

## إقرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

واقع تدريس بحوث العمليات في جامعات قطاع غزة من وجهة نظر مدرسيها

# Status of operations research education at Gaza strip universities "Teachers' viewpoint"

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه  
حيثما ورد، وإن هذه الرسالة ككل أو أي جزء منها لم يقدم من قبل لنيل درجة أو لقب علمي أو  
بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

### DECLARATION

The work provided in this thesis, unless otherwise referenced, is the  
researcher's own work, and has not been submitted elsewhere for any  
other degree or qualification

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**Status of operations research education at  
Gaza strip universities  
"Teachers' viewpoint"**

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## نتيجة الحكم على أطروحة ماجستير

بناءً على موافقة شئون البحث العلمي والدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحث/ محمد عبدالحليم محمد العطل لنيل درجة الماجستير في كلية التجارة/ قسم إدارة الأعمال وموضوعها:

واقع تدريس بحوث العمليات في جامعات قطاع غزة من وجهة نظر مدرسيها

"Status of Operations Research Education at Gaza Strip Universities "Teachers' Viewpoint

وبعد المناقشة التي تمت اليوم السبت 04 جمادى الأولى 1337 هـ، الموافق 2016/02/13م الساعة الثانية مساءً، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في كلية التجارة/ قسم إدارة الأعمال.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ونزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق ،،،

نائب الرئيس لشئون البحث العلمي والدراسات العليا

أ.د. عبدالرؤوف علي المناعمة



## DEDICATION

*I dedicate this research to my family, especially...*

*To my dear father and mother . . .*

*With love and appreciation*

*To my beloved wife ...*

*Whom without her I could not finish this work*

*To the future of Palestine . . .*

*My son's. . .*

*Abdullah & faten*

*To my wonderful brothers and sisters ...*

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## **Abstract**

The research aimed to investigate current status of operations research (OR) education at Gaza strip universities. In terms of the position of the course, title, objectives, contents, teaching methods, text books used assessment methods, and pre requisites.

The research used the descriptive analytical method and utilized both primary and secondary sources of data. The population of the research included all academics who teach OR at the 11th universities in Gaza, they counted 37 of them. A questionnaire was designed for this purpose, including a comprehensive survey.

The findings showed that the status of operations research education at Gaza strip universities is acceptable for teachers of this course. Despite finding some obstacles accommodated with the variables of the research.

The research recommends that a further work should be done taking the viewpoint of the students, to complete the picture of this research.

## Abstract in Arabic

عمدت الدراسة لاستكشاف واقع تدريس بحوث العمليات في جامعات قطاع غزة من وجهة نظر مدرسيها، من حيث نوع المساق، أهداف المساق، محتويات المساق، طرق التدريس، طرق التقييم، الكتب المستعملة، والمتطلبات السابقة. بالإضافة إلى الصعوبات التي تواجه تدريس هذا المساق.

استخدمت الدراسة المنهج الوصفي التحليلي، واعتمدت على عدد من المصادر الأولية والثانوية في جمع المعلومات؛ حيث مثلت المصادر الأولية في استبانة صممت خصيصا لهذه الدراسة. ويشمل مجتمع الدراسة كل جامعات قطاع غزة التي تدرس بحوث العمليات وعددها احدى عشرة جامعة، تضم سبع وثلاثون مدرسا لهذا المساق. وقد تم أخذ آراءهم جميعا من خلال استبانة أعدت لهذا الغرض.

نتائج الدراسة أوجدت أن مدرسي مادة بحوث العمليات راضون بالمجمل على واقع تدريس المادة في قطاع غزة، رغم اكتشاف بعض المعوقات المتعلقة بالمتغيرات الخاصة بالمادة.

توصي الدراسة باستكمال البحث في الموضوع من خلال الأخذ بوجهة نظر طلاب المساق في المستقبل؛ لرسم الصورة كاملة بشكل أوضح.

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# **Chapter one**

## **Introduction**

**This chapter consists of the following sections:**

**1.1 Background**

**1.2 Problem Statement**

**1.3 Research Objectives**

**1.4 Research Variables**

**1.5 Research Importance**

**1.6 Research Methodology**

**1.7 Previous studies**

## 1.1 Background

University is considered to be the root of knowledge for specialized students of different specialties and faculties before starting their practical life, and this applies to operations research (Gunawardane, 1991).

This fact truly runs on operations research (OR), due to the specialized nature of the subject that can't be taught to any student, as it needs students whom they have reasonable mental capabilities to deal with this course and its requirements(Čibej, 2002).

One of the most distinguishing factors of universities among each other is the distinction of their teachers working on teaching different courses, and one of them is OR.

Several factors may help teachers illustrate OR better, these factors will be the independent variables of the research which are the course position, course contents, course objectives, teaching methods, text book used, assessment method, and prerequisite.

Therefore, the opinion of OR teacher about the status of teaching OR in Gaza Strip universities is very important to identify the status of this course currently.

In addition to be a starting point to progress and advancement to activate OR in practical life, in a way that makes it a style of life and work for people who really need it in their business.

OR is thought to be among the hardest courses for students despite being one of the most subjects that influence the prosperity, revival, and development of nations(Yousef, 2009).

To adopt this science and make it practical in daily life, it is necessary at the beginning to refer to the root of knowledge of OR which is OR course in universities.

Therefore, investigating the status of OR teaching in universities, may form a starting point that will help in identifying the main obstacles; preventing the implementation of OR in the walks of practical life on the ground.

In other hand, Gaza strip is considered a third world region, were OR is usually a required course for certain majors, and the nature of these courses is usually to produce generalists, not specialists (Čibej, 2002).

Looking to OR from the angle of being a solution for the dilemma of the seize Gaza strip suffers from, in addition to the competition of foreigner products being imported from other countries.

Such situation needs an adequate business process management in the companies, which would help utilizing the scarce resources available, increase effectiveness, reduce cost, support critical managerial decisions, and even achieving business growth.

Further to the above, there is a need for trained OR personnel to handle problems arising from managing industrial and service establishments in a changing and complex business environment.

## **1.2 Problem statement**

In third world countries little attention has been paid to OR education and few universities in developing countries offer degrees in OR. This might be due in part to the belief that OR is not applicable in these countries, or to lack of awareness of its importance as problem-solving and decision-making tools(Čibej, 2002). The situation is the same in Gaza strip which is in urgent need for such tools to help the strip overcome its economic problems by the best use of its limited resources.

There is a need for trained OR personnel to handle problems arising from managing industrial and service establishments in a changing and complex business environment(Alsayed, 2009). Education is the main source of trained OR personnel, therefore, it is worthwhile investigating the current status of OR education in the Gaza strip.

The purpose of this research is to investigate current status of OR education at Gaza strip universities in terms of answering what are the main obstacles facing OR teaching in universities accommodated with the position of OR course in the curriculum, the title assigned to this course, its objectives, contents, teaching methods, text-books used, assessment methods, and pre-requisites?

### **1.3 Research objectives:**

The aims of this research are:

- a) Investigating current status of operations research education in Gaza strip.
- b) Identifying obstacles facing OR teaching in Gaza strip universities.

### **1.4 Research Variables:**

#### **1.4.1 Dependent variable:**

The status of OR education in Gaza strip universities.

#### **1.4.2 Independent variables:**

- 1- OR course position in the research plan (mandatory or elective).
- 2- Course objectives.
- 3- Course contents.
- 4- Teaching methods.
- 5- Text book (Ranking, publisher).
- 6- Assessment method (Course projects, case studies, exams, etc.).
- 7- Prerequisite.

### **1.5 Research Importance:**

As known Gaza strip suffers from a hard siege for many years. In light of this, a science that deals with the usage of limited resources in the best manner such as OR might help.

In order to focus more on this science, the research will give a description of OR teaching for the first time in Gaza strip universities. This will help in graduating skilled students, who can tackle real world problems.

## **1.6 Research Methodology:**

### Purpose

The purpose of this research is to research the current status of operations research education in Gaza strip universities.

### Paradigm

This research will frame the status of OR education in Gaza strip universities, and will be a base for forward researches that might try to improve OR teaching, moreover it will make it easier for upcoming researchers to investigate possibilities of improvement in this field depending on the conclusions and recommendations of this research.

### Population

The population of the research will be all the 11 universities in Gaza strip that teaches OR in their faculties either engineering or commerce, including the 37 teachers of OR those who teach this course in these universities.

### Data collection

The data collection depended basically on two sources:

- a) Secondary source which will be the books, references, researches, journals, statistics, web sites and recent studies that deal with the topic of this research.
- b) Primary source which is not available in the secondary source through distributing questionnaires on the research population in order to get their opinions about "Status of operations research education at Gaza strip universities".

### Analysis

To meet the exploratory nature of the research. A descriptive survey approach is being used to analyze the data collected. As this methodology studies the phenomena as it is in real life and describes it precisely either qualitatively or quantitatively, which meets the nature and goal of the research.

### Research questions

The research will answer nine questions thought to be some major variables that would influence the teaching of OR.

1. Is the current status of OR teaching in Gaza Strip universities acceptable for teachers?

2. Is there an obstacle facing OR teaching in universities accommodated with OR position?
3. Is there an obstacle facing OR teaching in universities accommodated with course objectives?
4. Is there an obstacle facing OR teaching in universities accommodated with course content?
5. Is there an obstacle facing OR teaching in universities accommodated with teaching methods?
6. Is there an obstacle facing OR teaching in universities accommodated with assessment methods?
7. Is there an obstacle facing OR teaching in universities accommodated with text book used?
8. Is there an obstacle facing OR teaching in universities accommodated with prerequisites?
9. Is there a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to the academic position, experience, age, profession?

## 1.7 Previous studies:

After reading studies written in the field of education of OR and how researchers tried to deal with this case, it was found that these researches could be divided between researches that try to investigate obstacles facing OR teaching, and other trying to remedy these obstacles, so in light of this, the researcher will try to classify the recent studies into two categories, firstly is the researches linked to obstacles, secondly the researches trying to solve the problems facing OR teaching.

### **First:** researches linked to obstacles

#### **1.7.1** (Pillay, 2014) *“A review of hyper-heuristics for educational timetabling”*

This research studied the effect of adequate timetabling of examination and the course on the teaching of OR and thought to as an obstacle if timetables weren't arranged adequately.

Educational timetabling problems, namely, university examination timetabling, university course timetabling and school timetabling, are combinatorial optimization problems requiring the allocation of resources so as to satisfy a specified set of constraints. Hyper-heuristics have been successfully applied to a variety of combinatorial optimization problems. This is a rapidly growing field which aims at providing generalized solutions to combinatorial optimization problems by exploring a heuristic space instead of a solution space. From the research conducted thus far it is

evident that hyper-heuristics are effective at solving educational timetabling problems and have the potential of advancing this field by providing a generalized solution to educational timetabling as a whole. Given this, the research provides an overview and critical analysis of hyper-heuristics for educational timetabling and purposes future research directions, focusing on using hyper-heuristic to provide a generalized solution to educational timetabling.

**1.7.2** (Cochran, 2012) *“You want them to remember? Then make it memorable! Means for enhancing operations research education”*

This research stated that not only poor teaching of OR makes it hard for people to understand it but also making OR boring is also another reason for making people afraid of it, so it was suggested to enhance operation research education by making it memorable through using some tricks.

Most of the points in this research focus mainly on making communications between an OR professional (academic or practitioner) and a student, client, subordinate, supervisor, or colleague more effective, these communications share a common objective that is facilitating learning.

**1.7.3**(Yousef, 2009) *“Current status of operations research/management science education at the United Arab Emirates business schools”*

The research stated that most people think that it is hard to apply OR in practical problems in real life, this thinking comes from misunderstanding and little knowledge about OR even from people who studied some courses about OR, this misunderstanding could be due to poor education of OR especially in the third world.

The research tried to describe the fact of OR teaching in the United Arab Emirates, by researching different aspects of the OR course, which in the opinion of the research will benefit both the developers of the courses and the instructors themselves.

For courses’ developers, they will be aware of current status of OR education and this in turn might enable them make better decisions. For instructors, they will learn from the experiences of each other and this, of course, will enhance their ability to deliver the course in much more effective manner.

**1.7.4** (Darby, 2006) *“The Effects Of The Elective Or Required Status Of Courses On Student Evaluations”*

This research discussed the level of concern that students give to a course, by examining the impact on a course evaluation of the course being either an elective or a required part of a training program. Three elective and three required courses were evaluated using both a scaled and an open ended response form. Many variables were taken into account when examining the effect of course status, which other researchers

have tended to neglect. These included the type of training method employed, the presenter and the type of student. It was found using a scaled response form that the elective courses received more favorable responses than the required courses on all three measures used, while on the open ended response forms, this occurred for two of the measures. It is suggested that, when comparing course evaluations, care should be taken to ensure that the status of the course as elective or required is taken into account.

#### **1.7.5** (Čibej, 2002) *“Operations research education for forgotten populations”*

This research stated that typical OR education programs are focused on those who should professionally act as specialists without taking in mind the gap between those people and the generalists which will be a reason for the survival of the gap between OR and normal users.

The situation in most of developing countries looks the same, as most of the universities in these countries doesn't offer a degree in OR, but most universities offer OR courses under different titles in the business, engineering schools and in the schools of science. These courses are usually required courses for certain majors, and the nature of these courses is usually to produce generalists, not specialists.

Undoubtedly, there is a need in these countries for trained OR personnel to handle problems arising from managing industrial and service establishments in a changing and complex business environment. Furthermore, the surveys conducted in these countries showed that a sizable number of organizations are using OR. Education is the main source of trained OR personnel, therefore, it is worthwhile investigating the current status of OR education in developed countries.

#### **1.7.6** (Scott, 2001) *“Education and a Future for OR-A Viewpoint”*

This research looked forward for the future; it expected that the growth in virtual learning could cause a massive restructuring of education provision, particularly in higher education.

The research asked a question about what will OR look like in 2015?, to answer this question the researcher looked to the question from five different viewpoints listed in the research, and claimed that these viewpoints provide implications and opportunities for OR, particularly within corporate education.

**1.7.7** (Grossman, 2001) “*Causes of the decline of the business school management science course*”

This research noted an obstacle that in some studies the OR course doesn't change dynamically with time and did not respond to the needs of high degree programs such as MBA and its students, as this problem stayed building for decades.

The research claimed that the course is suffering serious decline, the traditional model-and algorithm-based course fails to meet the needs of MBA programs and students. Poor student mathematical preparation is a reality, and is not acceptable justification for poor teaching outcomes.

MBA's rarely encounter problems that are suitable for straightforward application of management science tools, living instead in world where problems are ill-defined, data is scarce, time is short, politics is dominant, and rational decision makers are non-existent.

The root cause of the profession's failure to address these issues seems to be a habit of professional introversion that caused the profession to be uninterested in what MBA's really do on the job and the course can help them.

The future of management science in business schools depends on external factors that have little to do with the opinions of management scientists.

The focus of professional educators needs to be outward looking, they must focus and research what students need to know and can learn.

**1.7.8** (Goffin, 1998) “*Operations management teaching on European MBA programmes*”

This research stated that several investigations have been made of operations management teaching in the United States, whereas almost nothing has been published on European teaching. The research studied the case in term of the course content, teaching methods, assessments, integration with other subject, and perceptions of operation management.

The results showed that course content is similar across schools but there are large variations on three dimensions; the time allocated by schools to the subject; the balance between operations strategy and tools and techniques in teaching; and the level of emphasis given to service operations. The results also indicate the emerging importance of integrating operations management with other subjects in the MBA curriculum and the key challenge facing faculty—the need to raise the perceived the importance of operations management.

**1.7.9** (Finlay & Gregory, 1994) “*A management support system for directing and monitoring the activities of university academic staff*”

This research tried to investigate the obstacles according to four different activities of university faculty supervision, teaching, administration, and research.

The aim of the research was to have a balanced total load for each staff member, allowing for the strengths and weaknesses of individuals. Four models are derived and discussed, illustrating various options available in dealing with the allocation of one of the components lecture loads.

**1.7.10** (Bahl, 1989) “Teaching Production and Operations Management at the MBA Level - A Survey”

This research surveyed 31 US business schools and found: “there seems to be considerable disagreement as to what should be taught in a POM option”.

The research was an extend to the need of more concentration and focusing on operations management of American manufacturing sector to survive the dilemma of lack of competitiveness in world markets, so the role universities play in teaching this science was investigated in terms of the contents of this course, to ensure that adequate topics are being taught in this field, that would help the manufacturing sector withstand the challenges facing it.

**1.7.11** (Raiszadeh & Ettkin, 1989) “*POM in academia: some causes for concern*”

This research made a survey of 431 teachers at US business schools that showed a wide diversity in the content of their POM undergraduate courses This wide variation in content between schools was viewed negatively by the researchers who stated “although there are advantages to diversity, too much of it in an academic discipline can lead to a lack of focus and potential for confusion”.

The need for such research rose from the fact that the American manufacturing had fallen into a dilemma of lack of competitiveness in world markets, so operations management at manufacturing firms was put under spotlight as it was thought that the development in this field would lead to an outlet of this dilemma, as a result the role of academics in developing operations management professionals and in educating other college graduates was investigated to measure how adequate they perform their work, as universities are the first place of knowledge for such science.

**1.7.12** (Hill, 1987) *“Teaching and Research Directions in Production / Operations Management: The Manufacturing Sector”*

This research stated that teaching which is based on too many, often unrelated, tools and techniques is an ineffective way to convey “the excitement, magnitude and complexity” of operations research.

The pendulum of importance has swung decisively towards the area of operations management. It is critical that faculties address themselves to the core issues of the area, help provide direction within educational institutions, orientate research and teaching towards the plant-based needs of industrial business and capitalize on the favorable and growing opportunities provided by fresh sources for publication, funding and research.

**1.7.13** (Jauch & Glueck, 1975) *“Evaluation of university professors' research performance”*

This researcher assumed that obstacles facing OR teaching could be due to teachers themselves, so they tried to investigate that by measuring the performance of professors teaching OR and evaluate their publications as a variable that would control the quality of teaching OR.

The goal of the research was to compare the multiple measures of research output, both objectively and subjectively, in order to identify those which are effective for evaluation of research professors.

**1.7.14** (Schroeder, 1973) *“A survey of management science in university operations”*

This research discussed some early attempts that were made to link OR education obstacles and planning manpower, through making a survey that discusses the applications and research of the management sciences in institutions of higher education.

In further details, the research discusses applications of management science in higher education, in four specific areas: (1) Planning, programming and budgeting. (2) Management information systems. (3) Resource allocation models. (4) Mathematical models.

The survey of this research provides an analysis of different reports written in this field, and concluded that there are four problem area that need more attention, these areas were: (1) Stability and suitability of various student flow projections. (2) Investigation of decision making processes and the information which should be used. (3) Measurement of outputs. (4) Alternative approaches to improve planning methodology.

**Second:** researches trying to solve the problems facing OR teaching

**1.7.15** (Moazeni, 2012) “*Effective Strategies to Teach Operations Research to Non-Mathematics Majors*”

This research tried to make OR more familiar to people by finding effective strategies to Teach Operations Research to Non-Mathematics Majors, it stated to put five strategies that would facilitate understanding of hard mathematical algorithms aligned with the students' objectives and course goals in the host department.

In addition to mathematics, many other undergraduate programs such as management sciences, business, economics, electrical engineering, civil engineering, chemical engineering, and related fields, have incorporated some topics in OR in their curricula. Therefore the course content and teaching strategies used to teach an OR course should effectively aligned with the students' objectives and course goals I n the host department.

Efficiency of a strategy in teaching an OR course depends on the course goals and students' objectives. To ensure adopted teaching strategies are efficiently aligned by the course goals, instructors should incorporate different teaching techniques in addition to lecturing.

Strategies in teaching OR courses and students' major are scarce and relatively old. It would be interesting to conduct such case studies to realize the degree to which this teaching strategy alignment is practiced in universities today.

**1.7.16** (Romero & Ventura, 2007) “*Educational data mining: A survey from 1995 to 2005*”

This research tried to look in the future of E-learning and said that it will offer advantages in terms of a new research area which might be used in conjunction with data mining to facilitate teaching OR and eliminating the obstacles of communicating with teachers.

There is an increasing interest in data mining and educational systems, making educational data mining as a new growing research community. This research surveys the application of data mining to traditional educational systems, particular web-based courses, well-known learning content management systems, and adaptive and intelligent web-based educational systems in the field of OR. Each of these systems has different data source and objectives for knowledge discovering. After preprocessing the available data in each case, data mining techniques can be applied: statistics and visualization; clustering, classification and outlier detection; association rule mining and pattern mining; and text mining. The success of the plentiful work needs much more specialized work in order for educational data mining to become a mature area.

**1.7.17** (Nicholson, 1996) *“POM as the Systems Which Link Commercial Value and Daily Working Practices”*

This research suggested that videos of service operations are an ideal way of bringing realism into the classroom as a new teaching method.

Video can be used in a variety of instructional settings-in classrooms, in distance-learning sites where information is broadcast from a central point to learners who interact with a facilitator via video or computer, and in self-research situations. It can be used in teachers' professional development or with students as ways of presenting content, starting conversations, and providing illustration for concepts. Teachers or students can create their own videotapes as content for the class or as a means to assess learner performance.

This research focuses on providing a rationale for using video with the learners, presents guidelines for selecting and using videos in instruction, discusses some commercial videos used in programs, and concludes with a discussion of the future of video use in instruction.

**1.7.18** (Desai & Inman, 1994) *“Student Bias against POM Coursework and Manufacturing”*

This research suggested to invite guest speakers to bring the “real world” into the classroom and is another way of increasing students’ interest.

Students have traditionally shied away from the courses offered in schools of business in favor of financial and marketing coursework. Looks at proposed reasons for this phenomenon and surveys students regarding their perceptions of the course discipline and careers. While a number of suspicions are confirmed, some surprising perceptions are uncovered. A strategy for overcoming possible bias is offered.

**1.7.19** (Gunawardane, 1991) *“Trends in teaching management science in undergraduate business Programs”*

This research investigated the required course in management science in business and management schools accredited by the American Assembly of Collegiate Schools of Business (AACSB) investigated the objectives of this course, its content, major changes made, and issues relating to the integration of this course with functional area courses.

**1.7.20** (Armistead, Johnston, & Voss, 1986) *“Introducing Service Industries in Operations Management Teaching”*

This research claims that games and simulations are very useful approaches, as most Western countries are demonstrating a trend in the public and private sector away from traditional manufacturing operations. This has resulted in customer led pressure for Operations Management teachers to give service operations equal time with manufacturing. Service industries have the same operating issues as manufacturing but for effective teaching two aspects must be considered. The first is the context of service operations and the second is those differences that do exist between manufacturing and services. A teaching strategy is proposed. This emphasizes the use of games and simulations of service operations are an ideal way of bringing realism into the classroom as a new teaching method, examples from undergraduate and postgraduate teaching are given in the research.

**1.7.21** (Van Dusseldorp, 1971) *“Educational Decision-Making through Operations Research”*

This research introduced a commonly used approach for educational planning to override education obstacles by presenting the education system as a series of mathematical relationships.

It focuses on and utilizing the methodology and tools of systems analysis and OR to demonstrate their use in planning for the future and meeting public demands for information on how tax money is being spent by educational administrators. The range of possible and relevant applications is demonstrated by a step by step introduction to the particular concept being discussed and by an actual application whenever possible.

Getting back to the current research title which is about the status of OR teaching in Gaza strip, we must keep in mind that Gaza strip is a third world region and unfortunately few people wrote in literature about OR teaching in the third world, and among those few people were (Yousef, 2009) where he discussed education of OR for a developed country which is the United Arab Emirates, also (Smith, 1987) briefly discussed OR education in Jordan.

The last two mentioned researches will be the base for this research as obstacles related to variables listed in them will be investigated to get to and identify the status of OR education in Gaza Strip universities.

# **Chapter Two**

## **Operations Research status in Gaza Universities**

**This chapter consists of the following sections:**

- 2.1 Introduction**
- 2.2 Course position and name**
- 2.3 Course objectives**
- 2.4 Course content**
- 2.5 Teaching methods**
- 2.6 Assessment method**
- 2.7 Text book used**
- 2.8 Prerequisites**

## **2.1 Introduction:**

Operations research was first emerged at World War II by the United Kingdom to face the threats that surrounded the Kingdom at that era by finding scientific methods for effective planning (Anderson, Sweeney, Williams, Camm, & Cochran, 2015).

After that the development in this field continued to extend to economic and industrial fields which were forced by academics working in universities, and it became apparent that OR had a place in solving operational problems in organizations unrelated to military (Gass, 1994).

Through the years, most business schools in advanced civilized countries delivered core courses of operations research that derive the discipline of applying advanced analytical methods to help make better decisions (Moazeni, 2012), this stems from the importance of OR to these countries for their continuous development.

The evolution of the use of OR in the past years dramatically emerged and the analysis techniques of OR became tools to manipulate many problems as maximizing profit, reducing costs, improving service quality...etc., the development and spread of computer use helped in the development of OR and its techniques, and the spread of its applications in different aspects of life (Ashour, 2001).

Moreover, OR is very much linked to the quality of managerial decisions and this was one of the biggest topics which made OR the focus of attention of many production and service firms (Alsayed, 2009).

Unfortunately, this is not the fact in the third world despite the need of such countries for adequate planning for their limited resources, and this is the same fact going around in Gaza strip.

Although the importance of such scientific planning it is thought by many people that it is not applicable to use OR, this thought comes from lack of awareness and little understanding of OR by many people, as well as students who studies a course about OR in their education.

Because of the previously mentioned reasons it was intended to investigate about the status of OR teaching, and identify the obstacles preventing teaching OR and delivering its concepts adequately.

As it was also seen that the obstacles and reasons that prevented the achievements of OR isn't linked to one reason only, but it is a mixture of different reasons related to different educational elements that will be the independent variables of the research.

Teachers are considered to be the link between offering the correct image of OR and the students. As Clarke (1970) stated "A good teacher, like a good entertainer, first must hold his audience's attention. Then he can teach his lesson".

So it was decided to research the problem from the viewpoint of teachers as they experience the reality of the educational field.

The research here will be designed for trying to identify the status of OR teaching in Gaza Strip in different universities, depending on an investigation that will look for the position of operations research in the syllables of these schools, the title of the course, its objectives, contents, teaching methods, text-books used, assessment methods, and pre-requisites which will be the research independent variables.

This will be done throughout making a survey for these variables in all universities teaching OR in Gaza strip accommodated with a questioner that tries to explore obstacles facing these independent variables.

A descriptive analysis will be used to analyze the data collected to meet the exploratory nature of the research, as this type of analysis studies the phenomena as it is in real life and describes it precisely either qualitatively or quantitatively.

To illustrate our research population which is Gaza strip there are 11 different universities that teaches OR under different names, not all of them do have business faculties but some teaches it to complete the course plan of other undergraduate majors such as engineering.

So by taking in mind the number of students those who research in these universities, it could be clearly found that a great number of students do research OR

each semester which gives this research importance to identify the quality of teaching that is given to these students, and how much difference is there in teaching OR from one university to the other.

As a result of this research a picture of how OR is being taught in Gaza strip will be designated, and a base for forward researches that might try to improve OR teaching will be found which will make it easier for upcoming researchers to investigate possibilities of improvement in this field depending on the conclusions and recommendations of this research.

This chapter includes the results of the survey attached to the questionnaire, it aims to illustrate the status of OR teaching in the universities of Gaza, through mentioning the answers of the teachers on the questions being asked about the course of OR they teach, in terms of course position and name, course objectives, course contents, teaching methods, assessment methods, text book used, and prerequisites.

The results of the survey were linked to the results of the questionnaire, so a complete view of what's going on in the classrooms of the universities was pictured both qualitatively and quantitatively,

Differences between universities, faculties, and teachers themselves were noticed, not only in the ingredients of the course, but also in the degree of attention they paid to the course. It can be viewed how much priority do they give to OR, which will be reflected directly on the degree of attention paid by the students to OR.

Each term of comparison will be tabulated to list what each university teaches in this term of comparison, this tabling will facilitate illustrating each term and highlighting points of distinction among universities.

Some of the terms were found to be almost the same among all the universities, such as course name which only differs when OR is being taught at MBA, and is being called Quantitative analysis. Other terms contain a moderate level of differentiation among universities such as teaching methods, as one university seems to be more distinctive in this field than the others.

The most important differentiation was found to be among the course objectives, as it seems to follow the degree of attention paid to OR by the university itself.

Different objectives were given, some sound familiar and general as introductions, other seems to be more serious trying to access probably more in the real practical applications of OR.

## **2.2 Course position and name:**

The analysis of the collected data shows that all the business departments in the universities of Gaza gives OR as a required course, this might be due the awareness of the significance of OR to all functional areas of business(Yousef, 2009), and to the fact that OR course is one of the traditional subjects required for accreditation in business.

On the other hand, departments such as accounting, information technology (IT), and engineering mostly gives OR as an elective course, this would come probably from the fact that OR can work as a good extension for some of their courses, such as optimization in engineering, but still not an essential part of the main courses that would affect the real need of these faculties.

An interesting finding was that the industrial engineering department in the Islamic University, and the IT departments in both Al-Azhar University and Al Quds Open University paid a special attention to OR course, as some of these departments give OR as a required course, and this was attributed by teachers in these departments to the great awareness of how correlated OR and there engineering courses are linked together specially in industrial engineering, Moreover, OR II is given as an extension to OR in the industrial department of the Islamic university.

When linking the survey with the questionnaire, it was found from the viewpoint of the teachers that although the interest given by these faculties, students paid little attention to the course of OR, when the course is an elective in their faculties, furthermore, these faculties offer unspecialized teachers that are probably weak in the field of OR, further discussion will be found in chapter 4.

It was also found that the name of OR is the dominant name at the bachelor degree, but instead of that the course was found to be named as Quantitative Analysis in MBA at the universities that offers MBA degree, table (2.1) shows position and name of OR at the universities offering this course.

**Table (2.1): Position and name of OR course**

#	University	Faculty	Course position	Course name
1	Islamic University – Gaza	Engineering	1. Operations research 1 is a required course for industrial engineering. 2. Operations research 2 is an elective course for industrial engineering.	1. Operations research 1 2. Operations research 2
		Commerce	1. Required course for business. 2. Elective course for accounting.	1. Bachelor: Operations research 2. MBA: Quantitative analysis
2	Al Azhar University – Gaza	Engineering	1. Required course for IT. 2. Elective course for computer science.	Operational research
		Commerce	Required course	1. Bachelor: Operations research 2. MBA: Quantitative analysis
3	Al-Aqsa University- Gaza	Commerce	1. Required course for business. 2. Required course for accounting. 3. Required course for management information systems.	Operations research
4	Al-Quds Open University	Commerce	Required course for administration.	Operations research
		IT	Required course for IT and communication.	
5	University of Palestine	Commerce	1. Required course for business. 2. Elective course for accounting.	Operations research
6	Ummah University	Commerce	Required course	Operations research
7	Gaza University	Commerce	Required course	Operations research
8	University College of Applied Sciences	Commerce	Required course	Operations research
9	Arab College of Applied science	Commerce	Required course	Operations research
10	Palestine Polytechnic	Commerce	Required course	Operations research
11	University College of Science and Technology	Commerce	Required course	

### 2.3 Course objectives:

Despite the differences between objectives given by the universities, they all share the same spirit of giving the student probably something more than a hint about OR, but still not enough to introduce specialists in this field.

Students passing this course can be described as generalists in OR, more than specialists and this is a problem that is mentioned at the background of this research, and in the literature to what (Čibej, 2002) said.

Looking in the objectives, we can see that the main objective of most of the universities is to introduce, understand, describe, or giving knowledge only about OR, and then giving some examples about some of the OR techniques.

Moreover, some teachers talked about the difficulty of performing the written objectives because of the conditions in Gaza. Despite that they still claim that the objectives listed are still appropriate, as they give what they are intended to do in the term of introducing OR to students, they also claimed that one course isn't enough to introduce specialists in this field, this claim meets what was said by (Moazeni, 2012), and this thing was obvious by numbers when manipulating the results of the questionnaire distributed to the teachers.

Despite the listed above it can be recognized that some universities gave more attention to this course than the others, for example the industrial department in the Islamic University had an objective of understanding strategies behind algorithms for computing optimal solutions, and singled it a special course that was ORII.

Another example was the engineering department at Al-Azhar University that listed several objectives focused greatly on modeling, as this branch of OR is much related to some of their courses such as optimization.

Table (2.2) shows course objectives of OR at the universities offering this course.

**Table (2.2): Objectives of OR course**

#	University	Faculty	Course objectives
1	Islamic University – Gaza	Engineering	<ol style="list-style-type: none"> <li>1. Introduce undergraduates to deterministic optimization in operations research.</li> <li>2. Learning to formulate linear, network, and integer programming cases.</li> <li>3. Understanding strategies behind algorithms for computing optimal solutions.</li> </ol>
		Commerce	<ol style="list-style-type: none"> <li>1. Describe the operations research modeling approach.</li> <li>2. Understand the application of operations research in a real life.</li> <li>3. Describe the use of modeling in operations research.</li> <li>4. Discuss possible problems in using operations research.</li> </ol>
2	Al Azhar University – Gaza	Engineering	<ol style="list-style-type: none"> <li>1. Knowledge of informal and formal modeling skills.</li> <li>2. Knowledge of different models and algorithms used in operations research.</li> <li>3. Understand and appreciate the capabilities and limitations of deterministic models in operations research.</li> <li>4. Build, analyze, and reason logically with mathematical models.</li> <li>5. Propose and integrate with large-scale models.</li> <li>6. Integrate skills to design and analyze algorithms, and to distinguish good algorithms from not-so good ones.</li> <li>7. Inject knowledge of the varied applications of operations research.</li> <li>8. Problem solving skills using appropriate modeling techniques.</li> <li>9. Presenting knowledge of various modeling methods in different settings and applications and present them.</li> </ol>
		Commerce	<ol style="list-style-type: none"> <li>1. To provide the main concepts and practices of operations research.</li> <li>2. To focus on linear programming and modeling of business problems, duality, sensitivity analysis, transportation and assignment problems, queuing theory and network analysis.</li> </ol>
3	Al-Aqsa University-Gaza	Commerce	<ol style="list-style-type: none"> <li>1. Knowledge of operations research concept.</li> <li>2. Using scientific approach when researching</li> </ol>

#	University	Faculty	Course objectives
			<ul style="list-style-type: none"> <li>administrative problems.</li> <li>3. Choosing the best alternative.</li> <li>4. Linking the overall goals of the organization with the secondary goals.</li> <li>5. Linking different activities.</li> </ul>
4	Al-Quds Open University	<ul style="list-style-type: none"> <li>Commerce</li> <li>IT</li> </ul>	<ul style="list-style-type: none"> <li>1. Introducing operations research concept to students.</li> <li>2. Constructing mathematical models and using the best mathematical models to solve it and reach the best decision.</li> </ul>
5	University of Palestine	Commerce	<ul style="list-style-type: none"> <li>1. Introducing operations research concept to students.</li> <li>2. Introducing the role of operations research as a scientific approach in decision making.</li> <li>3. Using operations research approach in researching and analyzing problems.</li> <li>4. Using operations research in designing information systems.</li> </ul>
6	Ummah University	Commerce	<ul style="list-style-type: none"> <li>1. Introducing operations research concept to students.</li> <li>2. Improve student ability to solve problems mathematically.</li> <li>3. Improve student ability in decision making.</li> <li>4. Maximizing profit and reducing cost.</li> </ul>
7	Gaza University	Commerce	<ul style="list-style-type: none"> <li>1. Improve student ability to solve problems mathematically.</li> <li>2. Improve student ability in decision making.</li> <li>3. Maximizing profit and reducing cost.</li> </ul>
8	University College of Applied Sciences	Commerce	<ul style="list-style-type: none"> <li>1. Identify the role of operations research in administration aspects.</li> <li>2. Improve student capability to analyzing and decision making.</li> <li>3. Help students solve administrative problems using different operations research methods.</li> <li>4. Students must be able to translate mathematical problems from the qualitative form to the quantitative form.</li> <li>5. Identify some quantitative samples that are used in solving problems and taking decisions.</li> <li>6. The ability to solve problems using linear programming and use simple computer programs in solving it.</li> </ul>
9	Arab College of Applied science	Commerce	<ul style="list-style-type: none"> <li>1. Identify the role of operations research in administration aspects.</li> <li>2. Students must be able to translate</li> </ul>

#	University	Faculty	Course objectives
			mathematical problems from the qualitative form to the quantitative form. 3. The ability to deal with transportation problems. 4. The ability to deal with queuing problems. 5. The ability to deal with networking problems.
10	Palestine Polytechnic	Commerce	1. Introducing operations research concept to students. 2. Training students to build the mathematical model that translates the administrative problem to a solved mathematical model. 3. Using organized scientific approach in solving administrative problems.
11	University College of Science and Technology	Commerce	1. Introducing operations research concept to students. 2. Using operations research approach in researching and analyzing problems. 3. Understand the application of operations research in a real life.

## 2.4 Course contents:

As can be seen from the contents almost all universities share the same contents, such as teaching linear programming, transportation problem, assignment problem, theory of decision making, queuing theory, game theory, and network flow analysis.

This can be ascribed to the fact that these techniques are appropriate for developing countries and can be used in their manufacturing or service organizations as said by (Kemp & Yousef, 1995; Lai, Kam, & LEE, 1988; D. Yousef, 2000).

But when linking the survey results with the questionnaire findings it was found that the literature didn't completely agree with the opinion of the teachers at the universities of Gaza, teachers admit that the difficulty of some topics is an obstacle facing students; another obstacle was the size of the course and its length.

As mentioned before in the part of course objectives, some teachers talked about the difficulty of performing the written objectives because of the conditions in Gaza, this could be related here to what they said was an obstacle in the contents, that is syllables focus on the cognitive aspects and neglecting life experiences.

In general teachers see that the contents take individual differences between students into account by the moderate number of information and concepts per subject, and the enough amounts of exercises given.

Table (2.3) shows course contents of OR at the universities offering this course.

**Table (2.3): Contents of OR course**

#	University	Faculty	Course contents
1	Islamic University – Gaza	Engineering	<ol style="list-style-type: none"> <li>1. Introduction to formulation and classification of optimization models.</li> <li>2. Formulation and structure of linear programming models.</li> <li>3. Algorithms for solving linear programs.</li> <li>4. Duality and sensitivity analysis in linear programs.</li> <li>5. Formulating and solving network flow models.</li> <li>6. Formulation and tractability of integer programming models.</li> <li>7. Algorithms for solving integer programs.</li> </ol>
		Commerce	<ol style="list-style-type: none"> <li>1. Overview of the operations research modeling approach.</li> <li>2. Decision analysis.</li> <li>3. Forecasting.</li> <li>4. Linear programming: formulations and graphical solution.</li> <li>5. Linear programming: the simplex method.</li> <li>6. Transportation.</li> <li>7. Network.</li> <li>8. Simulation.</li> <li>9. Analytical hierarchy process (AHP).</li> <li>10. Waiting lines and queuing theory model.</li> </ol>
2	Al Azhar University – Gaza	Engineering	<ol style="list-style-type: none"> <li>1. Linear programming.</li> <li>2. Transportation problem.</li> <li>3. Assignment problem.</li> <li>4. Theory of decision making.</li> <li>5. Queuing theory.</li> <li>6. Game theory.</li> <li>7. Network flow analysis.</li> </ol>
		Commerce	<ol style="list-style-type: none"> <li>1. Introduction to operations research.</li> <li>2. Linear programming.</li> <li>3. Duality and sensitivity analysis.</li> </ol>

#	University	Faculty	Course contents
			<ol style="list-style-type: none"> <li>4. Transportation and assignment problems.</li> <li>5. The theory of decision making.</li> <li>6. Queuing theory.</li> <li>7. Game theory.</li> <li>8. Network flow analysis.</li> </ol>
3	Al-Aqsa University-Gaza	Commerce	<ol style="list-style-type: none"> <li>1. Linear programming.</li> <li>2. Decision making theory.</li> <li>3. Decision tree.</li> <li>4. Transportation.</li> <li>5. Queuing theory.</li> <li>6. Network flow analysis.</li> </ol>
4	Al-Quds Open University	Commerce	<ol style="list-style-type: none"> <li>1. Introduction to operations research.</li> <li>2. Linear programming.</li> <li>3. Sensitivity analysis.</li> <li>4. Queuing theory.</li> <li>5. Network flow analysis.</li> </ol>
		IT	<ol style="list-style-type: none"> <li>6. Game theory.</li> <li>7. Decision making theory.</li> </ol>
5	University of Palestine	Commerce	<ol style="list-style-type: none"> <li>1. Introduction to operations research.</li> <li>2. Most important quantitative techniques in solving problems.</li> <li>3. Linear programming.</li> <li>4. Simplex method.</li> <li>5. Transportation model.</li> <li>6. North West method.</li> <li>7. Hungarian method.</li> <li>8. Network analysis.</li> <li>9. PERT.</li> <li>10. Decision tree.</li> <li>11. Queuing theory.</li> </ol>
6	Ummah University	Commerce	<ol style="list-style-type: none"> <li>1. Introduction to operations research.</li> <li>2. Linear programming.</li> <li>3. Assignment problem.</li> <li>4. Decision theory.</li> <li>5. Network analysis.</li> </ol>
7	Gaza University	Commerce	<ol style="list-style-type: none"> <li>6. Introduction to operations research.</li> <li>7. Decision tree.</li> <li>8. Linear programming.</li> <li>9. Simplex method.</li> <li>10. Transportation model.</li> <li>11. Network analysis.</li> <li>12. Game theory.</li> <li>13. Queuing theory.</li> </ol>
8	University College of Applied Sciences	Commerce	<ol style="list-style-type: none"> <li>1. Theory of decision making.</li> <li>2. Solving decision making problems using computer.</li> </ol>

#	University	Faculty	Course contents
			<ol style="list-style-type: none"> <li>3. Expected value for complete information.</li> <li>4. Linear programming.</li> <li>5. Network analysis.</li> <li>6. Simplex method.</li> <li>7. Algebraic prosperities for linear programming.</li> <li>8. Calculating variable coefficients in goal function.</li> <li>9. Game theory.</li> </ol>
9	Arab College of Applied science	Commerce	<ol style="list-style-type: none"> <li>1. Administrative decisions and the effect of probabilities.</li> <li>2. Linear programming.</li> <li>3. Network analysis.</li> <li>4. Transportation problem.</li> <li>5. Queuing theory.</li> <li>6. Simulation models.</li> <li>7. Game theory.</li> </ol>
10	Palestine Polytechnic	Commerce	<ol style="list-style-type: none"> <li>1. Introduction to operations research.</li> <li>2. Constructing mathematical models.</li> <li>3. Decision theory.</li> <li>4. Transportation problem.</li> <li>5. Network analysis.</li> <li>6. Probability theory during uncertainties.</li> </ol>
11	University College of Science and Technology	Commerce	<ol style="list-style-type: none"> <li>1. Linear programming.</li> <li>2. Transportation problem.</li> <li>3. Assignment problem.</li> <li>4. Theory of decision making.</li> <li>5. Queuing theory.</li> <li>6. Game theory.</li> <li>7. Network flow analysis.</li> </ol>

## 2.5 Teaching methods:

Most of the universities focused on the traditional teaching method that is lecturing, which is considered to be normal as this method is the best way to present the content for most of the courses.

Somehow, teachers among themselves tried individually to enhance the teaching methods for example by asking the students to make projects, assignments, group discussion of case studies, and solve some practical problems.

Although these individual attempts give some enhancement to the course, it is still considered of the traditional old teaching methods(Desai & Inman, 1994), without being guided or supported by the universities themselves.

An exception of this fact was Al-Quds Open University, as this university was giving real attention to their modern teaching methods, and considering the improvement of these methods an objective for them, in the term of the overall improvement of the course being taught. This concern by the University may come from the nature and the philosophy behind it, which is adopting open teaching.

One can say that there are other open universities that didn't give much attention to their teaching method despite they share the same philosophy with Al-Quds Open University, and this is what made this university an exception.

Al-Quds Open University performs virtual classes on the internet where teachers get accessed to the web and start answering questions of students on live at previously specified time. Moreover, the university provides their students with an open access to their electronic library which enables them to reach any book electronically. In addition the university provides a special forum on the internet where students can find the notes of their teachers and all the contents of every lecture, with the lecture being recorded in audio or video mode, this forum can be used by the students to contact and discuss the courses among each other.

When linking the results of the survey to findings of the questionnaire, the results confirms and agrees that there is negligence to modern teaching methods, and this will be further discussed at chapter 4.

Table (2.4) shows teaching methods of OR at the universities offering this course.

**Table (2.4): teaching methods of OR course**

#	University	Faculty	Teaching methods
1	Islamic University – Gaza	Engineering	1. Lectures. 2. Project.
		Commerce	1. Lectures. 2. Case studies.
2	Al Azhar University – Gaza	Engineering	1. Lectures. 2. Practical exercises. 3. Projects.
		Commerce	1. Lectures. 2. Group discussions (case studies) 3. Outside reading materials and problems. 4. Using computer programs.
3	Al-Aqsa University- Gaza	Commerce	1. Lectures. 2. TQM program.
4	Al-Quds Open University	Commerce	1. Lectures. 2. Virtual classes on the internet. 3. Electronic library on the internet. 4. All the contents and its notes are on a special forum for the university on the internet
		IT	
5	University of Palestine	Commerce	1. Lectures. 2. Computer program.
6	Ummah University	Commerce	1. Lectures. 2. Recording lectures and uploading it on the university website.
7	Gaza University	Commerce	1. Lectures.
8	University College of Applied Sciences	Commerce	1. Lectures. 2. Project.
9	Arab College of Applied science	Commerce	1. Lectures. 2. Exercises. 3. Using QM computer program.
10	Palestine Polytechnic	Commerce	1. Lectures. 2. Discussion.
11	University College of Science and Technology	Commerce	1. Lectures.

## 2.6 Assessment methods:

As expected exams were the main assessment methods to be used, more than 70-80% of the marks on this course were given to exams, even in the presence of projects and assignments.

The findings of the questionnaire showed that there is an obstacle facing OR in the term of assessment method, and this was found to be normal in the opinion of the researcher, as exams seem to be the most dominant method being used without giving some equilibrium with other methods.

These findings agrees what (Pillay, 2014) said about examination, this literature claimed that depending on exams as the most dominant method of assessment would affect the students' academic achievement especially when failing to timetable these exams effectively.

Table (2.5) shows assessment methods of OR at the universities offering this course.

**Table (2.5): assessment methods of OR course**

#	University	Faculty	Assessment methods
1	Islamic University – Gaza	Engineering	1. Home-works and quizzes 2. First midterm 3. Second midterm 4. Project 5. Final exam
		Commerce	1. Quizzes. 2. Assignments. 3. Mid-term exam. 4. Final exam.
2	Al Azhar University – Gaza	Engineering	1. Mid-term exam I 2. Mid-term exam II 3. Projects. 4. Final exam.
		Commerce	5. Quizzes. 6. Assignments. 7. Mid-term exam. 8. Final exam.
3	Al-Aqsa University-Gaza	Commerce	1. Mid-term exam. 2. Project. 3. Quizzes 4. Discussion. 5. Final exam. 6. Homework.
4	Al-Quds Open University	Commerce	1. Mid-term exam. 2. Final exam.

#	University	Faculty	Assessment methods
		IT	3. Homework. 4. Computer lab test.
5	University of Palestine	Commerce	1. Attendance. 2. Quizzes. 3. Homework. 4. Mid-term exam. 5. Final exam.
6	Ummah University	Commerce	1. Mid-term exam. 2. Final exam.
7	Gaza University	Commerce	1. Mid-term exam. 2. Final exam.
8	University College of Applied Sciences	Commerce	1. Attendance. 2. Quizzes. 3. Project. 4. Mid-term exam. 5. Final exam.
9	Arab College of Applied science	Commerce	1. Attendance. 2. Homework. 3. Mid-term exam. 4. Final exam. 5. QM program exam.
10	Palestine Polytechnic	Commerce	1. Attendance. 2. Report. 3. Homework. 4. Quizzes. 5. Mid-term exam. 6. Final exam.
11	University College of Science and Technology	Commerce	1. Attendance. 2. Homework. 3. Mid-term exam. 4. Final exam.

## 2.7 Text book used:

Main text books used to teach OR course differs from one university to the other and from one faculty to the other, even from one teacher to the other.

These differences can be seen not only in the title of the book, but also in the language of the book (Arabic or English) as some teaches the course in Arabic others in English. The English language of the books was affecting the understanding of the students moderately in the opinion of teachers as their native language is Arabic.

Another field of difference is the authors of books being taught, some prefer foreign authors those are split into Arabs and westerns, others prefer local authors, both foreign and local authors are said to have good reputation in the field of OR in the opinion of teachers. But some found to prefer gathering their own notes and present it as an alternative of common books in this field, these notes was said to be moderately weak in the opinion of teachers.

Editions is also another field of differentiation as the editions of the same book differs from one university to the other, the difference in the term of edition was found to be little, as every teacher tries to update the book to its last edition, and that was proved by numbers in the findings of the questionnaire.

Other circumstances of this part is the reference books, as each teacher ask their students to read these books as an encouragement of them for outer reading as it was recognized from the findings of the questionnaire.

Table (2.6) shows text book used for OR at the universities offering this course.

**Table (2.6): Text books of OR course**

#	University	Faculty	Text book used
1	Islamic University – Gaza	Engineering	Operations Research: An Introduction, 9 <sup>th</sup> ed. - Hamdy A. Taha
		Commerce	<ol style="list-style-type: none"> <li>1. For Arabic bachelor students: Applications of operations research in business administration, (2013)ed. - Jihad Hani</li> <li>2. For English bachelor students: An introduction to management science, 7<sup>th</sup> ed.- David R. Anderson and Dennis J. Sweeney</li> <li>3. For MBA students: Quantitative analysis for management, 12<sup>th</sup> ed. - Render/Stair/Hanna</li> </ol>
2	Al Azhar University – Gaza	Engineering	Operations Research: An Introduction, 9 <sup>th</sup> ed. - Hamdy A. Taha
		Commerce	Operations Research: An Introduction, 8 <sup>th</sup> ed. - Hamdy A. Taha
3	Al-Aqsa University-Gaza	Commerce	Operations research and quantitative methods in administrative decision making, 4th ed.- Rand El Astal
4	Al-Quds Open University	Commerce	Special book for the university.
		IT	

#	University	Faculty	Text book used
5	University of Palestine	Commerce	1. For English students: Operations Research: An Introduction, 8 <sup>th</sup> ed. - Hamdy A. Taha 2. For Arabic students: Operations research "models and applications", 1 <sup>st</sup> ed.- Hassan Taama, Marwan Nsour, and Iman Hanoosh
6	Ummah University	Commerce	Introduction to operations research, 1st ed. - Yousif Ashour.
7	Gaza University	Commerce	1. Quantitative techniques in administration, 2 <sup>nd</sup> ed. - Sulaiman eidat 2. Operations research – applications on computer, 3 <sup>rd</sup> ed. - Majid tamimi and Ahmed Safar.
8	University College of Applied Sciences	Commerce	Operations research applications in administration, 1 <sup>st</sup> ed. - Awatef
9	Arab College of Applied science	Commerce	Introduction to operations research, 1st ed. - Yousif Ashour.
10	Palestine Polytechnic	Commerce	Operations research. 3 <sup>rd</sup> ed. - Monem Al Mosawy.
11	University College of Science and Technology	Commerce	Introduction to operations research, 1st ed. - Yousif Ashour.

## 2.8 Prerequisites

Not only does prerequisites varies from a university to the other, but also the existence of a prerequisite does vary, as some universities doesn't take in mind acquiring a prerequisites before a student can accredit an OR course.

After revising the findings of the questionnaire, there was found to be a serious problem in this field, as most of the teachers' consensus that prerequisites need a good ability from the students to deal with math, as a result of that math must be given as a mandatory before acquiring OR course, despite that many faculties doesn't seem to ask for that, an excuse could be given to faculties such as engineering, and accounting as students in such faculties are supposed to be good in math due to the nature of science being taught in such faculties.

Table (2.7) shows prerequisites for OR at the universities offering this course.

**Table (2.7): prerequisites of OR course**

#	University	Faculty	Prerequisites
1	Islamic University – Gaza	Engineering	No prerequisites
		Commerce	Math for administration.
2	Al Azhar University – Gaza	Engineering	No prerequisites
		Commerce	1. Production and operation management. 2. Introduction to administration.
3	Al-Aqsa University-Gaza	Commerce	Math in administration.
4	Al-Quds Open University	Commerce	1. For commerce students: Math in administration.
		IT	2. For IT and communication students: Linear algebra.
5	University of Palestine	Commerce	No prerequisites
6	Ummah University	Commerce	No prerequisites
7	Gaza University	Commerce	No prerequisites
8	University College of Applied Sciences	Commerce	Production and operation management
9	Arab College of Applied science	Commerce	2. Fundamentals of administration. 3. Math. 4. Introduction to computer.
10	Palestine Polytechnic	Commerce	No prerequisites
11	University College of Science and Technology	Commerce	No prerequisites

# **Chapter Three**

## **Methodology**

**This chapter consists of the following sections:**

- 3.1 Introduction**
- 3.2 Research Design**
- 3.3 Data collection**
- 3.4 Population and Sampling**
- 3.5 Questionnaire content**
- 3.6 Data measurement**
- 3.7 Pilot research**
- 3.8 Statistical Manipulation**
- 3.9 Validity of questionnaire**
- 3.10 Reliability of the research**

### **3.1 Introduction:**

This chapter describes the methodology that was used in this research. The adopted methodology to accomplish this research uses the following techniques: the information about the research design, research population, questionnaire design, statistical data analysis, content validity and pilot research.

### **3.2 Research Design**

To accomplish the research objectives specified, this research was conducted in five phases:

The first phase of the research research proposal included identifying and defining the problems and establishment objective of the research and development research plan.

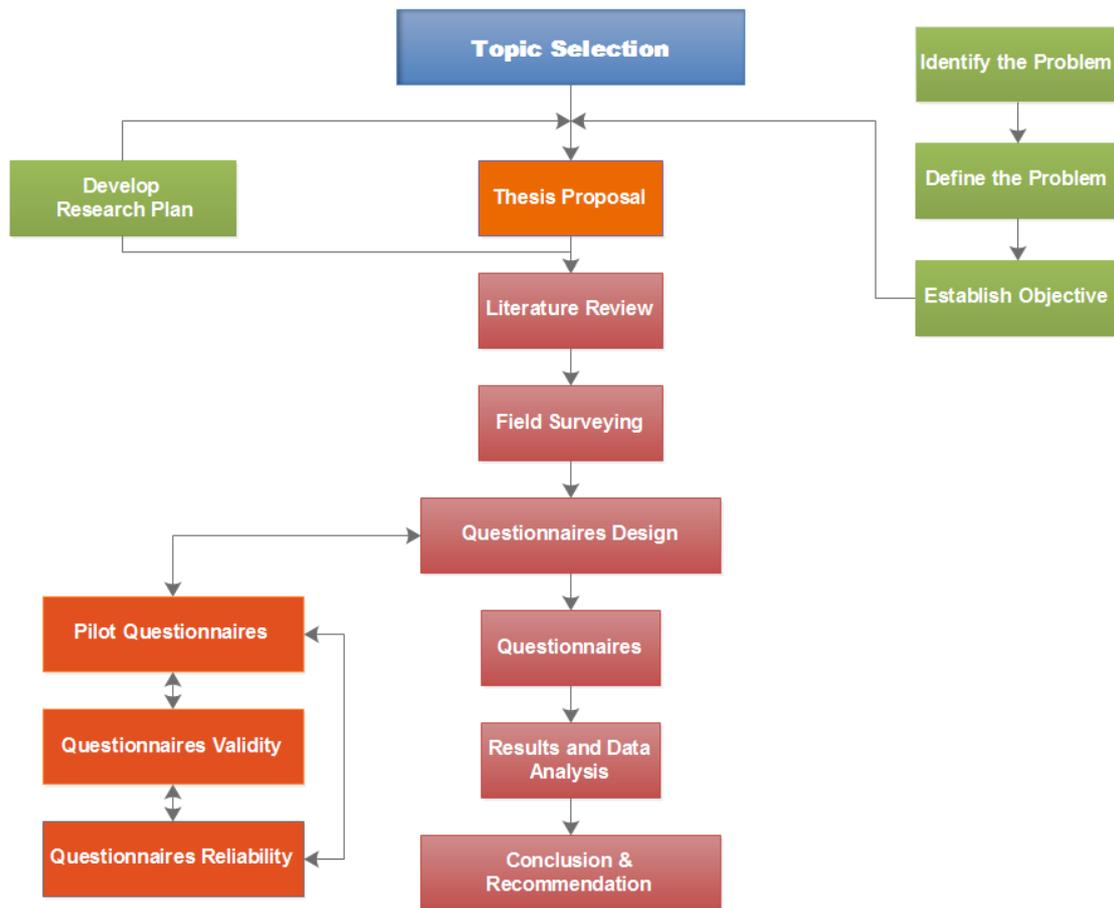
The second phase of the research included a summary of the comprehensive literature review. Based on the literature review independent variables were produced.

The third phase of the research focused on the modification of the questionnaire design, through distributing the questionnaire to pilot research, The purpose of the pilot research was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the research. The questionnaire was modified based on the results of the pilot research.

The fourth phase of the research focused on distributing questionnaire. This questionnaire was used to collect the required data in order to achieve the research objective.

The fifth phase of the research was data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) was used to perform the required analysis. The final phase includes the conclusions and recommendations.

Thirty seven questionnaires were distributed to the research population and thirty seven questionnaires are received. Figure (3.1) shows the methodology flowchart, which leads to achieve the research objective.



**Figure No. (3.1): Illustrates the methodology flow chart**

### 3.3 Data Collection:

The data collection will depend basically on two sources:

- a) Secondary source which will be the books, references, researches, journals, statistics, web sites and recent studies that deal with the topic of this research.
- b) Primary source which is not available in the secondary source through distributing questionnaires on the research population in order to get their opinions about "Status of operations research education at Gaza strip universities ".

### 3.4 Population and Sampling

The population included all teachers teaching operations research at Gaza strip universities which consist of 37 teachers, distributed among the 11 universities teaching OR. Questionnaires were distributed to the research population, all questionnaires are received, and the following tables illustrated the properties of personal information of the samples:

#### a) Academic position:

Table (3.1) shows that 56.8% from the sample's position are " lecturers " , and 13.5% from the sample's position are " Assistant professors " , and 21.6% from the sample's position are " Associate professors " , and 8.1 % from the sample's position are " Full professors " .

**Table (3.1): Academic position**

<b>Academic position</b>	<b>Frequency</b>	<b>Percentages (%)</b>
Assistant teacher	0	0.0
Lecturer	21	56.8
Assistant professor	5	13.5
Associate professor	8	21.6
Full professor	3	8.1
<b>Total</b>	<b>37</b>	<b>100.0</b>

#### b) Experience(years):

Table (3.2) shows that 27.0% from the sample experience lays between " 1-5 years " , and 27.0% from the sample experience between " 11-15 years " , and 18.9% from the sample experience between " 6-10 years " , and 18.9 % from the sample experience between " 16-20 years " , and 8.1% from the sample experience " More than 20 years " .

**Table (3.2): Experience**

<b>Experience</b>	<b>Frequency</b>	<b>Percentages (%)</b>
1-5 years	10	27.0
6-10 years	10	27.0
11-15 years	7	18.9
16-20 years	7	18.9
More than 20 years	3	8.1
<b>Total</b>	<b>37</b>	<b>100.0</b>

**c) Age(years):**

Table (3.3) shows that 8.1% of the sample age lay between " 20-30 year " , and 51.4% of the sample age between " 31-40 year " , and 27.0% of the sample age between " 41-50 year " , and 13.5% of the sample age between " 51-60 year " .

**Table (3.3): Age**

Age	Frequency	Percentages (%)
20-30 year	3	8.1
31-40 year	19	51.4
41-50 year	10	27.0
51-60 year	5	13.5
More than 60	0	0.0
<b>Total</b>	<b>37</b>	<b>100.0</b>

**d) Scientific major:**

Table (3.4) shows that 27.0% from the sample of scientific major are " Engineering " , and 8.1% from the sample of scientific major are " Accounting " , and 62.2% from the sample of scientific major are " Business management " , and 2.7% from the sample of scientific major are " Other scientific major " .

**Table (3.4): Scientific major**

Scientific major	Frequency	Percentages (%)
Engineering	10	27.0
Economy	0	0.0
Accounting	3	8.1
Business management	23	62.2
Other	1	2.7
<b>Total</b>	<b>37</b>	<b>100.0</b>

### **3.5 Questionnaire content**

The questionnaire was provided with a covering letter explaining the purpose of the research, the way of responding, the aim of the research, and the security of the information in order to encourage a high response. The questionnaire included multiple choice questions: which are used widely in the questionnaire, the variety in these questions aims first to meet the research objectives, and to collect all the necessary data that can support the discussion, results, and recommendations in the research.

The sections in the questionnaire will verify the objectives in this research related to Status of operations research education at Gaza strip universities as the following:

**First part:** personal information includes 4 questions.

**Second part:** Independent variables data collection.

**Third part:** Obstacles facing the independent variables: consist of seven fields as follows:

- ✓ Obstacles accommodated with OR position.
- ✓ Obstacles accommodated with course objective.
- ✓ Obstacles accommodated with contents.
- ✓ Obstacles accommodated with teaching methods.
- ✓ Obstacles accommodated with assessment methods.
- ✓ Obstacles accommodated with text book used.
- ✓ Obstacles accommodated with prerequisites.

Two forms of the questionnaire were prepared, one in English language (Annex1) for the interest of the research and the second one in Arabic language (Annex2) to have more accurate results the questionnaire, as most of the target population is not familiar with the English language.

### **3.6 Data measurement**

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there are appropriate methods that can be applied and not others. In this research, ordinal scales were used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the important (1, 2, 3, 4, 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities.

The respondent can answer the questionnaire item following the Likert scale, by assigning it with a number from 1 to 5 indicating his/her acceptance degree of this item, where (5) represents the highest acceptance degree about an item and (1) represents the lowest acceptance degree about it as illustrated in table No.(3.5).

**Table (3.5): lekart scale**

Level	<b>Totally disagree</b>	<b>Disagree</b>	<b>Maybe</b>	<b>agree</b>	<b>Totally agree</b>
Scale	1	2	3	4	5
Weight mean	<b>20%-36%</b>	<b>36%-52%</b>	<b>52%-68%</b>	<b>68%-84%</b>	<b>84%-100%</b>

### **3.7 Pilot Research**

A pilot research for the questionnaire was conducted before collecting the results of the sample. It provides a trial run for the questionnaire, which involves testing the wordings of question, identifying ambiguous questions, testing the techniques that used to collect data, and measuring the effectiveness of standard invitation to respondents.

### **3.8 Statistical Manipulation**

To achieve the research goal, researcher used the statistical package for the Social Science (SPSS) for Manipulating and analyzing the data.

Statistical methods are as follows:

- 1) Frequencies and Percentile
- 2) Alpha- Cronbach Test for measuring reliability of the items of the questionnaires
- 3) Person correlation coefficients for measuring validity of the items of the questionnaires.
- 4) Spearman –Brown Coefficient
- 5) One sample t test
- 6) One way ANOVA test for the difference between means three samples.

### **3.9 Validity of the Research**

We can define the validity of an instrument as a determination of the extent to which the instrument actually reflects the abstract construct being examined. "Validity refers to the degree to which an instrument measures what it is supposed to be measuring". High validity is the absence of systematic errors in the measuring instrument. When an instrument is valid; it truly reflects the concept it is supposed to measure. Achieving good validity required the care in the research design and sample selection. The amended questionnaire was by the supervisor and seven experts in the tendering and bidding environments to evaluate the procedure of questions and the method of analyzing the results. The expertise agreed that the questionnaire was valid and suitable enough to measure the purpose that the questionnaire designed for.

### 3.9.1 Content Validity of the Questionnaire

Content validity test was conducted by consulting two groups of experts. The first was requested to evaluate and identify whether the questions agreed with the scope of the items and the extent to which these items reflect the concept of the research problem. The other was requested to evaluate that the instrument used is valid statistically and that the questionnaire was designed well enough to provide relations and tests between variables. The two groups of experts did agree that the questionnaire was valid and suitable enough to measure the concept of interest with some amendments.

### 3.9.2 Statistical Validity of the Questionnaire

To insure the validity of the questionnaire, two statistical tests should be applied. The first test is Criterion-related validity test (Pearson test) which measures the correlation coefficient between each item in the field and the whole field. The second test is structure validity test (Pearson test) that is used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of similar scale.

#### 3.9.2.1 Criterion Related Validity:

a) **Internal consistency:**

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of twenty questionnaires, through measuring the correlation coefficients between each question in one field and the whole field. Table No. (3.6) below shows the correlation coefficient and p-value for each field items. As shown in the table the p- Values are less than 0.05 or 0.01, so the correlation coefficients of this field are significant at  $\alpha \leq 0.01$  or  $\alpha \leq 0.05$ , so it can be said that the paragraphs of this field are consistent and valid to be measure to what it was set for.

**Table (3.6):**

**The correlation coefficient between each question in the field and the whole field**

No.	Question	Pearson coefficient	p-value
Obstacles accommodated with OR position			
1	Type of the position makes students pay less concern to OR.	0.830**	0.000
2	The variation of the position according to different	0.706**	0.000

No.	Question	Pearson coefficient	p-value
	faculties rules the students concern according to their faculty.		
3	Faculties where OR is elective don't give much attention to OR.	0.783**	0.000
4	Teacher isn't a professional in this field as OR is only elective in their faculty.	0.538*	0.014
5	Teacher scientific weakness in mandatory.	0.782**	0.000
Obstacles accommodated with course objective			
1	Objectives of the course aren't linked to Gaza real life.	0.563**	0.010
2	Objectives unable to motivate the student.	0.631**	0.003
3	Objectives focus on theory rather than application.	0.517*	0.020
4	OR importance to the community isn't introduced well to students.	0.730**	0.000
Obstacles accommodated with contents			
1	Syllables focus on the cognitive aspects and neglecting life experiences.	0.794**	0.000
2	Length of the course syllables.	0.761**	0.000
3	Difficulty of some topics.	0.866**	0.000
4	Syllables don't take into account individual differences.	0.736**	0.000
5	Large number of concepts.	0.756**	0.000
6	Lack of exercises accompanying curriculum.	0.720**	0.000
7	Large number of information per subject.	0.680**	0.001
Obstacles accommodated with teaching methods			
1	Lack of diversification in teaching methods.	0.724**	0.000
2	Lack of interest of modern education techniques.	0.479*	0.032
3	Inability of teachers to use modern teaching techniques.	0.775**	0.000
4	Failing to provide teachers with modern teaching techniques.	0.595**	0.006
5	Universities planning for teaching without taking teachers opinions.	0.739**	0.000
Obstacles accommodated with assessment methods			
1	Using one assessment method to evaluate the student.	0.536*	0.015
2	Assessment methods are issued according to university policy without teacher involvement.	0.477*	0.033
3	Student opinion in assessment methods isn't taken.	0.528*	0.017
4	Using few assessment methods will be harmful for students.	0.786**	0.000
Obstacles accommodated with text book used			
1	Text books used aren't updated to last versions.	0.713*	0.000
2	Text books gathered locally by teachers are weak.	0.829**	0.000
3	Text books used are from weak authors.	0.789**	0.000
4	Teachers don't encourage students for outer reading.	0.860**	0.000
5	Lack of understanding of the students as a result of the English language of the books.	0.719**	0.000

No.	Question	Pearson coefficient	p-value
Obstacles accommodated with prerequisites			
1	OR prerequisites need a good ability to deal with math which makes a problem for students.	0.734**	0.000
2	Not all needed prerequisites are given in all faculties.	0.815**	0.000

\*\*Correlation is significant at 0.01 level

\* Correlation is significant at 0.05 level

### b) Structure Validity of the Questionnaire

Structure validity is the second statistical test that is used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of likert scale.

As shown in table No. (3.7), the significance values are less than 0.01, so the correlation coefficients of all the fields are significant at  $\alpha \leq 0.01$ , so it can be said that the fields are valid to be measured to what it was set for to achieve the main aim of the research.

**Table (3.7) Structure Validity of the Questionnaire**

No.	Section	Pearson correlation coefficient	p-value
1	Obstacles accommodated with OR position	0.792**	0.000
2	Obstacles accommodated with course objective	0.863**	0.000
3	Obstacles accommodated with contents	0.920**	0.000
4	Obstacles accommodated with teaching methods	0.608**	0.000
5	Obstacles accommodated with assessment methods	0.716**	0.000
6	Obstacles accommodated with text book used	0.828**	0.000
7	Obstacles accommodated with prerequisites	0.734**	0.000

\*\*Correlation is significant at 0.01 level

### 3.10 Reliability of the Research

Reliability of an instrument is the degree of consistency with which it measures the attribute it is supposed to be measuring. The test is repeated to the same sample of people on two occasions, and then compares the scores obtained by computing a

reliability coefficient. For the most purposes reliability coefficient above 0.70 are considered satisfactory. Period of two weeks to a month is recommended between two tests Due to complicated conditions that the consumer is facing at the time being, it was too difficult to ask them to responds to our questionnaire twice within short period. The statistician's explained that, overcoming the distribution of the questionnaire twice to measure the reliability can be achieved by using Cronbach's Alpha coefficient and Half Split Method through the SPSS software.

### 3.10.1 Half Split Method

This method depends on finding Pearson correlation coefficient between the means of odd rank questions and even rank questions of each field of the questionnaire. Then, correcting the Pearson correlation coefficients can be done by using Spearman Brown correlation coefficient of correction. The corrected correlation coefficient (consistency coefficient) is computed according to the following equation:

Consistency coefficient =  $2r/(r+1)$ , where r is the Pearson correlation coefficient. The normal range of corrected correlation coefficient  $2r/(r+1)$  is between 0.0 and + 1.0, as shown in Table No. (3.8). The general reliability for all items equal 0.858, and the significant ( $\alpha$ ) is less than 0.05 so all the corrected correlation coefficients are significance at  $\alpha \leq 0.05$ . It can be said that according to the Half Split method, the dispute causes group are reliable.

**Table (3.8): Split-Half Coefficient method**

No.	Section	person-correlation	Spearman-Brown Coefficient
1	Obstacles accommodated with OR position	0.711	0.831
2	Obstacles accommodated with course objective	0.678	0.808
3	Obstacles accommodated with contents	0.782	0.878
4	Obstacles accommodated with teaching methods	0.757	0.862
5	Obstacles accommodated with assessment methods	0.779	0.876
6	Obstacles accommodated with text book used	0.792	0.884
7	Obstacles accommodated with prerequisites	0.705	0.827
	Total items	0.752	0.858

### 3.10.2 Cronbach's Coefficient Alpha

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach's coefficient alpha value is between 0.0 and + 1.0. The higher values reflect a higher degree of internal consistency. As shown in Table No. (3.9) the Cronbach's coefficient alpha was calculated. The general reliability for all items equal 0.882. This range is considered high; the result ensures the reliability of the questionnaire.

**Table (3.9): Cronbach's Alpha for Reliability**

<b>No.</b>	<b>Section</b>	<b>Cronbach's Alpha</b>
1	Obstacles accommodated with OR position	0.847
2	Obstacles accommodated with course objective	0.860
3	Obstacles accommodated with contents	0.858
4	Obstacles accommodated with teaching methods	0.917
5	Obstacles accommodated with assessment methods	0.892
6	Obstacles accommodated with text book used	0.872
7	Obstacles accommodated with prerequisites	0.872
	<b>Total items</b>	<b>0.882</b>

# **Chapter Four**

## **Data Analysis and Discussion**

**This chapter consists of the following sections:**

- 4.1 Test of Normality**
- 4.2 Discussion and testing**

## 4.1 Tests of Normality

Shapiri-wilk test will be used to identify if the data follow normal distribution or not, this test is considered necessary in case of testing hypotheses as most parametric test that stipulate data to be normally distributed.

Results test as shown in table (4.1), clarifies that the calculated p-value is greater than the significant level which is equal 0.05 (p-value. > 0.05), this in turn denotes that data follows normal distribution, and so parametric Tests must be used.

**Table (4.1): Shapiri-wilk**

No.	Section	Statistic test	P-value
1	Obstacles accommodated with OR position	0.954	0.133
2	Obstacles accommodated with course objective	0.943	0.059
3	Obstacles accommodated with contents	0.968	0.350
4	Obstacles accommodated with teaching methods	0.968	0.364
5	Obstacles accommodated with assessment methods	0.964	0.277
6	Obstacles accommodated with text book used	0.982	0.811
7	Obstacles accommodated with prerequisites	1.061	0.211
	<b>All items</b>	0.970	0.419

## 4.2 Discussion and testing

In the following tables a one sample t test is being used, to test if the opinion of the respondent in the content of the sentences are positive ( weight mean greater than "60.0%" and the p-value less than 0.05) or the opinion of the respondent in the content of the sentences are neutral ( p- value is greater than 0.05) or the opinion of the respondent in the content of the sentences are negative (weight mean less than "60.0%" and the p-value less than 0.05) .

### 4.2.1 The first field: Obstacles accommodated with OR position

#### 1. Is there an obstacle facing OR teaching in universities accommodated with OR position?

To answer this question a one sample t test was used for the opinion of the respondents about Obstacles accommodated with OR position, the results shown in Table No. (4.2) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.2): Obstacles accommodated with OR position**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	Type of the position makes students pay less concern to OR.	4.19	0.616	83.78	11.736	0.000	1
2	The variation of the position according to different faculties rules the students concern according to their faculty.	4.08	0.682	81.62	9.639	0.000	2
3	Faculties where OR is elective don't give much attention to OR.	3.95	0.705	78.91	8.162	0.000	3
4	Teacher isn't a professional in this field as OR is only elective in their faculty.	3.46	1.016	69.18	2.750	0.009	4
5	Teacher scientific weakness in mandatory.	3.16	0.834	63.24	1.183	0.245	5
	<b>All items</b>	3.77	0.545	75.35	8.572	0.000	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (1) the weight mean equal " 83.78%" and p-value equal " 0.000" which is less than 0.05, that means (Type of the position makes students pay less concern to OR). It seems to be normal as students give more attention to the required course that deals with type of science in their different faculties, this agrees to the findings of (Darby, 2006), that students pay less attention to the elective courses, and this leads to the say that (Čibej, 2002) was right to say that these courses introduce generalists not specialists.
- b) In item No. (2) the weight mean equal " 81.62%" and p-value equal " 0.000" which is less than 0.05, that means (The variation of the position according to different faculties, rules the students concern according to their faculty). It seems that this result is an extension to the previous result that the type of the position makes students pay less concern to OR.
- c) In item No. (3) the weight mean equal " 78.91%" and p-value equal " 0.000" which is less than 0.05, that means (Faculties where OR is elective don't give much attention to OR), and this will be confirmed in the following two statements as teachers agree that faculties offer unspecialized teachers that are probably weak in the field of OR. The researcher attributes this to the view of these faculties to OR in the best case as a minor non-core in their studies.

- d) In item No. (4) the weight mean equal " 69.18%" and p-value equal " 0.000" which is less than 0.05, that means (Teacher isn't a professional in this field as OR is only elective in their faculty). This could be linked to the findings in the previous statement that faculties where OR is elective don't give much attention to OR, and this was the view of (Darby, 2006) that one of the reasons of the weakness of elective courses is the lack of professionalism of the teachers themselves and their scientific weakness, this will be confirmed also by the finding of the next statement that agree with this claim.
- e) In item No. (5) the weight mean equal " 63.24%" and p-value equal " 0.000" which is less than 0.05, that means (Teacher scientific weakness in elective course). This would be a normal extension to what has been found so far.

**For general the results for all items of the field show that the average mean equals 3.77, and the weight mean equals 75.35% which is greater than " 60%", and the value of t test equals 8.572 which is greater than the critical value which equals 2.03, and the p- value equal 0.000 which is less than 0.05.**

**This means that there is an obstacle facing OR teaching in universities accommodated with OR position, at a significance level  $\alpha \leq 0.05$ .**

#### 4.2.2 The second field: Obstacles accommodated with course objectives

##### 2. Is there an obstacle facing OR teaching in universities accommodated with course objectives?

To answer this question a one sample t test was used for the opinion of the respondents about obstacles accommodated with course objective, the results shown in Table No. (4.3) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.3): Obstacles accommodated with course objective**

No.	Paragraph	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	Objectives of the course aren't linked to Gaza real life.	3.14	1.182	62.70	0.695	0.491	1
2	Objectives unable to motivate the student.	2.92	0.894	58.37	-0.552	0.584	2
3	Objectives focus on theory rather than application.	3.14	1.294	62.70	0.635	0.529	1
	<b>All items</b>	3.06	0.942	61.26	0.407	0.686	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (1) the weight mean equal " 62.70%" and p-value equal " 0.491" which is greater than 0.05, that means (Objectives of the course are linked to Gaza real life). Despite that some of the teachers talked about the difficulty of performing the written objectives because of the conditions in Gaza. But they still claim that the objectives listed are still appropriate, as they give what they are intended to do in the term of introducing OR to students so far, they also claimed that one course isn't enough to introduce specialists in this field, this claim meets what was said by (Moazeni, 2012). This can be attributed that this was only the viewpoint of the teachers themselves, not the students who will be the side supposed to use OR in their practical life in future, this could be argued that these teachers are professionals in their field and know what's going on in the real life, in the opinion of the researcher this research has to be extended by another research that takes the opinion of graduated students those who problems related to OR in their practical life and under graduated students who still research this course, to be able to judge such argue.
- b) In item No. (3) the weight mean equal " 62.70%" and p-value equal " 0.529" which is greater than 0.05, that means (Objectives able to motivate the student). It seems to be logical as most of these objectives meet what (Gunawardane, 1991) found in the American universities syllables, and found to motivate the American students. One can argue that there would be differences between American students and our local students, but the researcher sees that this is a serious professional field that deals with different circumstances.
- c) In item No. (2) the weight mean equal " 58.37%" and p-value equal " 0.584" which is greater than 0.05, that means (Objectives focus on theory and application at the same level). This is supposed to be a normal extension of the previous findings in this part.

**For general the results for all items of the field show that the average mean equal 3.06, and the weight mean equals 61.26% which is greater than " 60%", and the value of t test equals 0.407 which is less than the critical value which equals 2.03, and the p- value equals 0.686 which is greater than 0.05,**

**This means there is no obstacle facing OR teaching in universities accommodated with course objectives, at a significance level  $\alpha \leq 0.05$ .**

#### 4.2.3 The third field: Obstacles accommodated with course content

### 3. Is there an obstacle facing OR teaching in universities accommodated with course content?

To answer this question a one sample t test was used for the opinion of the respondents about obstacles accommodated with contents, the results shown in Table No. (4.4) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.4): Obstacles accommodated with contents**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	Syllables focus on the cognitive aspects and neglecting life experiences.	3.43	1.144	68.64	2.300	0.027	3
2	Length of the course syllables.	3.54	1.070	70.81	3.074	0.004	2
3	Difficulty of some topics.	4.00	0.972	80.00	6.259	0.000	1
4	Syllables don't take into account individual differences.	3.32	1.107	66.48	1.782	0.083	4
5	Large number of concepts.	2.92	1.164	58.37	-0.424	0.674	6
6	Lack of exercises accompanying curriculum.	2.35	1.086	47.02	-3.634	0.001	7
7	Large number of information per subject.	3.03	1.067	60.54	0.154	0.878	5
	<b>All items</b>	3.23	0.736	64.55	1.883	0.068	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (3) the weight mean equal " 80.00%" and p-value equal " 0.000" which is less than 0.05, that means (Difficulty of some topics). This disagrees partially with the literature (Kemp & Yousef, 1995; Lai et al., 1988; D. Yousef, 2000) that said that such contents would be appropriate with developing countries. It doesn't seem to be a real conflict as this course is given to different students from different faculties and backgrounds, so some topics would be hard to some students; due the difference in the scientific specialization.
- b) In item No. (2) the weight mean equal " 70.81%" and p-value equal " 0.004" which is less than 0.05, that means (Length of the course syllables).
- c) In item No. (1) the weight mean equal " 68.64%" and p-value equal " 0.027" which is less than 0.05, that means (Syllables focus on the cognitive aspects and neglecting life experiences). This can be explained by what was said before that objectives focus on introducing OR, which will produce generalists not specialists, so in

introductions it is normal that cognitive aspects will take more attention in the contents.

- d) In item No. (4) the weight mean equal " 66.48%" and p-value equal " 0.083" which is greater than 0.05, that means (Syllables take into account individual differences moderately ).
- e) In item No. (7) the weight mean equal " 60.54%" and p-value equal " 0.878" which is greater than 0.05, that means (number of information per subject is moderate).
- f) In item No. (5) the weight mean equal " 58.37%" and p-value equal " 0.674" which is greater than 0.05, that means (number of concepts is moderate).
- g) In item No. (6) the weight mean equal " 47.02%" and p-value equal " 0.001" which is less than 0.05, that means (there is no Lack of exercises accompanying curriculum).

**For general the results for all items of the field show that the average mean equals 3.23, and the weight mean equals 64.55% which is greater than " 60%", and the value of t test equals 1.883 which is less than the critical value which equals 2.03, and the p- value equal 0.068 which is greater than 0.05.**

**This means that there is an obstacle facing OR teaching in universities accommodated with course content moderately, at a significance level  $\alpha \leq 0.05$ .**

#### **4.2.4 The fourth field: Obstacles accommodated with teaching methods**

#### **4. Is there an obstacle facing OR teaching in universities accommodated with teaching methods?**

To answer this question a one sample t test was used for the opinion of the respondents about obstacles accommodated with teaching methods, the results shown in Table No. (4.5) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.5): Obstacles accommodated with teaching methods**

<b>No.</b>	<b>Items</b>	<b>Mean</b>	<b>standard deviation</b>	<b>Weight mean</b>	<b>t-value</b>	<b>P-value</b>	<b>Rank</b>
<b>1</b>	Lack of diversification in teaching methods.	3.38	0.982	67.56	2.344	0.025	2
<b>2</b>	Lack of interest of modern education techniques.	3.49	1.017	69.73	2.909	0.006	1
<b>3</b>	Inability of teachers to use modern teaching	3.14	0.976	62.70	0.842	0.405	5

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
	techniques.						
4	Failing to provide teachers with modern teaching techniques.	3.22	0.947	64.32	1.389	0.173	4
5	Universities planning for teaching without taking teachers opinions.	3.32	0.973	66.48	2.027	0.051	3
	<b>All items</b>	3.31	0.663	66.162	2.828	0.008	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (2) The weight mean equal "69.73%" and p-value equal "0.006" which is less than 0.05, that means (Lack of interest of modern education techniques). This was obvious in the survey as most of the universities focused on the traditional teaching method that is lecturing, and this was found to be a worldwide problem after reviewing the literature(Desai & Inman, 1994).
- b) In item No. (1) the weight mean equal " 67.56%" and p-value equal " 0.025" which is less than 0.05, that means (Lack of diversification in teaching methods). This seems to be a normal extension to the fact that lecturing is the dominant teaching method being used.
- c) In item No. (5) the weight mean equal " 66.48%" and p-value equal " 0.051" which is greater than 0.05, that means (Universities planning moderately for teaching without taking teachers opinions).
- d) In item No. (4) the weight mean equal " 64.32%" and p-value equal " 0.173" which is greater than 0.05, that means (Failing to provide teachers with modern teaching techniques moderately).
- e) In item No. (3) the weight mean equal " 62.70%" and p-value equal " 0.405" which is greater than 0.05, that means (Inability of teachers to use modern teaching techniques moderately).

**For general the results for all items of the field show that the average mean equals 3.31, and the weight mean equals 66.16% which is greater than " 60%", and the value of t test equals 2.828 which is greater than the critical value which equals 2.03, and the p- value equal 0.008 which is less than 0.05.**

**This means that there is an obstacle facing OR teaching in universities accommodated with teaching methods, at a significance level  $\alpha \leq 0.05$**

#### 4.2.5 The fifth field: Obstacles accommodated with assessment methods

#### 5. Is there an obstacle facing OR teaching in universities accommodated with assessment methods?

To answer this question a one sample t test was used for the opinion of the respondents about Obstacles accommodated with assessment methods and the results shown in Table No. (4.6) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.6): Obstacles accommodated with assessment methods**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	Using one assessment method to evaluate the student.	3.00	1.130	60.00	0.000	1.000	3
2	Assessment methods are issued according to university policy without teacher involvement.	2.89	1.197	57.83	-0.549	0.586	4
3	Student opinion in assessment methods isn't taken.	3.14	1.228	62.70	0.669	0.508	2
4	Using few assessment methods will be harmful for students.	3.86	1.058	77.29	4.971	0.000	1
	<b>All items</b>	3.22	0.841	64.45	1.612	0.116	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (4) the weight mean equal " 77.29%" and p-value equal " 0.000" which is less than 0.05, that means (Using few assessment methods will be harmful for students). This agrees to the literature of (Pillay, 2014) that depending only on a few assessment methods will be harmful to students.
- b) In item No. (3) the weight mean equal " 62.70%" and p-value equal " 0.508" which is greater than 0.05, that means (Student opinion in assessment methods is taken moderately). It was noticed that this was done by teachers by distributing a questionnaire to the students at the end of the course, to take their opinion about the course, but this still must be investigated by an extension of this research that takes in mind the viewpoint of students.
- c) In item No. (1) the weight mean equal " 60.00%" and p-value equal " 1.000" which is greater than 0.05, that means (Using more than one assessment method to evaluate the student).

d) In item No. (2) the weight mean equal " 57.83%" and p-value equal " 0.586" which is greater than 0.05, that means (Assessment methods are issued according to university policy with teacher involvement).

For general the results for all items of the field show that the average mean equals 3.22, and the weight mean equals 64.45% which is greater than " 60%", and the value of t test equals 1.612 which is less than the critical value which equals 2.03, and the p- value equal 0.116 which is greater than 0.05.

This means that there is an obstacle facing OR teaching in universities accommodated with assessment methods, at a significance level  $\alpha \leq 0.05$ .

#### 4.2.6 The sixth field: Obstacles accommodated with text book used

#### 6. Is there an obstacle facing OR teaching in universities accommodated with text book used?

To answer this question a one sample t test was used for the opinion of the respondents about obstacles accommodated with text book used, the results shown in Table No. (4.7) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.7): Obstacles accommodated with text book used**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	Text books used aren't updated to last versions.	2.97	1.404	59.45	-0.117	0.907	3
2	Text books gathered locally by teachers are weak.	3.35	1.207	67.02	1.771	0.085	1
3	Text books used are from weak authors.	2.24	0.641	44.86	-7.177	0.000	4
4	Teachers don't encourage students for outer reading.	3.14	1.110	62.70	0.741	0.464	2
5	Lack of understanding of the students as a result of the English language of the books.	3.14	1.159	62.70	0.709	0.483	2
	<b>All items</b>	2.97	0.792	59.35	-0.249	0.805	

Critical value of t at df "36" and significance level 0.05 equal 2.03

a) In item No. (2) the weight mean equal " 67.02%" and p-value equal " 0.085" which is greater than 0.05, that means (Text books gathered locally by teachers are weak moderately). It must be differentiated between the notes that are gathered and presented by some teachers as an alternative of official books, either these official

books are written by local or foreign authors. In general it was found in the survey that a few teachers try to gather such notes, so it would not affect significantly on this field of investigation.

- b) In item No. (4) the weight mean equal " 62.70%" and p-value equal " 0.464" which is greater than 0.05, that means (Teachers are encouraging students for outer reading moderately).
- c) In item No. (5) The weight mean equal "62.70%" and p-value equal "0.483" which is greater than 0.05, that means (Lack of understanding of the students as a result of the English language of the books moderately). It seems that that this problem is limited to the courses being taught in English, and would probably have list effect due to the fact that most courses in OR are being taught in Arabic.
- d) In item No. (1) the weight mean equal " 59.45%" and p-value equal " 0.907" which is greater than 0.05, that means (Text books used are updated to last versions). This can be seen realistic; depending on the results of the survey as it is obvious that almost all books used are up to date.
- e) In item No. (3) the weight mean equal " 44.86%" and p-value equal " 0.000" which is less than 0.05, that means (Text books used are not from weak authors).

**For general the results for all items of the field show that the average mean equals 2.97, and the weight mean equals 59.35% which is less than " 60%", and the value of t test equals 0.249 which is less than the critical value which equals 2.03, and the p- value equals 0.805 which is greater than 0.05.**

**This means that there is no obstacle facing OR teaching in universities accommodated with the text book used, at a significance level  $\alpha \leq 0.05$ .**

#### **4.2.7 The seventh field: Obstacles accommodated with OR prerequisites**

#### **7. Is there an obstacle facing OR teaching in universities accommodated with prerequisites?**

To answer this question a one sample t test was used for the opinion of the respondents about obstacles accommodated with prerequisites, the results shown in Table No. (4.8) illustrates the highest to lowest items according to the weight mean as follows:

**Table (4.8): Obstacles accommodated with prerequisites**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
1	OR prerequisites need a good ability to deal with math which makes a problem for students.	3.86	0.948	77.29	5.552	0.000	1

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
2	Not all needed prerequisites are given in all faculties.	3.86	0.887	77.29	5.931	0.000	1
	<b>All items</b>	3.86	0.830	77.29	6.335	0.000	

Critical value of t at df "36" and significance level 0.05 equal 2.03

- a) In item No. (1) the weight mean equal " 77.29%" and p-value equal " 0.000" which is less than 0.05, that means (OR prerequisites need a good ability to deal with math which makes it a problem for students). This could be referred to the nature of algorithms used in OR that needs some skills in math, so math must be given as a mandatory before acquiring OR course.
- b) In item No. (2) the weight mean equal "77.29 %" and p-value equal " 0.000" which is less than 0.05, that means (Not all needed prerequisites are given in all faculties). An excuse could be given to faculties such as engineering, and accounting as students in such faculties are supposed to be good in math due to the nature of science being taught in such faculties.

**For general the results for all items of the field show that the average mean equals 3.86, and the weight mean equal 77.29 % which is greater than " 60%", and the value of t test equals 6.335 which is greater than the critical value which equals 2.03, and the p- value equals 0.000 which is less than 0.05.**

**That means that there is an obstacle facing OR teaching in universities accommodated with prerequisites, at a significance level  $\alpha \leq 0.05$ .**

#### 4.2.8 Analysis of all variables

- **Analyses of all items (Status of operations research education at Gaza strip universities)**

A one sample t test is being used for the opinion of the respondent about status of operations research education at Gaza strip universities; the results for all items are summarized in Table No. (4.9), which shows that the average mean equals 3.31, and the weight mean equal 66.21% which is greater than " 60%", and the value of t test equals 3.841 which is greater than the critical value which is equal 2.03, and the p- value equals 0.000, which is less than 0.05.

**This means that the status of operations research education at Gaza strip universities is acceptable for teachers of this course in the universities of Gaza, at significance level  $\alpha \leq 0.05$ .**

**Table (4.9): Status of operations research education at Gaza strip universities**

No.	Items	Mean	standard deviation	Weight mean	t-value	P-value	Rank
7	Obstacles accommodated with prerequisites	3.86	0.830	77.30	6.335	0.000	1
1	Obstacles accommodated with OR position	3.77	0.545	75.35	8.572	0.000	2
4	Obstacles accommodated with teaching methods	3.31	0.663	66.16	2.828	0.008	3
3	Obstacles accommodated with contents	3.23	0.736	64.56	1.883	0.068	4
5	Obstacles accommodated with assessment methods	3.22	0.841	64.46	1.612	0.116	5
2	Obstacles accommodated with course objective	3.06	0.942	61.26	0.407	0.686	6
6	Obstacles accommodated with text book used	2.97	0.792	59.35	-0.249	0.805	7
	<b>All items</b>	3.31	0.492	66.21	3.841	0.000	

Critical value of t at df "36" and significance level 0.05 equal 2.03

#### 4.2.9 Significance differences among population properties

**8. Is there a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to the academic position, experience, age, profession at significance level  $\alpha \leq 0.05$ ?**

And this hyporesearch is divided into sub-hypotheses as follows:

**8.1-There is a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to the academic position at significance level  $\alpha \leq 0.05$**

To test the hyporesearch we use the one way ANOVA, the results are bieng illustrated in table no. (4.10), which shows that the p-value equals 0.660 which is greater than 0.05, and the value of Fstat =0.537 which is less than Fcritical = 2.89.

This means that there are no statistical significant differences at the level of  $\alpha \leq 0.05$  about the answers of the population in term of the obstacles facing teaching OR in Gaza universities and could be referred to qualifications.

**Table (4.10): One way ANOVA test for differences about the obstacles facing teaching OR in Gaza universities and could be referred to the academic position**

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Obstacles accommodated with OR position	Between Groups	2.611	3	0.870	3.559	0.025
	Within Groups	8.070	33	0.245		
	Total	10.681	36			
Obstacles accommodated with course objective	Between Groups	6.767	3	2.256	2.954	0.047
	Within Groups	25.197	33	0.764		
	Total	31.964	36			
Obstacles accommodated with contents	Between Groups	0.388	3	0.129	0.224	0.879
	Within Groups	19.100	33	0.579		
	Total	19.488	36			
accommodated with teaching methods	Between Groups	0.108	3	0.036	0.076	0.973
	Within Groups	15.699	33	0.476		
	Total	15.808	36			
Obstacles accommodated with assessment methods	Between Groups	0.626	3	0.209	0.277	0.841
	Within Groups	24.847	33	0.753		
	Total	25.473	36			
Obstacles accommodated with text book used	Between Groups	1.317	3	0.439	0.680	0.570
	Within Groups	21.285	33	0.645		
	Total	22.601	36			
Obstacles accommodated with prerequisites	Between Groups	1.030	3	0.343	0.476	0.701
	Within Groups	23.794	33	0.721		
	Total	24.824	36			
All items	Between Groups	0.405	3	0.135	0.537	0.660
	Within Groups	8.293	33	0.251		
	Total	8.698	36			

Critical value of F at df "3, 33 " and significance level 0.05 equal 2.89

**8.2- There is a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to the experience at significance level  $\alpha \leq 0.05$**

To test the hyporesearch we use the one way ANOVA, the results illustrated in table no. (4.11) Shows that the p-value equals 0.849 which is greater than 0.05, and the value of Fstat = 0.339 which is less than Fcritical = 2.67.

That means that there is no statistical significant differences at the level of  $\alpha \leq 0.05$  in term of the obstacles facing teaching OR in Gaza universities and could be referred to the experience.

**Table (4.11): One way ANOVA test for differences about the obstacles facing teaching OR in Gaza universities and could be referred to the experience**

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Obstacles accommodated with OR position	Between Groups	1.821	4	0.455	1.645	0.187
	Within Groups	8.860	32	0.277		
	Total	10.681	36			
Obstacles accommodated with course objective	Between Groups	3.130	4	0.782	0.868	0.494
	Within Groups	28.834	32	0.901		
	Total	31.964	36			
Obstacles accommodated with contents	Between Groups	1.071	4	0.268	0.465	0.761
	Within Groups	18.417	32	0.576		
	Total	19.488	36			
accommodated with teaching methods	Between Groups	0.456	4	0.114	0.238	0.915
	Within Groups	15.352	32	0.480		
	Total	15.808	36			
Obstacles accommodated with assessment methods	Between Groups	1.406	4	0.352	0.467	0.759
	Within Groups	24.067	32	0.752		
	Total	25.473	36			
Obstacles accommodated with text book used	Between Groups	1.300	4	0.325	0.488	0.744
	Within Groups	21.302	32	0.666		
	Total	22.601	36			
Obstacles accommodated with prerequisites	Between Groups	0.331	4	0.083	0.108	0.979
	Within Groups	24.493	32	0.765		
	Total	24.824	36			
All items	Between Groups	0.354	4	0.088	0.339	0.849
	Within Groups	8.344	32	0.261		
	Total	8.698	36			

Critical value of F at df "4, 32 " and significance level 0.05 equal 2.67

**8.3-There is a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to age at significance level  $\alpha \leq 0.05$**

To test the hyporesearch we use the one way ANOVA, the result illustrated in table no. (4.12) shows that the p-value equals 0.191, which is greater than 0.05, and the value of Fstat = 1.674 which is less than Fcritical = 2.89.

That means that there is no statistical significant differences at the level of  $\alpha \leq 0.05$  about answers of the population in term of the obstacles facing teaching OR in Gaza universities and could be refer to the age.

**Table (4.12): One way ANOVA test for differences about the obstacles facing teaching OR in Gaza universities and could be referred to the age**

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Obstacles accommodated with OR position	Between Groups	1.181	3	0.394	1.367	0.270
	Within Groups	9.500	33	0.288		
	Total	10.681	36			
Obstacles accommodated with course objective	Between Groups	4.021	3	1.340	1.583	0.212
	Within Groups	27.943	33	0.847		
	Total	31.964	36			
Obstacles accommodated with contents	Between Groups	4.434	3	1.478	3.240	0.034
	Within Groups	15.054	33	0.456		
	Total	19.488	36			
accommodated with teaching methods	Between Groups	0.798	3	0.266	0.584	0.629
	Within Groups	15.010	33	0.455		
	Total	15.808	36			
Obstacles accommodated with assessment methods	Between Groups	3.223	3	1.074	1.594	0.210
	Within Groups	22.250	33	0.674		
	Total	25.473	36			
Obstacles accommodated with text book used	Between Groups	1.379	3	0.460	0.715	0.550
	Within Groups	21.222	33	0.643		
	Total	22.601	36			
Obstacles accommodated with prerequisites	Between Groups	0.226	3	0.075	0.101	0.959
	Within Groups	24.598	33	0.745		
	Total	24.824	36			
All items	Between Groups	1.149	3	0.383	1.674	0.191
	Within Groups	7.549	33	0.229		
	Total	8.698	36			

Critical value of F at df "3, 33 " and significance level 0.05 equal 2.89

**8.4-There is a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to profession at significance level  $\alpha \leq 0.05$**

To test the hyporesearch we use the one way ANOVA, the results illustrated in table no. (4.13) shows that the p-value equals 0.299 which is greater than 0.05, and the value of Fstat = 1.274 which is less than Fcritical = 2.89.

That means that there is no statistical significant differences at the level of  $\alpha \leq 0.05$  in term of the obstacles facing teaching OR in Gaza universities and could be refer to profession.

**Table (4.13): One way ANOVA test for differences about the obstacles facing teaching OR in Gaza universities and could be referred to the profession**

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Obstacles accommodated with OR position	Between Groups	1.960	3	0.653	2.472	0.079
	Within Groups	8.721	33	0.264		
	Total	10.681	36			
Obstacles accommodated with course objective	Between Groups	2.006	3	0.669	0.736	0.538
	Within Groups	29.958	33	0.908		
	Total	31.964	36			
Obstacles accommodated with contents	Between Groups	0.076	3	0.025	0.043	0.988
	Within Groups	19.413	33	0.588		
	Total	19.488	36			
accommodated with teaching methods	Between Groups	1.946	3	0.649	1.544	0.222
	Within Groups	13.862	33	0.420		
	Total	15.808	36			
Obstacles accommodated with assessment methods	Between Groups	1.688	3	0.563	0.781	0.513
	Within Groups	23.785	33	0.721		
	Total	25.473	36			
Obstacles accommodated with text book used	Between Groups	6.471	3	2.157	4.413	0.010
	Within Groups	16.130	33	0.489		
	Total	22.601	36			
Obstacles accommodated with prerequisites	Between Groups	1.258	3	0.419	0.587	0.628
	Within Groups	23.567	33	0.714		
	Total	24.824	36			
All items	Between Groups	0.903	3	0.301	1.274	0.299
	Within Groups	7.795	33	0.236		
	Total	8.698	36			

Critical value of F at df "3,33 " and significance level 0.05 equal 2.89

# **Chapter Five**

## **Conclusion and Recommendation**

**This chapter consists of the following sections:**

- 5.1 Introduction**
- 5.2 Findings**
- 5.3 Conclusion**
- 5.4 Recommendations**
- 5.5 Suggestions for Future Researches**

## **5.1 Introduction**

This research concentrates efforts to explore the obstacles facing OR teaching in Gaza, to achieve the aim of this research that was drawing a view for the status of OR teaching in the universities of Gaza.

This chapter will consolidate the main results of the previous chapters in the light of research problem and objectives and focuses on the conclusion and recommendation of this research.

The conclusion will explain how this research achieves its goals according to the objectives and problem statement. Finally brief recommendations will be directed towards promoting the enhancement of OR teaching. Suggestions obtained would be taken into consideration for future enhancements and implementation.

## **5.2 Findings**

The research investigates the status of OR teaching in the universities of Gaza, and summarizes the following findings based on the data analysis:

### **5.2.1 Obstacles accommodated with OR position**

- a) Teachers agree that the type of the position makes students pay less concern to OR.
- b) Teachers agree that the variation of the position according to different faculties, rules the students concern according to their faculty.
- c) Teachers agree that faculties where OR is elective don't give much attention to OR.
- d) It is being admitted that the teachers chosen to teach OR are mostly not professionals in this field, when OR is an elective course.
- e) Teachers agree to the fact that the teacher of the elective course suffers in most of the cases from scientific weakness in field of OR.
- f) As a result of the previously mentioned findings in this part, it was found that there is an obstacle facing OR teaching in universities accommodated with OR position.

### **5.2.2 Obstacles accommodated with the course objectives**

- a) Teachers see that the objectives of the course are linked to Gaza real life.
- b) Teachers see that the objectives are able to motivate the student.
- c) Teachers see that objectives focus on theory and application at the same level.
- d) As a result of the previously mentioned findings in this part, it was found that there is no obstacle facing OR teaching in universities accommodated with course objectives.

### **5.2.3 Obstacles accommodated with the Course contents**

- a) Teachers admit that there is some difficulty accommodated with some topics.
- b) Teachers admit that the length of the course syllables is an obstacle facing the students.
- c) Most of the teachers see that the syllables focus on the cognitive aspects and neglecting life experiences.
- d) Teachers see that syllables take into account individual differences between students moderately.
- e) Teachers see that the number of information per subject is moderate and acceptable.
- f) Teachers see that the number of concepts is moderate.
- g) Teachers see that there is no lack of exercises accompanying curriculum.
- e) As a result of the previously mentioned findings in this part, it was found that there is an obstacle facing OR teaching in universities accommodated with course content moderately.

### **5.2.4 Obstacles accommodated with the teaching methods**

- a) Teachers agree that there is a lack of interest of modern education techniques.
- b) Teachers also see that there is a lack of diversification in teaching methods.
- c) Teachers moderately agree that universities plan for teaching without taking the teachers opinion.
- d) Teachers moderately agree that universities fail to provide teachers with modern teaching techniques.
- e) Teachers hardly admit that there is a problem accommodated with their ability to use modern teaching techniques, as they moderately agree that there is an inability among teachers to use modern teaching techniques.
- f) As a result of the previously mentioned findings in this part, it was found that there is an obstacle facing OR teaching in universities accommodated with teaching methods.

### **5.2.5 Obstacles accommodated with the assessment methods**

- a) Teachers agree that using few assessment methods will be harmful for students.
- b) Teachers claim that the students' opinion in assessment methods is taken moderately.
- c) Teachers claim that they use more than one assessment method to evaluate the student.
- d) Teachers say that they are being involved in issuing assessment methods under the policy of their universities.
- e) As a result of the previously mentioned findings in this part, it was found that there is a moderate obstacle facing OR teaching in universities accommodated with assessment methods.

### **5.2.6 Obstacles accommodated with the text book used**

- a) Teachers do agree that text books gathered locally by teachers are weak.
- b) Teachers say that they encourage students for outer reading moderately.
- c) Teachers agree that there is a lack of understanding among the students as a result of the English language of the books moderately when the course is being taught in English.
- d) Teachers' claim that the text books used are updated to the last versions.
- e) Teachers say that text books used are not from weak authors.
- f) As a result of the previously mentioned findings in this part, it was found that there is no obstacle facing OR teaching in universities accommodated with text book used.

### **5.2.7 Obstacles accommodated with prerequisites**

- a) Teachers agree that OR prerequisites need a good ability to deal with math which makes it a problem for students.
  - b) Teachers agree that not all needed prerequisites are given in all faculties.
  - c) As a result of the previously mentioned findings in this part, it was found that there is an obstacle facing OR teaching in universities accommodated with prerequisites.
- After manipulating the results of all the variables affecting teaching of OR as a lump sum, it is found that the status of operations research education at Gaza strip universities is acceptable for teachers of this course in the universities of Gaza.

### **5.2.8 significance difference between the means of the answers of the population referred to the academic position, experience, age, profession**

- a) There are no statistical significant differences in term of the obstacles facing teaching OR in Gaza universities and could be referred to academic position.
- b) There are no statistical significant differences in term of the obstacles facing teaching OR in Gaza universities and could be referred to the experience.
- c) There are no statistical significant differences in term of the obstacles facing teaching OR in Gaza universities and could be referred to the age.
- d) There are no statistical significant differences in term of the obstacles facing teaching OR in Gaza universities and could be referred to the scientific profession.

### 5.2.9 Summary of findings

Before answering the questions of this research, a brief summary of the findings about which variables in the viewpoint of teachers had obstacles accommodated with OR teaching and which are not, will be listed in table no. (5.1).

**Table (5.1): findings summary**

<b>Variable</b>	<b>Obstacle occurrence</b>
<b>Course position</b>	Yes
<b>Course objectives</b>	No
<b>Course contents</b>	Yes
<b>Teaching methods</b>	Yes
<b>Assessment methods</b>	Yes
<b>Text book used</b>	No
<b>Prerequisites</b>	Yes

The average mean of the overall results equals 3.31, the weight mean equals 66.21% which is greater than "60%", the value of t test equals 3.841 which is greater than the critical value which equals 2.03, and the p- value equals 0.000, which is less than 0.05.

*This means that the status of operations research education at Gaza strip universities is acceptable for teachers of this course in the universities of Gaza, at significance level  $\alpha \leq 0.05$ .*

### 5.3 Conclusion

The research objectives were achieved. To confirm this conclusion the research questions will be answered.

**First: Is the current status of OR teaching in Gaza acceptable for teachers?**

The status of operations research education at Gaza strip universities is acceptable for teachers of this course in the universities of Gaza.

This conclusion will be explained by the researcher through answering the following questions of the research.

**Second: To answer the first question that is: Is there an obstacle facing OR teaching in universities accommodated with OR position?**

*There is an obstacle facing OR teaching in universities accommodated with OR position.*

In light of the previous results the researcher refers the obstacles in this field from the viewpoint of teachers to their agree about:

- a) The position makes students pay less concern to OR.
- b) The variation of the position according to different faculties, rules the students concern according to their faculty.
- c) Faculties where OR is elective don't give much attention to OR.
- d) Teachers chosen to teach OR are mostly not professionals in this field.
- e) The teacher of the elective course suffers in most of the cases from scientific weakness in field of OR.

**Third: To answer the second question that is: Is there an obstacle facing OR teaching in universities accommodated with course objectives?**

*There is no obstacle facing OR teaching in universities accommodated with course objectives.*

In light of the previous results the researcher refers this from the viewpoint of teachers to their agree about:

- a) Objectives of the course are linked to Gaza real life.
- b) Objectives are able to motivate the students.
- c) Objectives focus on theory and application at the same level.

**Fourth: To answer the third question that is: Is there an obstacle facing OR teaching in universities accommodated with course content?**

*There is an obstacle facing OR teaching in universities accommodated with course content moderately.*

In light of the previous results the researcher refers the obstacles in this field from the viewpoint of teachers to their agree about:

- a) The difficulty of some topics.
- b) The length of the course syllables.
- c) Syllables focus on the cognitive aspects and neglecting life experiences.

This result was found, despite their acceptance in the course content for:

- a) Syllables take into account individual differences moderately.
- b) Number of information per subject is moderate.
- c) Number of concepts is moderate.
- d) There is no Lack of exercises accompanying curriculum.

**Fifth: To answer the fourth question that is: Is there an obstacle facing OR teaching in universities accommodated with teaching methods?**

*There is an obstacle facing OR teaching in universities accommodated with teaching methods.*

In light of the previous results the researcher refers the obstacles in this field from the viewpoint of teachers to their agree about:

- a) Lack of interest of modern education techniques.
- b) Lack of diversification in teaching methods.
- c) Universities planning moderately for teaching without taking teachers opinions.
- d) Failing to provide teachers with modern teaching techniques moderately.
- e) Inability of teachers to use modern teaching techniques moderately.

**Sixth: To answer the fifth question that is: Is there an obstacle facing OR teaching in universities accommodated with assessment methods?**

*There is an obstacle facing OR teaching in universities accommodated with assessment methods.*

In light of the previous results the researcher refers the obstacles in this field from the viewpoint of teachers to their agree about:

- a) Using few assessment methods will be harmful for students.
- b) Student opinion in assessment methods is taken moderately.

This result was found, despite their acceptance in the course content for:

- a) Using more than one assessment method to evaluate the student.
- b) Assessment methods are issued according to university policy with teacher involvement.

**Seventh: To answer the sixth question that is: Is there an obstacle facing OR teaching in universities accommodated with text book used?**

*There is no obstacle facing OR teaching in universities accommodated with the text book used.*

In light of the previous results the researcher refers this from the viewpoint of teachers to their agree about:

- a) Teachers are encouraging students for outer reading moderately.
- b) Text books used are updated to last versions.
- c) Text books used are not from weak authors.

This result was found, despite their acceptance in the course content for:

- a) Text books gathered locally by teachers are weak moderately.
- b) Lack of understanding of the students as a result of the English language of the books moderately.

**Eighth: To answer the seventh question that is: Is there an obstacle facing OR teaching in universities accommodated with prerequisites?**

*There is an obstacle facing OR teaching in universities accommodated with prerequisites.*

In light of the previous results the researcher refers this from the viewpoint of teachers to their agree about:

- a) OR prerequisites need a good ability to deal with math which makes it a problem for students.
- b) Not all needed prerequisites are given in all faculties.

**Ninth: To answer the eighth question that is: Is there a significance difference between the means of the answers of the population about the obstacles facing teaching OR in Gaza universities and could be referred to the academic position, experience, age, scientific profession?**

1) Academic position

There is no statistical significant differences at the level of  $\alpha \leq 0.05$  about the answers of the population in term of the obstacles facing teaching OR in Gaza universities and could be referred to qualifications.

2) Experience

There is no statistical significant differences at the level of  $\alpha \leq 0.05$  in term of the obstacles facing teaching OR in Gaza universities and could be referred to the experience.

3) Age

There are no statistical significant differences at the level of  $\alpha \leq 0.05$  about answers of the population in term of the obstacles facing teaching OR in Gaza universities and could be refer to the age.

4) Scientific profession

That means that there is no statistical significant difference at the level of  $\alpha \leq 0.05$  in term of the obstacles facing teaching OR in Gaza universities and could be refer to the scientific profession.

## **5.4 Recommendations**

In light of results obtained from this research it is recommended:

1. To make students pay more attention to OR course, it is recommended to make it a required course as much as it is possible.
2. Faculties must select specialized teachers to teach OR elective courses.
3. Teachers must try to facilitate some of the topics that seem to be difficult to students.
4. The length of the course must be reviewed by teachers.
5. More focus must be given to practical real life examples during the course.
6. More attention must be paid to modern teaching methods by universities, and teachers.
7. Universities must support teachers with training on modern teaching methods.
8. Universities must involve teachers' opinion more in planning for teaching.
9. Students' opinion must be taken more seriously in assessment methods.
10. Universities should avoid gathered notes and relay more on famous common books in the field of OR.
11. A math prerequisite must be taken before OR course.

## **5.5 Suggestions for Future Researches**

The researcher suggests the following future researches:

1. A research which takes into account students' views must be held to complete the whole picture.
2. A research comparing this research with similar researches in the world would be worthwhile.

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## **List of Annexes**

**Annex 1 Questionnaire in Arabic language (Final Form)**

**Annex 2 Questionnaire in English language (Final Form)**

## Annex 1

### Final questionnaire in Arabic



الجامعة الإسلامية - غزة  
عمادة البحث العلمي والدراسات العليا  
كلية التجارة  
قسم إدارة الأعمال

السيد الفاضل / السيدة الفاضلة  
تحية طيبة وبعد،،،

الموضوع: استبيان

يقوم الباحث بإجراء دراسة للحصول على درجة الماجستير في إدارة الأعمال، بعنوان:

**واقع تدريس بحوث العمليات في جامعات قطاع غزة**

**"وجهة نظر مدرسيها"**

**تحت إشراف: أ.د. يوسف عاشور**

ويمثل هذا الاستبيان أحد الجوانب المهمة للبحث بهدف التعرف على آراء مدرسي مساق بحوث العمليات في جامعات قطاع غزة، حول واقع تدريس المساق، لذلك فقد تم تصميم هذا الاستبيان المرفق لجمع البيانات اللازمة لهذه الدراسة.

يرجى التكرم بتقديم إجاباتكم المحايدة والممثلة لقناعتكم الشخصية، وسوف تعامل هذه الإجابات بالسرية التامة ولن تستعمل إلا لأغراض البحث العلمي فقط.

شاكرا لكم تعاونكم ومؤكدا أن لإجاباتكم تأثيرا مهما في دقة النتائج و تحقيق أهداف الدراسة، ومساعدة الباحث في التوصل إلى نتائج صحيحة ومفيدة.

مع خالص الشكر والتقدير،،،

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## الإستبانة

### الجزء الأول: المعلومات الشخصية

الرجاء اختيار البديل المناسب:

#### • المنصب الأكاديمي:

معيد	محاضر	أستاذ	أستاذ مساعد	أستاذ مشارك

#### • سنوات الخبرة:

5-1	10-6	15-11	20-16	أكثر من ذلك

#### • العمر:

20-30	40-31	41-50	60-51	أكثر من ذلك

#### • التخصص العلمي:

هندسة	اقتصاد	محاسبة	ادارة أعمال	أخرى

الجزء الثاني: جمع معلومات المتغيرات المستقلة للدراسة

الرجاء تعبئة المعلومات المطلوبة:

1.	اسم المساق	
2.	نوع المساق (اجباري/متطلب)	
3.	أهداف المساق	
4.	محتويات المساق	
5.	طرق التدريس	
6.	طرق التقييم	

الكتاب المستخدم	.7
المتطلبات السابقة	.8

الجزء الثالث: المعوقات التي تواجه المتغيرات المستقلة

الرجاء اختيار البديل المناسب:

المعوقات المتعلقة بنوع المساق					
م.	العبرة	أوافق بشدة	أوافق	ربما	معارض بشدة
1.	نوع المساق يؤثر على اهتمام الطلاب بالمساق.				
2.	تغير نوع المساق من كلية لأخرى يحكم اهتمام الطلاب بالمساق تبعاً لکلیتهم.				
3.	الکلیات التي بها مساق بحوث العمليات اختياري تولي أهمية محدودة لهذا المساق.				
4.	عادة ما يكون المدرس غير متخصص في بحوث العمليات في الكليات التي تدرسها على أنها مساق اختياري.				
5.	ضعف مدرس المتطلب الإختياري عادة.				

المعوقات المتعلقة بأهداف المساق					
م.	العبرة	أوافق بشدة	أوافق	ربما	معارض بشدة
1.	عادة ما تكون الأهداف غير مرتبطة مع واقع قطاع غزة.				
2.	الأهداف غير محفزة للطلاب وغير جاذبة للإهتمام.				
3.	الأهداف تركز على النظرية أكثر من التطبيق.				

المعوقات المتعلقة بمحتوى المادة						
م.	العبرة	أوافق بشدة	أوافق	ربما	معارض	معارض بشدة
1.	المحتوى يركز على الجوانب المعرفية والنظرية أكثر من الخبرة العملية.					
2.	طول مدة الساق وكبر حجمه يشكل تحدياً.					
3.	صعوبة بعض المواضيع تزيد تعقيد المادة وبالتالي يجب تبسيطها أكثر.					
4.	المساق لا يؤخذ بعين الإعتبار الفروق الفردية.					
5.	كثرة المفاهيم والمصطلحات.					
6.	قلة التمارين المرافقة للمساق.					
7.	كثرة المعلومات خلال المساق تصيب الطالب بالإرباك وتداخل المعلومات.					
المعوقات المتعلقة بطرق التدريس						
م.	العبرة	أوافق بشدة	أوافق	ربما	معارض	معارض بشدة
1.	قلة التنوع في طرق التدريس.					
2.	قلة الإهتمام بطرق التدريس الحديثة من عروض تفاعلية وغيرها.					
3.	عدم قدرة المدرسين على استعمال طرق التدريس الحديثة، من تعليم الكتروني وتعليم عن بعد..إلخ.					
4.	فشل الكليات في تزويد المدرسين بطرق التدريس الحديثة.					
5.	قيام الجامعات بالتخطيط للعملية التدريسية بدون أخذ آراء المدرسين.					

المعوقات المتعلقة بطرق التقييم						
م.	العبرة	أوافق بشدة	أوافق	ربما	معترض	معترض بشدة
1.	استعمال طريقة واحدة في تقييم الطلاب.					
2.	عملية التقييم تخضع لسياسات الجامعة دون الرجوع للمدرس.					
3.	رأي الطلاب في عملية التقييم غير مأخوذ بعين الاعتبار.					
4.	استعمال طرق قليلة للتقييم سيؤثر على تحصيل الطالب.					

المعوقات المتعلقة بالكتاب المستخدم لتدريس المادة						
م.	العبرة	أوافق بشدة	أوافق	ربما	معترض	معترض بشدة
1.	عدم استخدام النسخ الحديثة من الكتاب.					
2.	الكتب المؤلفة والمجمعة من المدرسين أنفسهم تكون ضعيفة عادة.					
3.	المؤلفين الأصليين للكتب في الأساس غير أكفاء.					
4.	المدرسين لا يحضون الطلاب على القراءة الخارجية.					
5.	عدم فهم الطلاب للكتب نظرا لكونها مكتوبة بالإنجليزية، عند تدريس المساق باللغة الإنجليزية.					

المعوقات المتعلقة بالمتطلبات السابقة للمادة						
م.	العبرة	أوافق بشدة	أوافق	ربما	معترض	معترض بشدة
1.	المتطلبات السابقة تحتاج إلى مهارة في الرياضيات مما يشكل عائق أمام الطلاب.					
2.	لا يتم اعطاء كامل المتطلبات السابقة التي تحتاجها المادة في بعض الكليات مما يصعب المادة على الطلاب.					

**Annex 2**  
**Final questionnaire in English**

**Islamic University – Gaza**  
**Deanery of graduate studies**  
**Faculty of commerce**  
**Department of business administration**



**Questionnaire**  
**Status of operations research education at Gaza**  
**strip universities**  
**"Teachers' viewpoint"**

**Supervised by: Prof. Yousif Ashour**

**Dear Colleagues**

This questionnaire represents an important aspect for the research, in the aim of identifying the opinion of operations research course teachers at Gaza strip universities, about the status of teaching this course, so this questionnaire was designed to collect the needed information for this research.

All data in this questionnaire are confidential and will be used only for the purpose of the academic research. The research results will be available for all parties working in this field.

**Researcher: Mohammed A. El-Otol**

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**Mobile: 059-2652994**

## Questioner

### First part: personal information

Please choose the right answer:

- Academic position:

Assistant professor	Associate professor	Full professor	lecturer	Assistant teacher

- Experience(years):

1-5	6-10	11-15	16-20	More than 20years

- Age(years):

20-30	31-40	41-50	51-60	More than 60

- Scientific major:

Engineering	Business management	Accounting	Economy	Other

Second part: Independent variables data collection

<b>Institution</b>	<b>OR\MS course position</b>	<b>Course name</b>
	<b>Course objective</b>	
	<b>Course contents</b>	
	<b>Teaching methods</b>	
	<b>Assessment methods</b>	
	<b>Text book used</b>	
	<b>Prerequisites</b>	

**Third part: Obstacles facing the independent variables**

<b>Obstacles accommodated with OR position</b>						
<b>#</b>	<b>Paragraph</b>	<b>Totally agree</b>	<b>agree</b>	<b>Maybe</b>	<b>Disagree</b>	<b>Totally disagree</b>
1	Type of the position makes students pay less concern to OR.					
2	The variation of the position according to different faculties rules the students concern according to their faculty.					
3	Faculties where OR is elective don't give much attention to OR.					
4	Teacher isn't a professional in this field as OR is only elective in their faculty.					
5	Teacher scientific weakness in mandatory.					
<b>Obstacles accommodated with course objective</b>						
<b>#</b>	<b>Paragraph</b>	<b>Totally agree</b>	<b>agree</b>	<b>Maybe</b>	<b>Disagree</b>	<b>Totally disagree</b>
1	Objectives of the course aren't linked to Gaza real life.					
2	Objectives unable to motivate the student.					
3	Objectives focus on theory rather than application.					
4	OR importance to the community isn't introduced well to students.					

<b>Obstacles accommodated with contents</b>						
1	Syllables focus on the cognitive aspects and neglecting life experiences.					
2	Length of the course syllables.					
3	Difficulty of some topics.					

4	Syllables don't take into account individual differences.					
5	Large number of concepts.					
6	Lack of exercises accompanying curriculum.					
7	Large number of information per subject.					
<b>Obstacles accommodated with teaching methods</b>						
#	<b>Paragraph</b>	<b>Totally agree</b>	<b>agree</b>	<b>Maybe</b>	<b>Disagree</b>	<b>Totally disagree</b>
1	Lack of diversification in teaching methods.					
2	Lack of interest of modern education techniques.					
3	Inability of teachers to use modern teaching techniques.					
4	Failing to provide teachers with modern teaching techniques.					
5	Universities planning for teaching without taking teachers opinions.					
<b>Obstacles accommodated with assessment methods</b>						
#	<b>Paragraph</b>	<b>Totally agree</b>	<b>agree</b>	<b>Maybe</b>	<b>Disagree</b>	<b>Totally disagree</b>
1	Using one assessment method to evaluate the student.					
2	Assessment methods are issued according to university policy without teacher involvement.					
3	Student opinion in assessment methods isn't taken.					
4	Using few assessment methods will be harmful for students.					
<b>Obstacles accommodated with text book used</b>						
1	Text books used aren't updated to last versions.					
2	Text books gathered locally by teachers are weak.					
3	Text books used are from weak authors.					

4	Teachers don't encourage students for outer reading.					
5	Lack of understanding of the students as a result of the English language of the books, when OR is been taught in English.					
<b>Obstacles accommodated with prerequisites</b>						
1	OR prerequisites need a good ability to deal with math which makes a problem for students.					
2	Not all needed prerequisites are given in all faculties.					