ATTACHMENT

Course Specifications

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

Course Specifications
(CS)

Introduction to Mathematical Programming, MATH456

1436/1437H

Course Specifications

Institution: King Saud University	Date of Report: 7/05/1437H
College/Department: College of Sciences / Department of Mathematics	

A. Course Identification and General Information

1. Course title and code:
Introduction to Mathematical Programming, MATH456

2. Credit hours: 3 (2+1+0)

3. Program(s) in which the course is offered.

(If general elective available in many programs indicate this rather than list programs):

- Bachelor of Science in Mathematics

4. Name of faculty member responsible for the course:
Dr. Nejmeddine Chorfi and any teaching staff in the Department of Mathematics in the specialty of linear programing or computational mathematics.

5. Level/year at which this course is offered: 5th level / 3rd year

6. Pre-requisites for this course (if any):
Linear Algebra, MATH246

7. Co-requisites for this course (if any):
None

8. Location if not on main campus:
Main campus

9. Mode of Instruction (mark all that apply)

a. Traditional classroom	X	What percentage?	90%
b. Blended (traditional and online)		What percentage?	
c. e-learning	X	What percentage?	10%
d. Correspondence		What percentage?	
f. Other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce: 1. Mathematical modeling for optimization problems 2. Writing algorithms for solving optimization problems 3. Applying Algorithms for many linear programming applications
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) 1. Encourage students to read certain books about the topics of the course 2. Encourage students to use internet to look for related websites, computer software, and references. 3- Train students to write and implement computer algorithms for solving certain mathematical models

C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

1 Topics to be Covered (**see reference books**)

List of Topics	No of Weeks	Contact hours
Modeling of real life optimization problems	1	2
Convex sets & polyhedral approach and geometrical approach	2	4
Exchange method & the structure of matrices	2	4
Simplex method & variants (2 phase; revised, degeneracy Bland rule etc)	3	6
Duality theory and application	3	6
Transportation Problem	2	4
Networks & Flow problems	2	4

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	30	30	0	0	0	60
Credit	2	1	0	0	0	3

3. Additional private study/learning hours expected for students per week.	6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

Course Learning Outcomes, Assessment Methods, and Teaching Strategy work together and are aligned. They are joined together as one, coherent, unity that collectively articulate a consistent agreement between student learning, assessment, and teaching.

The ***National Qualification Framework*** provides five learning domains. Course learning outcomes are required. Normally a course has should not exceed eight learning outcomes which align with one or more of the five learning domains. Some courses have one or more program learning outcomes integrated into the course learning outcomes to demonstrate program learning outcome alignment. The program learning outcome matrix map identifies which program learning outcomes are incorporated into specific courses.

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. **Fourth**, if any program learning outcomes are included in the course learning outcomes, place the @ symbol next to it.

Every course is not required to include learning outcomes from each domain.

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge** By completing this course, the student is expected to be able to:		
1.1	Define a mathematical model	• At the beginning of studying each topic some examples will be laid out and discussed with the students encouraging them to discover the relevant concepts. • At the beginning of each lecture a discussion is conducted with the students about what have been done in the previous lecture in order to establish a link with the current lecture.	• Hold Class discussion and quizzes. • Homework assignments • Mid-term exams and final exam.
1.2	Define an optimization problem.		
1.3	Explain sensitivity analysis		
1.4	Recall the duality theory		
2.0	**Cognitive Skills** By completing this course, the student is expected to be able to:		
2.1	Be able to model optimization problems	• Discuss the students during lectures. • Give extensive examples during lectures. • Give homework assignments. • Give problem sheets to be discussed during tutorial sessions.	• Have discussions during lectures and tutorial sessions. • Discuss the students' homework assignments. • Give quizzes, mid-term exams and final exam.
2.2	Solve a linear optimization problems geometrically		
2.3	Solve a linear optimization problems algebraically		
2.4	Apply the duality theory		
2.5	Use the sensitivity analysis		
2.6	write and run computer algorithms to solve some problems using computers		
2.7	Apply linear programming methods in solving some mathematical models appearing frequently in the daily life situations		
3.0	**Interpersonal Skills & Responsibility** After studying this course, the student is expected to be able to:		
3.1	Study, learn and work independently.	Encourage students to: • Participate in class discussion. • Participate in college and university activities. • Be members of department	• Instructor's assessment of student's • Performance through discussions during lectures. • Follow up the homework assignments.
3.2	Work effectively in teams.		
3.3	Meet deadlines and manage time properly.		
3.4	Exhibit ethical behaviour and respect different points of view.		

		committees and college committees. • Use of available information technology.	
4.0	**Communication, Information Technology, Numerical** After studying this course, the student is expected to be able to:		
4.1	Present mathematics to others, both in oral and written form clearly and in a well-organized manner.	Encourage students to: • Give short presentations. • Participate in competitions. • Be members of department committees and college committees. • Use department and college computing facilities. • Use e-mail, internet, college and department websites, and central library.	Follow up the homework assignments and discuss it with students.
4.2	Use IT facilities as an aid to mathematical processes and for acquiring available information		
4.3	Write algorithms and solve some mathematical problems numerically		
5.0	**Psychomotor**		
	Not applicable		

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize

Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	First midterm	6	20%
2	Computer assignments	Monthly	6%
3	Quizzes	Monthly	4%
4	Second midterm	12	20%
5	Final examination	16	50%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

• 10 scheduled office hours per week • 5 hours weekly for academic advice through the academic guidance unit in the department.

E. Learning Resources

1. List Required Textbooks Introduction to Linear programming, by Ibraheem Al Olian, Publications of King Saud University
2. List Essential References Materials (Journals, Reports, etc.) Introduction to Linear programming, by Ibraheem Al Olian, Publications of King Saud University
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) Any available text book on linear programming
4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.) • Electronic materials available on internet • Web sites relevant to the course.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. In order to do the computer assignments one of the following computer software must be available for the student: - Maple - Mathematica - MATLAB

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
• Classroom to accommodate 25 students equipped with usual blackboard or smart board. • Computer laboratory equipped with hardware and software. • Available texts and references in the main library and the bookshop center

2. Computing resources (AV, data show, Smart Board, software, etc.) • Computers lab connected to internet and equipped with required software. • Printers.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation by the students at the end of the semester
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor • Discussing the teaching methods by the group of faculty members teaching the course at the beginning of each semester. • Analyzing the course evaluation conducted by students at the end of the semester • Observations of the group of faculty teaching the course.
3 Processes for Improvement of Teaching • Attending workshops on teaching and learning methods conducted by the deanship of skills development. • Discussing the teaching methods by the group of faculty members teaching the course at the beginning of each semester.
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) Discussing the teaching methods by the group of faculty members teaching the course at the beginning of each semester.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Reviewing the course contents every five years • Updating the text book and references.

Faculty or Teaching Staff: Dr. Nejmeddine Chorfi _____

Signature: _____ **Date Report Completed:** _____

Received by: _____ **Dean/Department Head**

Signature: _____ **Date:** _____