Speaker: **Jan Wingenbach**

Title: **Non-Hermitian Physics in Polariton Condensates in Semiconductor Microcavities**

Place: **Seminar room (915)**

Abstract:

Exciton polaritons are hybrid light-matter quasiparticles that exhibit intriguing properties due to strong light-matter interaction. They can be generated in semiconductor microcavity systems where they arise from the superposition of exciton and photon states. Large exciton binding energies in microcavity systems enable condensation under sufficient optical excitation even at high temperatures. Unlike Bose-Einstein condensates, exciton polariton condensates form in non- equilibrium due to limited polaritonic lifetime.
The non-linearity of polariton condensates has attracted significant attention as they exhibit new non-linear phenomena, such as the generation and trapping of quantized vortices in reservoir-induced potential landscapes. While non-linear effects under Hermitian description are inherently reversible, their description in a non-Hermitian framework enables new insights into non-linear phenomena in open and closed systems exposed to gain and loss. One consequence of the non-Hermitian formalism is the emergence of exceptional points, i.e., square- root-shaped eigenvalue singularities, at which two or more eigenvalues and their eigenvectors coincide, leading to a variety of counterintuitive phenomena. Their topology allows switching betweenthe eigenstates of the system by encircling the singularity. Their square-root dependent eigenvalue splitting leads to increased sensitivity, making them promising candidates for a new generation of sensors.
We will show that exciton-polariton condensates, due to their non-linearity and non-equilibrium nature, provide a perfect platform to study both non-linear effects and non-Hermitian phenomena likeexceptional points.
