineering — 3 Cr (3,0)

Polymeric materials; thermoplastics, thermosets, elastomers. Polymer structures, mechanical, chemical and physical properties. Polymer processing and characterization.

Prerequisites: IE223

IE525: Non-Traditional Manufacturing — 3 Cr (3,0)

Introduction to surface engineering and surface characterization. Differences between conventional and non-traditional machining. Electrical Discharge Machining (EDM), Chemical Machining (CM), Electrochemical Machining (ECM), Ultrasonic Machining (USM), Abrasive Jet Machining (AJM), and Laser-Beam Machining (LBM). Water-jet cutting. Rapid prototyping.

Prerequisites: IE325

IE529: Special Topics in Manufacturing and Engineering Materials — 3 Cr (3,0)

A course on a special topic in manufacturing and engineering materials.

Prerequisites: Dept. Approval

IE536: Optimization Theory — 3 Cr (3,0)

An extensive treatment of the theory and concepts of linear, nonlinear, constrained, and unconstrained optimization techniques.

Prerequisites: IE3315, BM371

IE538: Multi-Criteria Decision Making — 3 Cr (3,0)

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

Prerequisites: IE3315, BM371

IE5399: Special Topics in Optimization and Mathematics — 3 Cr (3,0)

A course on a special topic in optimization and mathematics.

Prerequisites: Dept. Approval

IE544: Integer Programming — 3 Cr (3,0)

Integer programming including cutting planes, branch and bound, and Lagrangian relaxation. Introduction to complexity issues and search-based heuristics.

Prerequisites: IE3315, BM371

IE545: Nonlinear Programming — 3 Cr (3,0)

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

Prerequisites: IE3315, BM371

IE546: Fuzzy Logic and Neural Networks 3 Cr (3,0)

Fuzzy set theory, membership functions, fuzzification, fuzzy decision making systems and types, fuzzy logic controllers. Methods and techniques of neural networks. Single-layer and multi-layer feed forward networks, Recurrent networks, Supervised and unsupervised learning. Neural network controllers. Adaptive neural fuzzy inference system (ANFIS). Use of software such as Matlab.

Prerequisites: BM371

IE547: Design of Industrial Information Systems 3 Cr (3,0)

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

Prerequisites: BM371

IE548: CAD/CAM/CIM Systems 3 Cr (3,0)

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

Prerequisites: IE325, IE332

IE549: Special Topics in Informatics 3 Cr (3,0)

A course on a special topic in informatics.

Prerequisites: Dept. Approval

IE563: Ergonomic Product Design and Evaluation 3 Cr (3,0)

Issues related to evaluation of existing products; objective and subjective assessment to reduce and prevent musculoskeletal disorders as well as improve performance and design.

Prerequisites: IE562

IE564: Occupational Biomechanics 3 Cr (3,0)

Key knowledge to reduce the risk of injury and increase worker productivity. Topics include: biomechanical, psychophysical, physiological, and integrated approaches to performing physical demands analyses, anatomy of low back injuries and upper limb disorders, principles of redesigning tasks to reduce the risk of injury, identification of injury risk factors, understanding injury mechanism, quantitative assessment of injury risk and intervention strategies to reduce the risk of injury. Students apply the course material to ergonomic assessments performed in industrial environments.

Prerequisites: IE562

IE565: Occupational Health and Safety 3 Cr (3,0)

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

Prerequisites: IE562

IE569: Special Topics in Ergonomics 3 Cr (3,0)

A course on a special topic in ergonomics.

Prerequisites: Dept. Approval

IE572: Micro and Macroeconomics 3 Cr (3,0)

This course introduces national income accounting, inflation and unemployment, competing theories of national income, fiscal policy, the reserve system and monetary policy, and international trade. Principle of resource allocation, supply and demand, consumer behavior, costs of production, the competitive model, and factor markets.

Prerequisites: IE371

IE573: Economics and Financial Modeling   **3 Cr (3,0)**

Numerical analysis for economic problems, projection approaches to ordinary and partial differential equations as well as topics in high-dimensional integration, perturbation and bifurcation techniques, solving for Nash equilibrium and competitive general equilibrium, solving portfolio problems, solving dynamic optimization problems, computing maximum likelihood and Generalized Method of Moments (GMM) estimates of structural models, and solving optimal incentive problems.

Prerequisites: IE371

IE574: Advanced Engineering Economics   **3 Cr (3,0)**

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

Prerequisites: IE371

IE575: Finance and Capital Investment   **3 Cr (3,0)**

Introduction to financial analysis, planning, and control. Study of basic investment markets, fundamental and technical analysis, and portfolio analysis. Principles of financial management, risk, return and the opportunity cost of capital, diversification, market versus unique risk, capital asset pricing model, efficient markets, common stock, corporate debt, patterns of corporate financing, derivative instruments.

Prerequisites: IE371

IE576: Risk Management   **3 Cr (3,0)**

Principles of risk management for individuals and organizations, identification of risks and associated potential costs, analysis of the causes of risk of financial loss, determination of various strategies to treat risk, financial aspects of insurance companies and markets, industry structure, managerial aspects of underwriting and pricing, and public policy issues.

Prerequisites: IE371

IE579: Special Topics in Economics and Finance   **3 Cr (3,0)**

A course on a special topic in economics and finance.

Prerequisites: Dept. Approval

IE585: Human Resource Management   **3 Cr (3,0)**

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

Prerequisites: IE371

IE586: Leadership   **3 Cr (3,0)**

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

Prerequisites: IE371

IE587: Product Development   **3 Cr (3,0)**

Introduction to engineering activities that takes place for new product. Product evaluation and testing, collaborative engineering activities in new product design, Marketing studies, customer surveys, quality and reliability of new design.

Prerequisites: IE332

IE588: Lean Manufacturing   **3 Cr (3,0)**

Introduces lean concepts as applied to the manufacturing environment. The course deals with the concepts of value, value stream, flow, pull, and perfection. Includes waste identification, value stream mapping, visual controls, and lean metrics.

Prerequisites: IE212, IE332

IE589: Special Topics in Operations Management and Managerial Sciences   **3 Cr (3,0)**

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

Prerequisites: Dept. Approval

VIII.   Description of Courses offered by other Departments

ME111: Computer Aided Engineering Drawing   **3 Cr (2,3)**

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

Prerequisites: CS116, CS1160

ME211: Statics and Dynamics   **3 Cr (3,0)**

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. Friction. Internal shear and bending moments in beams. Kinematics of particles, rectilinear and curvilinear motion. Kinetics of particles, application to space mechanics. Energy and momentum methods. Systems of particles. Kinematics and kinetics of rigid bodies; planar motion.

Prerequisites: PHYS103, MATH102

ME223: Thermofluids   **3 Cr (3,0)**

Properties of pure substances, energy transfer, first law of thermodynamics, second law of thermodynamics, basic concepts of fluid mechanics, Bernoulli and energy equation, momentum equation, flow in pipes, mechanisms of heat transfer.

Prerequisites: MATH205

ME323: Thermofluids Lab   **1 Cr (0,3)**

Measurement of thermal conductivity, forced convection heat transfer, measurement of specific heat ratio, flow through nozzles, losses in pipes and fittings, hydrostatic pressure, impact of water jet, flow visualizations, performance of hydraulic positive displacement pumps.

Prerequisites: ME223

ME346: Instrumentation and Measurements   **2 Cr (2,0)**

Introduction to instrumentation, units, dimensions and standards, error measurements, statistical analysis of experimental data, op-amp circuits in instrumentation, basic electrical measurement and sensing devices: physics of electric, magnetic, chemical sensors displacements, area, pressure, flow, temperature, thermal and transport properties, force, torque and strain measurements. Smart sensors and networking of sensor systems. Data acquisition and processing.

Prerequisites: ENE211, MATH205

ME347: Instrumentation and Measurements Lab   **1 Cr (0,3)**

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

Corequisite: ME346

ME343: Automatic Control Systems   **4 Cr (3,3)**

Modeling of electrical, pneumatic, hydraulic and mechanical systems, Transfer functions, block diagrams, and signal flow graph. Time domain analysis, test signals, transient response, steady state error and stability. Root locus, bode plots, PID control, phase-lead, phase lag. Software application such as Matlab and Simulink.

Practical experience on several physical setups designed to teach the principles of automatic control systems, including systems modeling, controller simulation, as well as, sensors and actuators interface and control. Most of the setups are programmed using MATLAB and Simulink, where the students will develop and simulate numerical models and controllers, and test their behavior on the physical setup.

Prerequisites: MATH205, ME211, ENE211

ME534: Electrical Machines and Control   **3 Cr (3,0)**

Fundamentals of energy, single and three phase AC systems, power quality, magnetic circuits, transformers, single and three phase induction motors, power electronics, synchronous machines, DC machines, control drives and circuits, building electrical systems, and programmable logic controllers (PLCs).

Prerequisites: ENE211

ME535: Electrical Machines and Control Lab   **1 Cr (0,3)**

Single and three phase transformers (open and short tests), single and three phase induction motors (open and locked rotor tests), three phase synchronous motor and generator, DC motors and generators (shunt, series, separately excited connections), motor control using PLC.

Prerequisites: ME534

TME213: Mechanics of Materials   **3 Cr (3,0)**

Normal and shear stress and strain, deflection of axially loaded members, thermal stress, torsion of bars with circular sections, shear stress, angle of twist, power transmission, bending of beams, bending and shear stress, combined loadings, beam deflection, column buckling.

Prerequisites: ME211

IX. Description of Courses offered by other Schools

BM371: Numerical Methods for Engineers   **3 Cr (2,3)**

Fundamentals of error analysis, numerical solutions of linear and nonlinear equations, numerical solution of system of equations, curve fitting, numerical integration and differentiation, numerical solution of ordinary differential equations. Application of numerical methods using relevant software packages.

Prerequisites: CS116, MATH203, MATH205

CS116: Computing Fundamentals   **3 Cr (3,0)**

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

Prerequisites:-

CS1160: Computing Fundamentals Lab   1 Cr (0,3)

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

Corequisites: CS116

ENE211: Electrical Circuits I   3 Cr (3,0)

Circuit variables: current, voltages, power. Models. KCL and KVL. Two-terminal elements. Calculation of currents and voltages in simple circuits. Resistors. Sources. Capacitors. Inductors. Thevenin's and Norton's theorems. Maximum power transfer. Two-ports. Controlled sources. Op-amps. Graph theory. Set of independent voltages and currents. Nodal equations. Loop and mesh equations. RC, RL and RLC circuits. Differential equation solutions (homogeneous and non-homogeneous). Periodic steady state response: simple RC and RL circuits. Phasor's calculus. Solving circuits with phasors

Prerequisites: PHYS104

ENE213: Electrical Circuits Lab   1 Cr (0,3)

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

Prerequisites: ENE211

MATH099: Pre-Math   0 Cr (3,0)

Real numbers and their properties, solutions of equations and inequalities, functions, domain of functions, operations on functions, polynomials, zeros of polynomials, power, exponential, logistic, logarithmic, and trigonometric functions and their graphs, applications of trigonometry, analytic geometry: lines, circles and parabolas.

Prerequisites:-

MATH101: Calculus I   3 Cr (3,0)

Review of functions, functions, inverse functions, inverse trigonometric functions, the concept of limits, computation of limits, continuity, asymptotes, the derivative, computation of derivatives, the product and quotient rules, the chain rule, derivatives of trigonometric, inverse trigonometric, exponential, logarithmic, and hyperbolic functions. Applications of differentiation: increasing and decreasing functions, extrema of functions, graphs of functions, indeterminate forms and L'hopital rule. Antiderivatives, definite integrals, fundamental theorem of calculus, integration by substitutions, integration by parts, applications of integration: area between curves, arc length, volume and surface area of solids of revolution.

Prerequisites: MATH099

MATH102: Calculus II   3 Cr (3,0)

Review of integration, integration by trigonometric substitutions, integration using partial fractions, improper integrals. Vectors in 2 and 3 spaces, the inner and cross products of vectors. Polar coordinates, graphs and arc length of polar curves. Functions of several variables; domain, limits, and continuity. Partial derivatives, the chain rule, the gradient and directional derivatives, extrema of functions of several variables and lagrange multipliers. Double integrals, area of plane region and volumes of solids using double integrals, triple integrals, cylindrical and spherical coordinates, triple integrals using cylindrical and spherical coordinates.

Prerequisites: MATH101

MATH203: Applied Mathematics for Engineers 3 Cr (3,0)

Vector analysis in Cartesian coordinates. General curvilinear coordinates, vector calculus in general curvilinear coordinates with emphasis on spherical and cylindrical coordinates, transformations between different coordinate systems, vector differentiation. Matrices and linear equations; matrices and linear operators, determinants, eigenvalues and eigenvectors. Complex numbers and complex variables; representation of complex numbers, powers and roots of complex numbers, functions of a complex variable. Review of infinite series; infinite series of constant terms, convergence tests, power series and radius of convergence, Taylor, and Maclaurin series and Fourier series.

Prerequisites: MATH102

MATH205: Differential Equations 3 Cr (3,0)

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

Prerequisites: MATH102

PHYS103: Physics I 3 Cr (3,0)

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

Prerequisites:-

PHYS104: Physics II 3 Cr (3,0)

Electric fields. Gauss's law. Electric potential. Capacitance and dielectrics. Current and resistance. Direct current circuits. Magnetic fields. Sources of magnetic field. Faraday's law.

Prerequisites: PHYS103

PHYS106: General Physics Lab 1 Cr (0,1)

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

Prerequisites: PHYS103
Corequisites: PHYS104

MGT525: Project Management 3 Cr (3,0)

Introduction to project management (project definition, project life cycle), project initiation (project selection, project manager, project-organization relationship), project planning (project costing, task scheduling, resource allocation, risk management), and project execution (controlling, auditing, terminating).

Prerequisites: IE371

ARB099: Arabic 99 0 Cr (3,0)

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 (3,0)**

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

ENGL098: English I   **0 Cr (3,0)**

Students will focus on English at an elementary level concentrating on the receptive skills of reading and listening, and the productive skills of writing and speaking. These will include such things as independent clauses, verb tenses, model verbs, adverbs, short dialogues, reading simple material and answering short questions, writing short meaningful sentences, listening to short conversations.

Prerequisites:-

ENGL099: English II   **0 Cr (3,0)**

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: ENGL098

ENGL101: English III   **1 Cr (3,0)**

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 (3,0)**

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

ENGL201: English V   **2 Cr (3,0)**

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

ENGL202: English VI   **2 Cr (3,0)**

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: ENGL201

GERL101: German I   **3 Cr (9,0)**

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

Prerequisites:-

GERL102: German II   **3 Cr (9,0)**

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

Prerequisites: GERL101

GERL201: German III   **3 Cr (6,0)**

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

Prerequisites: GERL102

GERL202: German IV   **3 Cr (6,0)**

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

Prerequisites: GERL201

GERL301: German V   **3 Cr (9,0)**

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

Prerequisites: GERL202

IC101: Intercultural Communication   3 Cr (3,0)

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:-

MILS100: Military Science   3 Cr (3,0)

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 (3,0)

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 (3,0)

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:-

SFTS101: Soft Skills   3 Cr (3,0)

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:-