

ABDUS SALAM SCHOOL OF MATHEMATICAL SCIENCES  
GC University Lahore

DIPLOMA FOR ACADEMIC EXCELLENCE IN MATHEMATICS.

Abdus Salam School of Mathematical Sciences (ASSMS) will organize during academical year 2008-2009 a series of lectures in main topics of contemporary mathematics.

These lectures will be accordant with the actual state of mathematical research and will offer many examples and applications. They will be delivered by professors with great experience in research and teaching as well. Also, they will give to the national participants the possibility to exchange ideas and experience with renowned specialists in respective fields. The lectures will equally offer to participants the opportunity to obtain informations in their area of interest, to ask questions and receive answers, to express openly their opinion and exchange experience.

The schedule of a typical day at these courses will contain a two hours lecture followed by a two hours session of problem solving. The lectures will give intensive information but they are equally open to any open discussion or proposals coming from participants. Independent work hours where interesting problems have to be solved will be organized.

During the academic year 2008-2009, ASSMS will organize lectures on the topics: ALGEBRA, GEOMETRY and MATHEMATICAL ANALYSIS. For each topic we will have three sessions. The first session will be organized in the month of October, November and December, respectively. The second session will be organized in the second semester of the academic year 2008-2009 and the third session in the first semester of the year 2009-2010. The participants whose aim is to obtain the DIPLOMA FOR ACADEMIC EXCELLENCE IN MATHEMATICS have to take part successfully in at least two courses of the same topic.

The program for the first session is the following:

## Topic A. ALGEBRA

**Thursday, 23 October 2008.** Groups and permutations. (Dr. Mircea Becheanu)

**Friday, 24 October 2008.** Matrices, rings of matrices. Determinants.(Dr. Mircea Becheanu)

**Saturday, 25 October 2008.** Systems of linear equations.(Dr. Tiberiu Dumitrescu)

**Monday, 27 October 2008.** Vectors spaces, linear transformations and their matrices.(Dr. Tiberiu Dumitrescu)

**Tuesday, 28 October 2008.** Groups of matrices. Classifications of linear transformations.(Dr. Mircea Becheanu)

**Wednesday, 29 October 2008.** Euclidean vector spaces. Symmetric forms and orthogonality. Isometries.(Dr. Mircea Becheanu)

**Thursday, 30 October 2008.** Eigenvalues, eigenvectors and invariant subspaces.(Dr. Tiberiu Dumitrescu)

**Friday, 31 October 2008.** Jordan canonical form of a matrix. Existence.(Dr. Tiberiu Dumitrescu)

**Saturday, 1 November 2008.** Jordan canonical form of a matrix.Unicity and computation methods.(Dr. Mircea Becheanu)

**Monday, 3 November 2008.** Hermitian forms and the spectral theorem.(Dr. Mircea Becheanu)

**Tuesday, 4 November 2008.** Normal operators. Spectral theorem for normal operators.(Dr. Tiberiu Dumitrescu)

**Wednesday, 5 November 2008.** Evaluation of the participant contributions.(Dr. Mircea Becheanu and Dr.Tiberiu Dumitrescu) The lectures, problem sessions and independent work hours in this topic will be directed by Dr. Mircea Becheanu, Dr. Tiberiu Dumitrescu and Dr. Cristodor Ionescu.

## References

Serge Lang: Algebra

Serge Lang: Introduction to Linear Algebra

Michael Artin: Algebra

Peter Halmos: Finite dimensional vector spaces

Peter Lax: Linear Algebra.

## Topic B. GEOMETRY

**Monday, 10 November 2008.** Elementary geometry. Affine plane and affine space. Euclidean plane and euclidean space. (Dr. Mircea Becheanu)

**Tuesday, 11 November 2008.** Convex geometry. Convex sets and convex functions. Theorems of Jensen, Helly, Caratheodory.(1)(Dr. Barbu Berceanu)

**Wednesday, 12 November 2008.** Elementary geometry. Geometric figures: lines, planes in the space, triangles, polygons, circles and their geometry. (Dr. Mircea Becheanu)

**Thursday, 13 November 2008.** Convex geometry. Convex sets and convex functions. Theorems of Jensen, Helly, Caratheodory.(2)(Dr. Barbu Berceanu)

**Friday, 14 November 2008.** Transformation groups. General linear group. Affine transformations. Isometries.(1)(Dr. Barbu Berceanu)

**Saturday, 15 November 2008.** Transformation groups. General linear group. Affine transformations. Isometries.(2)(Dr. Catalin Gherghe)

**Monday, 17 November 2008.** Plane curves and space curves. Bezout theorem on plane algebraic curves. Frenet frame. (Dr. Catalin Gherghe)

**Tuesday, 18 November 2008.** Fundamental group of a topological space  $\pi_1(X, x_0)$ . The covering  $\mathbb{R} \rightarrow S^1$ . (Dr. Barbu Berceanu)

**Wednesday, 19 November 2008.** Space curves. Global properties: isoperimetric inequality, total curvature, Jordan's theorem. (Dr. Catalin Gherghe)

**Thursday, 20 November 2008.** Fundamental group. Van Kampen theorem. Knots. (Dr. Barbu Berceanu)

**Friday, 21 November 2008.** Global theorems for curves. Fary-Milnor theorem. (Dr. Catalin Gherghe)

**Saturday, 22 November 2008.** Evaluation of the participant contributions.

The lectures, problem sessions and independent work hours in this topic will be directed by Dr. Barbu Berceanu, Dr. Mircea Becheanu and Dr. Catalin Gherghe.

## References

M.Berger: Geometry

M.do Carmo: Differentiable Geometry of Curves and Surfaces

M.Berger and B.Gostiaux: Differential Geometry

M.Hatcher: Algebraic Topology

P.Lax: Linear Algebra.

## Topic C. MATHEMATICAL ANALYSIS

**Thursday, 4 December 2008.** Foundation of the system of real numbers. (Dr. Georgi Karadzhov)

**Friday, 5 December 2008.** Continuity. Special properties of continuous functions defined on intervals. (Dr. Alexander Meskhi)

**Saturday, 6 December 2008.** Sequences and series. (Dr. Georgi Karadzhov)

**Thursday, 11 December 2008.** Differentiable functions. The theorems of Fermat, Rolle, Lagrange and Cauchy. L'Hospital rule. (Dr. Oleg Reynov)

**Friday, 12 December 2008.** Taylor formula. Taylor and Maclaurin expansions. (Dr. Alexander Meskhi)

**Saturday, 13 December 2008.** Convex functions. (Dr. Alexander Meskhi)

**Monday, 15 December 2008.** Riemann integrability of regular functions. The fundamental theorem of integral calculus. (Dr. Alexander Meskhi)

**Tuesday, 16 December 2008.** Integral inequalities. (Dr. Constantin Niculescu)

**Wednesday, 17 December 2008.** Darboux criterion of integrability. Weyl's ergodic theorem. (Dr. Constantin Niculescu)

**Thursday, 18 December 2008.** The Euler-Maclaurin formula and the computation with accuracy of sums and integrals. (Dr. Constantin Niculescu)

**Friday, 19 December 2008.** The recurrent sequences as dynamical systems. Construction of elementary functions. (Dr. Constantin Niculescu)

**Saturday, 20 December 2008.** Evaluation of the participant contributions.

The lectures, problem sessions and independent work hours in this topic will be directed by Dr. Alexander Meskhi, Dr. Constantin Niculescu and Dr. Georgi Karadzhov.

### References

S. Lang: A first course in Calculus

W. Rudin: Real Analysis

S.M. Nikolski: A course in Mathematical Analysis

Tom Apostol: Calculus

R. Courant and Fritz John: Introduction to Calculus and Analysis.