GAU, Faculty of Engineering

Course Unit Title	Introduction to Modelling and Optimization
Course Unit Code	ENG204
Type of Course Unit	Compulsory for all departments
Level of Course Unit	2nd year BSc
National Credits	3
Number of ECTS Credits Allocated	5
Theoretical (hour/week)	3
Practice (hour/week)	0
Laboratory (hour/week)	0
Year of Study	2
Semester when the course unit is delivered	4
Mode of Delivery	Face to face
Language of Instruction	English
Prerequisites	
Corequisites	
Recommended Optional Programme Components	Taking Fundamentals of Industrial Engineering is

Objectives of the Course:

- To teach the students the general problem solving approach, the concept of quantitative decision making in the analysis and solution of management and engineering problems encountered in production systems.

Learning Outcomes

When this course has been completed the student should be able to		Assess.
1	Explain clearly concepts for models, systems and optimization problems.	1
2	Formulate and analyze real-world problems in service and manufacturing systems.	1,3
3	Use linear programming in allocating scarce resources to competing activities in order to find optimal solutions.	1,3,6
4	Apply transportation and assignment techniques to help decision makers to find best solutions.	1,3
5	Manipulate optimization techniques in analyzing the results derived from mathematical models	3,6
6	Analyze and synthesis optimization methods and real systems to enhance the performance of real-world systems	1,3

Assessment Methods: 1. Written Exam, 2. Oral Exam, 3. Assignment, 4. Project/Report, 5. Presentation, 6. Lab Work

Course's Contribution to Program

		CL
1	Ability to understand and apply knowledge of mathematics, science, and engineering	3
2	Ability to design and conduct experiments as well as to analyze and interpret	3
3	Ability to work in multidisciplinary teams while exhibiting professional responsibility and ethical conduct	2
4	Ability to apply systems thinking in problem solving	3
5	Knowledge of contemporary issues while continuing to engage in lifelong learning	1
6	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	3
7	Ability to express their ideas and findings, in written and oral form	2
8	Ability to design and integrate systems, components or processes to meet desired needs within realistic constraints	3

9	Ability to approach engineering problems and effects of their possible solutions within a well structured, ethically responsible and professional manner	2

CL: Contribution Level (1: Low, 2: Medium, 3: High)

Course Contents

Week	Chapter	Subject	Exams
1		Introduction to Modelling and Optimization, Quantitative Decision Making	
2		Overview of Modelling Approach, Steps in Modelling	
3		Introduction to Linear Programming, Model Formulation	
4		Graphical Solution Method	
5		The Simplex Solution Method	
6		Linear Programming: Modelling Examples	
7		Adapting to Other Model Forms	
8			Midterm
9		Sensitivity Analysis	
10		The Transportation Problem	
11		North-west Cornel Rule, Vogel's Approximation Method, Russell's	
12		A Streamlined Simplex Method for the Transportation Problem	
13		The Assignment Problem	
14		Converting Assignment Problems into Transportation Problem and Solution	
15			Final

Recommended Sources

- Winston, W.L. (2004) Operations Research Applications and Algorithms. 4th Edition, Duxbury Press, Pacific Grove, CA.
- Hillier F. S., Lieberman G. J. 'Introduction to Operations Research ', 9e, McGraw-Hill, Inc., 2009
- Taylor. B. W., 'Introduction to Management Science', 10e, Prentice Hall, 2009.

Assessment

Midterm exam	25 %
Final exam	40 %
Attendance and E-learning	10 %
Quiz	15 %

ECTS Allocated Based on the Student Workload

Activities	Number	Duration (hour)	Total Workload (hour)
In-class lecture (including exam weeks)	15	3	45
E-learning Activities	5	1	5
Midterm Exam	1	12	12
Final exam	1	12	12
Quiz	1	6	6
Assignment	6	3	18
Project/presentation/report writing	0	0	0
Lab and tutorial	2	2	4
Self-study	14	3	42
Total Workload			144.00
Total Workload / 30 (h)			4.80

ECTS Credit of the Course	5