

Oral Qualifying Exam Syllabus

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Major Topic: Control Theory

Linear systems in discrete and continuous time.

Minimum-norm control of time-varying linear systems.

Sufficient accessibility rank condition.

Feedback stabilization of LTI systems. Pole-shifting.

Unstable and stable modes.

Control-Lyapunov functions for LTI systems.

Realization theory for linear systems.

Observers and detectability. Dynamic feedback.

Continuous-time dynamic programming, Hamilton-Jacobi-Bellman equation.

Optimal control of LQ systems.

Optimal control using the Maximum Principle.

Minor Topic: Asymptotics

Asymptotic series. Asymptotics of solutions of linear differential equations.

Asymptotic expansion of integrals: Watson's Lemma, Laplace's method, method of steepest descent, method of stationary phase.

Perturbation methods, asymptotic matching.

Boundary layer theory.

Elementary WKB theory.