Teaching Mathematics Through Distance Learning In Al- Quds Open University

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Introduction:

Al- Quds Open University (QOU) is a national institution for higher education located in Jerusalem. It enjoys an independent status in academic, financial and administrative affairs. The university provides educational services through adopting distance learning, a mode of university education adopted by other distance education universities.

(QOU) is a pioneer higher education project in the Arab world arising from the principle of democratizing higher education and training for all.

(QOU) attempts to attain the following objectives:

1) Providing opportunities and facilities for higher education and advanced training in Various fields of study, including science and technology, thus meeting the needs of the largest possible number of Palestinian who would be deprived of higher education.
2) Developing students' characters and preparing them for a useful role in the community through encouraging cooperation and training on self- employment projects.
3) Providing continuous education and professional preparation in various applied studies to enable students to play a constructive role in their communities.
4) Supporting local pre-university and university education, as well as training systems, through the production of high quality instructions, printed, audio- visual and computer oriented materials and encouraging educational research.
5) To Initiate and develop public- oriented modes of education appropriate for the exceptional and unexpected future conditions.
6) Conducting basic and applied research directed to the service of the Arabs, particularly the Palestinian community.
7) To Initiate and promote cooperation with Palestinian, Arab, and foreign universities, and similar institutions and international parties.

Open Learning and Distance Education Adopted by (QOU):

Open learning and distance education means in essence, taking education to the work place or residence of interested students instead of requiring them to attend regular classes at the campus.

This method allows students to both study and work at the same time. And by adjusting their chosen study program they can work at a place, which suits their individual circumstances. The underlying aim is to increase productivity and makes better use of human effort and energy.

Mathematics in the (QOU):

Due to the importance of Mathematics in the all fields of knowledge (QOU) offers special courses in mathematics through a program namely education, Mathematics specialization courses.

The General Objectives of these Courses are:

1- To Provide teachers with Mathematical knowledge which help them to teach curriculums in basic classes.
2- To Provide teachers with professional academic efficiency to teach Mathematics such as:

Uno) Discovery of models.

Due) Making conjectures, Generalizations and building arguments to support such situations.

Tre) Building mathematical proofs.

Quattro) Employing thinking models such as (deductive, inductive, critical thinking……..)
Cinque) Making mathematical examples due to special conditions.
Sei) To Perceive the role of mathematics in the development of our contemporary society and explore relationships among mathematics and the disciplines, serving the physical and life sciences, the social sciences, and the humanities.
Sette) Analyzing mathematical problems and solving them.

Mathematics Courses in (QOU):

These Courses are:

1) General Mathematics (3 credit hours)

This course contain a set of academic subjects such as:

Real numbers, Complex numbers, Polynomials, Algebraic functions, Trigonometric functions, Exponential function, Logarithmic function, Inequality and equation.

This course aims:

1- To develop students' Mathematical knowledge and operations on the real and complex number system and on the polynomials.
2- To solve inequalities and equalities.
3- To identify Algebraic, Trigonometric, Exponential functions.
4- To develop Mathematical thinking to solve problems from different systems.

This course considered as a pre-request for later courses and to revise other courses that students studied at school.

2) Calculus I (3 credit hours)

This course contains a set of academic subjects such as:

Limits and continuity, differentiation, Differential Algebraic and non-Algebraic functions. And applied integration, L'hopital's rule, this course aims to:

1- Understand concept of limit and continuity of functions and solve problems related.
2- Understand the concept of the derivative and its geometric meaning.
3- Solve problems and Draw curves for different applications on Derivative.
4- Understand the concept of integration and solve problems.
5- Find the derivative for non-Algebraic Functions.

3) Co-ordinate Geometry (3 credit hours)

This course contains: Cartesian plane, straight line, circle, translation and rotation, parabola, Ellipse, Hyperbola, polar coordinates, parametric, equations, Quadratic surface, cylindrical surface, Cylindrical coordinates, spherical coordinates, sphere, and vectors.

This course aims to:

1- Clarify the concepts of coordinate Geometry and find the equation of straight line, plane, parabola, Ellipse, Hyperbola….etc
2- Solve problems about vectors.

This course is a pre-request for calculus 2.

4) Foundations of Mathematics: (3 credit hours)

This course contains: logic and proofs, functions and relations, sets, and order relation on Real numbers.

This course aims to:

Understand principles of Mathematical logic and use language of mathematics in solving problems of functions and relations and to develop the ability of students in mathematical thinking.

5) Calculus II (3 credit hours)

This course contains: Improper integrals, partial Derivative chain Rule, Multiple integration, Double integrals, and Triple integrals.

The aims of this course are:

1. To know the different kinds of integration.
2. To know concepts of infinite series and convergence and divergence of these series.
3. To find power series for a given function.
4. To carry out multiple integration.

Co-ordinate Geometry is considered a pre-requisite for this course.

6) Theory of Numbers: (3 credit hours)

This course contains: Peano axioms on Natural Numbers (IN), Operations on (IN), Prime numbers, greatest common divisor (G.C.D) , least common multiple (L.C.M), fundamental Theorem of Arithmetic (F.T.A), Fermat's theorem, Wilson's theorem , Euler's theorem, and Pythagorean equations.

The aims of this course are:

1. Using Peanos' axioms to find the properties of Multiplication and addition on integers.
2. Using (F.T.A) to find (G.C.D) and (L.C.M).
3. Solving Diophantine equations.
4. Finding proof of the division rules of integers from 2-11.
5. Finding proof of Wilson's, Euler's and Fermat's theorem.
6. Finding Pythagorean triangles under special conditions, fundamental Mathematics is a pre-requisite for this course.

7) Applied Statistics: (3 credit hours)

This course contains:

Principles of statistical Analysis, Models of Regression, Testing Hypotheses, Estimation of proportion, Estimation of variance Analysis of Variance, and The Non parametric methods.

This course aims to:

1. Use procedure of statistics to compare between two means or variance for two different populations.
2. Use analysis of variance to solve real problems.
3. Use Non parametric Tests.

8) Differential Equations: (3 credit hours)

This course contains:

- Solutions of Differential Equations from first, second and upper order.
- Solutions of series for second order differential equations.
- Systems of first order differential equations.

This course aims to:

Recognize kinds of differential equations with applications.

9) Linear Algebra: (3 credit hours)

This course contains: linear equations and matrices, vector space, Linear transformations, Matrix theory, Linear system, Eigenvalues and Eigenvectors.

This course aims to develop the ability of students to:

1. Work with matrices.
2. Define fundamental properties for operations on matrices.
3. Solve systems of linear equations.
4. Solve systems of differential equations.
5. Work with determinants.

6. Define vector space and carry out addition.
7. Recognize linear transformations and solve problems.
8. Find Eigenvalues and Eigenvectors.
9. Recognize sufficient conditions for a Diagonalizable matrix to be like a square matrix.

10) Euclidean Geometry: (3 credit hours)
This course contains: Mathematics structure for Euclidean Geometry, Congruence, Parallel, Similarity, Area, Equivalent, Circle, Lines and Planes in the space.
Upon completing this course, students should be able to:
1. Recognize Axiomatic Systems.
2. Discuss Axioms of Euclidean Geometry.
3. Recognize Geometric proof and write the right proofs.
4. Employ Deductive method in solving Geometric problems.
5. Recognize the importance of Euclidean Geometry in daily life.

11) Probability: (3 credit hours)
This course contains: Probability function and some rule of Probabilities, Random Variables, some of probability distributions, Convergence in probability.
Upon completing this course, students should be able to:
1. Recognize the concepts of probability.
2. Solve problems on Moment Generating Functions, Correlation, Probability of Events related to given distributions, find dependent variables.
3. Recognize different models of distributions.
4. Recognize convergence in probability and use this model to solve problems included.

12) Vector Analysis: (3 credit hours)
This course contains:
Ordinary integral of vector valued function of one variable, line integral, Volume integral, Surface integral, and Applied vector analysis.
Upon completing this course, students should be able to:
1. Recognize concepts of vectors and application from Euclidian and space Geometry.
2. Recognize concept of ordinary integral of vector valued function of one variable.
3. Calculate partial Derivative for vector function in many variables.
4. Prove Stocks, Gauss, and Green theorems.
5. Understand concepts of Orthogonal Curvilinear Coordinates.

Calculus II is a prerequisite for this course:
13) History of Mathematics: (3 credit hours)
This course contains a description of the different systems (Babylonian, Egyptian, Indian, Roman) Numbers, Arabian Moslem Mathematics, European Mathematics in the old period.

14) Abstract Algebra: (3 credit hours)
This course contains binary operations on Groups, Homomorphism , Isomorphism of Groups, Fields and rings, Cyclic Groups, and Normal Groups.
Upon completing this course students should be able to:
1- Recognize Mathematical Groups.
2- Recognize cyclic, Isomorphism, Homomorphism Group and use them in building new Groups.
3- Recognize some Algebraic structures such as rings, fields, and their properties.
4- Recognize the importance of the Group in fields and rings.

The theory of numbers is a pre-requisite for this course:

15) Elementary Numerical Analysis: (3 credit hours)

This course contains principles of Elementary Numerical Analysis and solving Non-linear equations with one variable, Direct and indirect methods to solve the Non-linear equations, Approximation, Interpolation, Numerical Integration.

Upon completing this course, students should be able to:

1- Understand the Numerical Analysis and Recognize it's importance in solving practical problems.
2- Analyze Numerically and improve problem solutions.
3- Solve linear and non-linear equations and computer applications.
4- Predict the result of Mathematical operations by interpolation and approximation.

Students use the computer during training to solve some Numerical Analysis problems, using Basic, Bascal, or Fortran, so the introduction of programming and calculus II are prerequisites for this course.

16) Introduction to General Topology: (3 credit hours)

This course contains:

Neighborhood system, axioms of disjoint, continuity, compact.

Upon completing this course, students should be able to:

1- Understand topological space.
2- Recognize the subspace for a topology and it's role in generating the topological space.
3- Recognize axioms of continuity and disjointness.
4- Recognize the compact space.

Real Analysis is a prerequisite for this course.

Method of teaching and evaluation:

(QOU) has adopted distance education which is based on self-learning and learner's autonomy utilizing printed and audio-visual media made available by recent massive progress in instructional communication and information technologies.

(QOU) employs an appropriate multi-media approach such as videocassettes, audio cassettes, computers and study packages. But the main medium used is the printed materials produced in the form of books accompanied by assignments.

These materials are meant to provide learners with good and effective teaching.

In the following paragraph we shall discuss the printed materials:

1- Text book "hand book"

It's prepared in house in accordance with a set of regulations and controls included in (QOU)'s writing materials handbook prepared by the writers themselves.

The handbook includes internationally recognized patterns of material preparation and development characteristic of distance education, such as presentation, students' participation, guided dialogue and student-centered techniques.

The handbook accompanied by two kinds of assignments, in text-questions (i.e. self-assessment questions) and course assignments.

Course assignments (Students assignments):

Ranging from two to four assignments depending on the number of credit hours assigned to each course, which is marked by the tutor.

Assignments contain a limited number of objective type questions, some questions requiring short answers and key terms to be defined.

Students are expected to work out written responses which are to be handed in to their tutors who grade and comment on them, then return them to the students within a certain period of time.

Every unit of the textbook has many exercises and essays additional to three or two assessments.

There are two examinations, students are requested to sit for them in order to test their learning throughout the course; the first examination is taken after the first half of the course work while the final examination is given at the end of the course.

Conclusion:

This paper has attempted to raise for thought and discussion the distribution of teaching mathematics in the (QOU) by distance learning. The paper has tried to describe the content, objective procedure and evaluation of mathematics courses at (QOU).

But there are some questions that need answers, these questions are:

1- Are the mathematics courses in (QOU) providing the knowledge and skills that students need for the 21st century?
2- Are they coping with the variety of student demands?
3- Does teaching mathematics by open learning meet the expectations and habits of today's students?
4- Has (QOU) been developing the technologies that have defined the 21st century.
5- Has (QOU) made real evaluation of mathematics courses to inform as to whether or not instruction has been effective.
6- Has (QOU) faced the largest possible number of students.