

Beirut Arab University
Faculty of Science
Department of Mathematics and Computer
Science

Mathematics

Comprehensive Exam Guidelines

Exam Time: 9:00 AM- 12 noon

Tuesday April 28th, 2015 :

The written exam comprises both general and specialized topics in Mathematics . Specialized topics related to research papers selected by the students and approved by the exam committee, see the exam parts below.

After the written exam, an oral exam date is assigned within two weeks of the written exam where the student presents a report in front of the advisors committee. The final decision is taken based on both the written and oral exams.

General Part:

Algebra is one of the broad parts of mathematics . It is the study of symbols and the rules for manipulating symbols and is a unifying thread of almost all of mathematics.

The topics covered in this regard are: theory of groups, subgroups, permutation groups, normal subgroups, quotient groups, homomorphisms, cyclic groups, rings, integral domains, fields. Matrices, Gauss elimination method, invertibility,

Recommended Textbook(s):

- 1- *I.N HERSTEIN Topics in algebra*
- 2- *H. Anton, Elementary Linear Algebra*

Analysis analysis is a branch of mathematics that includes the theories of differentiation, integration, measure, limits, series, and analytic functions. These theories are usually studied in the context of real and complex numbers and functions.

- 1- Real, Complex and Functional Analysis :

Topics covered in this regard are: : Sequence of Real Functions, Riemann Integrals, Continuity and Uniform Continuity, Interchanging Limits with Integrals, Cauchy Riemann equations and harmonic functions, Complex integration & Residue theorem, Contour integration, Evaluation of definite integrals by means of residues. Bounded and unbounded Linear Operators, Norm of Linear Functionals, Banach Spaces, Hilbert Spaces, Hahn-Banach Theorem, Principle of Uniform Boundedness, Inverse Mapping Theorem, Riesz Representation Theorem, Dual Spaces, L^p spaces.

Recommended Textbook(s):

- 1- *H. L. Royden Real Analysis*
- 2- *W. Rudin, Real and Complex Analysis*

Topology is the mathematical study of shapes and topological spaces. It is an area of mathematics concerned with the properties of space that are preserved under continuous deformations including stretching and bending, but not tearing or gluing.

The topics covered in this regard are: Point set topology, Construction of Topologies and examples, Coursest and Finest topologies, Open, Closed sets, Interior Points, Limit Points, Compact Sets, Continuous and Open maps, Homeomorphisms, Basis and Sub basis, Product Topology, Separation Techniques, Topologically and Path-wise connected spaces

Recommended Textbook(s):

J.M MUNKERS Topology

Specialized Part:

Prior to the written exam, the students should meet with their advisor committee assigned by the department to specify the prospective area of research where the students are intending to prepare the PhD thesis. The committee assigns some research papers related to the students' specialization. The specialized part of the written exam is designed to examine the student in the assigned papers.