Fourier analysis in phase space

Professor Jens Marklof (Bristol)

There is a beautiful mathematical world hidden underneath the humble Fourier transform, connecting the representation theory of the symplectic group with important applications in the analysis of PDE, number theory, quantum mechanics and signal processing. This introductory course is aimed at postgraduate students from a broad mathematical background, requiring few prerequisites beyond the standard foundational undergraduate lectures.

Topics to be covered include:

1. Fourier integrals and pseudodiGerential operators
2. Oscillatory integrals and stationary phase
3. Symplectic geometry and Hamiltonian dynamics
4. Heisenberg group and Schrödinger representation; Stone-von Neumann theorem
5. The Shale-Weil representation of the metaplectic group
6. Bargmann representation and Fock space
7. Poisson summation, theta functions and Gauss sums
8. Semiclassical measures and Egorov's theorem; quantum ergodicity