The theory of operator algebras introduced in the thirties by J. von Neumann was developed in close relationship with fundamental aspects of functional analysis, ergodic theory, harmonic analysis and quantum physics.
More recently this field has shown many further fruitful interrelations with other areas of mathematics and mathematical physics.

This school addresses two fundamental aspects of the theory of operator algebras which are interesting in themselves and important in applications: K-Theory for C*-algebras and Modular Theory for von Neumann algebras.

This school aims to train PHD students and young researchers with interdisciplinary interests in mathematics or mathematical physics in some fundamental aspects of operator algebras.
Background: Rudiments of functional analysis, algebra or quantum theory.

Bibliography (some background text books; more specific references will be distributed during the course)

[1] H. Baumgaertel, Operatoralgebraic methods in quantum field theory, Akademie Verlag, 1995.

[2] B. Blackadar, K-Theory for Operator Algebras, Spinger Verlag, 1986

[3] A. Connes (et al. eds), Noncommutative Geometry, Springer Verlag, 2004

[4] M. Rørdam, Classifications of nuclear C*-algebras, Springer Verlag 2002.

[5] M. Rørdam, F. Larsen, N. Laustsen, An introduction to K-theory for C*-algebras. London Mathematical Society Student Texts, 49. Cambridge University Press, Cambridge, 2000.

[6] S. Stratila, Modular Theory in Operator Algebras, Abacus Press, 1981.

[7] V.S. Sunder, An Invitation to von Neumann algebras, Springer Verlag, 1987.

[8] M. Takesaki, Theory of operator algebras. Vols I,II and III, Springer-Verlag, 2002.

[9] N.E. Wegge-Olsen, K-Theory and C*-Algebras. An Introduction, Oxford University Press, 1993

Información, matrículas y becas (plazas limitadas)

SANTANDER 2008

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SCHOOL OF MATHEMATICS «LLUIS SANTALÓ»

Aspects of operator algebras and applications

Pere Ara

Santander
21-25 of July, 2008

Sponsor:

UIMP
Universidad Internacional Menéndez Pelayo

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

SCHOOL OF MATHEMATICS
«LLUIS SANTALÓ»
Aspects of operator algebras and applications

Director
Pere Ara
Universitat Autònoma de Barcelona

Fernando Lledó
Universidad Carlos III de Madrid
RWTH-Aachen University
Francesc Perera
Universitat Autònoma de Barcelona

21-25 of July, 2008

Monday 21

10,00 h Informal overview of C*-algebras and von
Neumann algebras
Fernando Lledó

11,30 h Basics on C*-algebras:
positive elements, functional calculus, K-Theory. Part A
Andrew S. Toms
York University, Toronto

15,30 h Von Neumann algebras and examples. Part B
Fernando Lledó

17,30 h The Cuntz semigroup:
historical origin, essential technical devices. Part A
Francesc Perera

Tuesday 22

9,30 h Hilbert modules and hereditary subalgebras:
Kasparov´s theorem. Part A
Pere Ara

11,30 h Modular theory: definition and main results. Part B
Fernando Lledó

15,30 h The category Cu and its order structure. Part A
Andrew S. Toms

17,30 h Free quantum fields and local quantum theories. Part B
Daniele Guido
Università degli studi di Roma "Tor Vergata", Roma

Wednesday 23

9,30 h Coward-Elliott-Ivanescu´s picture of
the Cuntz semigroup in terms of the category Cu. Part A
Francesc Perera

11,30 h Examples of modular objects. Part B
Fernando Lledó

13,00 h From C*-algebras to von Neumann algebras,
and back. Part C
Nathanial P. Brown
Penn State University

Thursday 24

9,30 h Functorial properties of the Cuntz semigroup:
continuity and half exactness. Part A
Andrew S. Toms

10,15 h Amenability for operator algebras. Part C
Nathanial P. Brown

11,30 h Bisognano-Wichmann relations:
proofs and interpretations. Part B
Daniele Guido

15,30 h Amenability for group actions and exactness. Part C
Nathanial P. Brown

17,30 h Geometric modular action and modular localization.
Part B
Daniele Guido

Friday 25

9,30 h Classification of C*-algebras, or why do we care
about the Cuntz semigroup? Part A
Francesc Perera

11,30 h Hyperbolic groups and their von Neumann algebras.
Part C
Nathanial P. Brown

13,15 h Clousure: open problems

This school is divided in three parts:

Part A: K-theory for operator algebras. Classification of
C*-algebras

Part B: Modular theory for von Neumann algebras and
applications to quantum field theory

Part C: Amenability, hyperbolic groups and operator algebras

Part C provides connections between part A (C*-algebras) and
part B (von Neumann algebras)