INSTRUCTOR:
Nihat Gökhan Göğüş

TIMETABLE:
Wednesday 8.40-11.30 (may change)

CONTACT:
ngogus@sabanciuniv.edu, phone: 216 483 9615

ASSESSMENT:
Participation

PRE-REQUISITIES:
A graduate course in complex analysis (Rudin, Real and Complex Analysis) and preferably functional analysis (Conway, Functional Analysis)

PRINCIPAL TEXTBOOK:

PROGRAMME

- Review of analytic functions. Review of analytic functions on the unit disk $D$, Blaschke products.
- Introduction to the Hardy space. Harmonic and subharmonic functions, Poisson integral, Littlewood’s subordination theorem, the Hardy space $H^p(D)$ on $D$, the Nevanlinna class $N$.
  - Properties of the $H^p$ spaces. Imbedding into $L^p(T)$, boundary values.
  - Factorization of $H^p$ functions. Inner and outer functions, F. and M. Riesz theorem.
- Banach spaces. Banach spaces, Hilbert spaces, bounded linear operators, spectrum, invariant subspaces, the shift operator, Beurling’s theorem.
- Singular inner functions. Structure of singular inner functions, closed invariant subspaces of $H^2$.
  - Outer functions. Structure of outer functions.

The following are possible topics to continue. I am planning to choose according the taste and interest of the course participants.

- $H^p$ as a linear space. Representation of linear functionals and extremal problems.
  - Interpolation theory. Carleson’s theorem.
- $H^p$ spaces over general domains. Jordan and Smirnov domains, multiply connected domains.
  - The corona theorem. Maximal ideals.
- Composition operators. Basic properties of composition operators on $H^p$, compactness and invertibility of the composition operators.
- Spectra of composition operators. Eigenvalues and eigenvectors, spectra of composition operators.
  - More on composition operators. Topics will be determined in class.
- Toeplitz operators. Basic properties of Toeplitz operators, matrix representations, product of Toeplitz operators.
- Spectral structure. The spectral inclusion theorem, the Coburn alternative, spectra of self-adjoint Toeplitz operators and Toeplitz operators with continuous symbols.