OPERATOR THEORY

PROF. G. RAMESH
Department of Mathematics
IIT Hyderabad

PRE-REQUISITES :   Functional Analysis

INTENDED AUDIENCE : M. Sc Mathematics II Year students and Ph. D first year students

COURSE OUTLINE :

In this course, we aim to study the spectral theory of normal operators and continuous functional calculus. We begin with the introduction of Hilbert space and study bounded operators on these spaces. More often we compare the results on operators with operators on finite-dimensional Hilbert spaces (or matrices). In this way, we study the spectrum and its properties, spectral theorem for compact normal operators which is a generalization of finite-dimensional operators. The further generalization is the spectral theorem for normal operators.

ABOUT INSTRUCTOR :

Prof. G. Ramesh completed his Ph. D (Operator Theory) from IIT Madras in 2008 and did Post Doctoral studies at ISI Bangalore, Bengaluru during 2009-2010 and worked as an Assistant Professor at Hyderabad University till June 2011. In 2011 July, he joined as an assistant professor in IUT Hyderabad. Currently, he is an Associate Professor at IIT Hyderabad. His area of specialization is Functional Analysis and Operator Theory

COURSE PLAN :
Week 1: Review of Hilbert space Theory , Bounded operators on Hilbert spaces, examples
Week 2: Adjoint an operator, examples, Self-adjoint, normal, positive, unitary, isometries, partial isometries
Week 3: Orthogonal projections with examples, invariant subspaces, numerical range and characterization of operators
Week 4: Banach Algebras, inertibility, spectrum
Week 5: Gelfand-Mazur theorem, spectral radius formula, spectral mapping theorem.
Week 6: Subdivion of the spectrum of an operator, properties of the various spectra
Week 7: Computing spectrum with examples
Week 8: Existence of square root, polar-decomposition.
Week 9: Compact operators, properties
Week 10: Spectral theorem for compact self-adjoint operators, spectral theorem for compact normal operators, Schmidt-decomposition, Monotone convergence theorem for self-adjoint operators
Week 11: Spectral theorem for self-adjoint operators, continuous functional calculus, spectral theorem for self-adjoint operators(multiplication form)
Week 12: Spectral theorem for normal operators (both integral and multiplication form), continuous functional calculus for normal operators.