Kingdom of Saudi Arabia Ministry of Higher Education **Qassim University** College of Engineering		**المملكة العربية السعودية** وزارة التعليم العالي **جامعة القصيم** **كليه الهندسه**

Optimization of Communication Networks

College: Engineering

Department: Electrical

First: Course Definition

1- Course Code: 620

2- Units: 3

3 – Semester

4 -Prerequisite

5- Co-requisite

6- Location (if not on main Campus):

Second: Course Objectives

In this course we present the salient concepts associated with network flows and optimization. Emphasis is placed on algorithm development concepts and proofs of complexity. Problems and application provide a grounding context for the network flow algorithms. In addition, stress is placed on implementation issues and how they affect performance. Key network optimization concepts covered:

1.Shortest path algorithms
2.Maxflow algorithms
3.Mincost algorithms
4.Network transformations
5.Duality
6.Mathematical programs that can be viewed as network problems
7.Scheduling using network flow approaches.

Third: Course Specifications

1- Topics to be covered

Subject	No of Weeks	Units
Network Optimization motivation and historical background	2	6

Network terminology and graph theoretic background	**2**	**6**
Data structures for network representation	**2**	**6**
Shortest path algorithms	**3**	**9**
Max Flow Algorithms	**3**	**9**
Min Cost Algorithms	**3**	**9**

2- Course components (Total hrs in the Semester)

Lecture	lab	Other
30	**30**	

3- Intended Learning Outcomes of the Course (ILO's)

a. *Knowledge*

i) Description of the knowledge to be acquired:

The fundamental of networks and graph theory are covered with emphasis on optimization problems of interest to decision support type problems.

a1- Understanding the relationship between classical network optimization problems and linear programming

a2- Appreciating how understating the structure of the problem can be exploited to realize more efficient algorithms

a3- Understanding the data structure and implementation issues associated with the main network optimization algorithms.

ii) Teaching strategies to be used to develop that knowledge

Lectures & Seminars
Tutorials
Computer-lab Sessions
Reading Materials
Independent Work

iii) Methods of assessment of knowledge acquired

Exams
Open book Exam
Quizzes
Course Work

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

- The course should hone the students analytical abilities to make well reasoned proofs about algorithms and to realize how a given optimization problem can have multiple facets.

b1- Identifying a network problem even though it is not originally cast as such

b2- Detecting flaws and weakness in proofs

b3- Reasoning about why one approach is better than the other for a given problem

ii) Teaching strategies to be used to develop these cognitive skills

Computer-lab Sessions
Practical lab work
Web-site Searches
Independent Work
Group Work
Case Studies

iii) Methods of assessment of students' cognitive skills

Open book Exam
Take home Exam
Case Study Analysis
Group Project
Individual Project

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- On completing this course, the student should be able to apply

c2- Different spatial filters for image enhancement.

c3- Different filters in frequency domain.

c4- Different segmentation and classification techniques

c5- Morphological operations on grey level images.

ii) Teaching strategies to be used to develop these skills

Practical lab work
Web-site Searches
Independent Work
Group Work
Case Studies
Presentations

iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

Case Study Analysis
Oral Presentations
Practical
Group Project

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- The course involves a significant amount of programming and modeling challenges, the skills gained may be applied in other contexts.
d1- Java programming
d2- Report writing

ii) Teaching strategies to be used to develop these skills

Case Studies
Presentations

iii) Methods of assessment of students numerical and communication skills

Report Writing
Case Study Analysis
Oral Presentations
Individual Project

e. Psychomotor (if applicable) & Other Non-cognitive Skills

i) Description of the psychomotor or other skills to be developed and the level of performance required

ii) Teaching strategies to be used to develop these skills-

iii) Methods of assessment of student's psychomotor skills

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4- Student Assessment Schedule

Serial	*Assessment tool (test, group project, examination etc.)*	*Week due*	*Weight*
1			
2			

3			
4			

5- Student Support

6- Learning Resources

i) Essential Books (References)

Ahuja, Magnanti, and Orlin. Network Flows: Theory, Algorithms and Applications. Prentice-Hall 1993.

ii) Course Notes

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iii) Recommended Books

- **D. P. Bertsekas, Network Optimization: Continuous and Discrete Models. Athena Scientific, 1998.-**

iv) Electronic Books & Web Sites:

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v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

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ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

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iii) Processes for Improvement of Teaching

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iv) Processes for verifying standards of student achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

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v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

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