

Course Specifications

| | |
|----------------------|-------------------------------|
| Course Title: | Linear Programming |
| Course Code: | 4044201-3 |
| Program: | Mathematics |
| Department: | Mathematical Science |
| College: | Applied Science |
| Institution: | Umm Al-Qura University |

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A. Course Identification

| | | | |
|--|--|-----------------------------------|--|
| 1. Credit hours: 3 | | | |
| 2. Course type | | | |
| a. | University <input type="checkbox"/> | College <input type="checkbox"/> | Department <input checked="" type="checkbox"/> |
| b. | Required <input checked="" type="checkbox"/> | Elective <input type="checkbox"/> | Others <input type="checkbox"/> |
| 3. Level/year at which this course is offered: The Fifth level | | | |
| 4. Pre-requisites for this course (if any): Linear Algebra (1) 4042402-4 | | | |
| 5. Co-requisites for this course (if any): | | | |

6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1 | Traditional classroom | ✓ | 100% |
| 2 | Blended | | |
| 3 | E-learning | | |
| 4 | Correspondence | | |
| 5 | Other | | |

7. Actual Learning Hours (based on academic semester)

| No | Activity | Learning Hours |
|------------------------------|---------------------------------|----------------|
| Contact Hours | | |
| 1 | Lecture | 45 |
| 2 | Laboratory/Studio | - |
| 3 | Tutorial | - |
| 4 | Others (Exams & Quizzes) | 8 |
| | Total | 53 |
| Other Learning Hours* | | |
| 1 | Study | 70 |
| 2 | Assignments | 20 |
| 3 | Library | - |
| 4 | Projects/Research Essays/Theses | - |
| 5 | Others (Exams & Quizzes) | 20 |
| | Total | 110 |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

| |
|--|
| 1. Course Description |
| 2. Course Main Objective Gain experience in modeling, solving and analyzing problems using linear programming. Recognize different methods for solving linear programming problems (LPP). Reveal the fundamental concepts and theories related to linear programming problems. |

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|------|--|--------------|
| 1 | Knowledge: | |
| 1.1 | Recognize how to model the real problem in the form of linear programming problems. | 1 |
| 1.2 | Describe the problem and solve it graphically. | 2 |
| 1.3 | Identify different terminology, concepts and theories of linear programming problems. | 3 |
| 1.4 | Recognize different methods and their related definition and theories for solving linear programming problems. | |
| 2 | Skills : | |
| 2.1 | Modeling real situations in the form of linear programming problems | 1 |
| 2.2 | Analyzing real problems and solve them graphically. | 2,3 |
| 2.3 | Utilizing appropriate method to solve a given linear programming problems. | 2, 3 |
| 2.4 | Develop connections within branches of Operation research and between linear programming and other disciplines | 4 |
| 2.5 | Solve problems using a range of formats and approaches in basic science | |
| 2.6 | show the ability to work independently and within groups. | |
| 2.7 | Develop connections within branches of Operation research and between linear programming and other disciplines | |
| 3 | Competence: | |
| 3.1 | Apply scientific models and tools effectively. | |
| 3.2 | Use the internet to write reports about basic linear programming principles. | |
| 3.3 | Apply knowledge gained during the course using computer applications | |
| 3.4 | Work both independently and in a coordination role with multiple groups. | |
| 3.5 | Express a personal view in the context of an understanding of solving problems knowledge | |

C. Course Content

| No | List of Topics | Contact Hours |
|--------------|--|---------------|
| 1 | Introduction to operations research and linear programming problem (LPP) | 3 |
| 2 | Convex sets, Convex function, vertex points, and optimization theory | 3 |
| 3 | Graphical method for solving LPP | 3 |
| 4 | Simplex methods, | 6 |
| 5 | Special cases of simplex method Duality Problem, sensitivity analysis | 9 |
| 6 | Special cases of simplex method Two Phase Method | 6 |
| 7 | applications of the linear programming problem (Transportation problems, Game Theory, Network) | 6 |
| 8 | Use software application to solve LPP | 6 |
| 9 | Revision | 3 |
| Total | | 45 |

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| CLOs | | Teaching Strategies | Assessment Methods |
|----------|--|---|--|
| 1 | Knowledge: | | |
| 1.1 | Recognize how to model the real problem in the form of linear programming problems. | Lectures Discussion Problem Solving | Exams Assignments Quizzes |
| 1.2 | Describe the problem and solve it graphically. | | |
| 1.3 | Identify different terminology, concepts and theories of linear programming problems. | | |
| 1.4 | Recognize different methods and their related definition and theories for solving linear programming problems. | | |
| 2 | Skills : | | |
| 2.1 | Modeling real situations in the form of linear programming problems | Lectures Discussion Problem Solving Brain Storming | Assignments. Reports. Quizzes. Discussion |
| 2.2 | Analyzing real problems and solve them graphically. | | |
| 2.3 | Utilizing appropriate method to solve a given linear programming problems. | | |
| 2.4 | Develop connections within branches of Operation research and between linear programming and other disciplines | | |
| 2.5 | Solve problems using a range of formats and approaches in basic science | | |
| 2.6 | show the ability to work independently and within groups. | | |
| 2.7 | Develop connections within branches of Operation research and between linear programming and other disciplines | | |
| 3 | Competence: | | |
| 3.1 | Show the ability to identify and use appropriate statistical models. | Lectures Brain storming Tasks to measure students' Personal skills. | Assignments. Reports. Discussion |
| 3.2 | The student should illustrate the ability to work independently and within groups. | | |
| 3.3 | Illustrate how to use the internet and using software programs to deal with problems and to write reports about mathematical statistics. | | |
| 3.4 | Apply statistical knowledge gained during the course using computer packages | | |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|------------------------------|-----------------------|--------------------------------------|
| 1 | Midterm 1 | 6 th week | 20 % |
| 2 | Midterm 2 | 12 th week | 20% |
| 3 | Homework + reports + Quizzes | During the semester | 10% |
| 4 | Final exam | End of semester | 50 % |

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- 1- There are student advisor committee for the students,
- 2- The office hours for the teaching staff is depicted on their office.

F. Learning Resources and Facilities

1.Learning Resources

| | |
|---------------------------------------|---|
| Required Textbooks | H.A.Taha, Introduction Operations Research 6th edition, London, Macmillan Publishing Company, Inc. V. Chvatal: Linear Programming, San Francisco: McGraw-Hill, W.H. Freeman and Company, |
| Essential References Materials | G. Hadley, linear programming, Addison-Wesley, 1969 P.K.Gupta and D.S.Hira, Problems in Operations research, Ram Nagar, 1998. Michel Sakarovitch, Linear Programming, Springer-Verlag, 1983 Gerald Brickman, Mathematical Introduction to Linear Programming, Springer Verlag, New York, 1989. |
| Electronic Materials | http://www.freetechbooks.com http://tutorial.math.lamar.edu/sitemap.aspx |
| Other Learning Materials | http://www.freetechbooks.com http://tutorial.math.lamar.edu/sitemap.aspx http://mathforum.org/advanced/numerical.htm/ |

2. Facilities Required

| Item | Resources |
|--|---|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | -Classroom with capacity of 30-students. - Library |
| Technology Resources (AV, data show, Smart Board, software, etc.) | all classrooms are equipped by data show |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Effectiveness of teaching and assessment | deanship of registration and acceptance | Student feedback through electronic survey |
| Quality of learning resources | Program Leaders | Student feedback through electronic survey |
| Evaluation of the teachers by internal & external faculty members | Program Leaders | Course Reports, evaluation of random grading report |
| Program Quality | Peer Reviewer | Peer evaluation and feedback |
| | | |
| | | |
| | | |

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, , etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

| | |
|---------------------|--|
| Council / Committee | |
| Reference No. | |
| Date | |