

14-Week Study Plan on Adaptive Optics and Laser Systems

Weeks 1-2: Foundation in Laser Propagation and Thermal Blooming

Objective: Grasp basic concepts of laser propagation and thermal blooming.

Activities:

- Read “The Theory of Compensated Laser Propagation through Strong Thermal Blooming” and “Linear Analysis of Thermal Blooming Compensation Instabilities in Laser Propagation”.
- Further reading as directed.
- Possible exercise problems.

Weeks 3-4: Introduction to Adaptive Optics and Control Theory

Objective: Understand principles of adaptive optics and basic control theory.

Activities:

- Introduction to Control Theory. Found a control series by Brian Douglas and I see some series by MatLab
- Study “Model-Based Control in Adaptive Optics Systems” and “Active Optics: A New Technology For The Control of Light”.
- Further readings as directed.
- Potential exercise problems

Weeks 5-6: Advanced Control Theory in Optics

Objective: Delve into advanced control theory applications in optics.

Activities:

- Read additional PDFs focusing on control systems in optics. Review “Phase variance and Strehl ratio in adaptive optics”
- Crash course into mathematical modeling?
- Draft more concrete ideas for potential research questions or paper topics.
- Exercise problems/readings

Weeks 6-7: Comprehensive Study of Thermal Blooming

Objective: In-depth understanding of thermal blooming and compensation techniques.

Activities:

- Review “Twenty-Five Years of Thermal Blooming: An Overview” and “Analysis and Modeling of Thermal-blooming Compensation”
- Explore mathematical models used for thermal blooming.
- Explore the relationship between control theory and differential equations (how controls affect the differential equation models and how differential equations and models affect the controls).

Weeks 7-9: Control Theory Applications in Laser Systems

Objective: Understand control theory applications in laser systems.

Activities:

- Focus on sections discussing control theory in laser propagation.
- Study additional resources on laser control systems.
- Develop understanding of laser systems and control mechanisms interaction.
- Begin looking to expand on existing paper(s) and/or models.

Weeks 10-12: Synthesizing Knowledge and Preparing for Paper Writing

Objective: Integrate all concepts and prepare for final paper.

Activities:

- Review notes and summaries.
- Identify interactions between control theory and laser system models.
- Finalize topic and outline for the paper.

Weeks 13-14: Writing the Final Paper

Objective: Write a comprehensive paper incorporating all learned materials.

Activities:

- Draft the paper, integrating insights from studied materials.
- Focus on interplay between control theory and laser system models.
- Revise, proofread, and finalize the paper.
- Stretch goal: if progress was made fast enough and is of high enough quality, look into publishing