

Design Project

This is an opportunity for you to apply your optical design skills in a realistic application of interest to you. This will determine 25% of your final course grade.

Objective: Perform first-order design of an optical system and use Zemax to optimize it to achieve design specifications for image quality and other appropriate specifications. You choose the problem and design specifications, but they must be realistic, nontrivial, and pre-approved.

System Requirements: Your system must have at least two optical elements and you must state and explain a specification for at least the following (and any others unique to your application):

1. wavelength range
2. object and image locations (or distance between object and image, etc.)
3. image size
4. image quality in terms of:
 - a. spot diagrams or amount of 3rd-order aberrations
 - b. image contrast (modulation transfer function)

Required Project Elements: Your final written report must include at least the following:

1. Abstract summarizing the objectives, approach, and results of the project;
2. Description of system objectives and design requirements;
3. Choice of optical materials and justification based on system requirements;
4. First-order design calculations (to determine focal lengths, image size, field of view, etc.)
5. First-order system diagram, showing optical elements, focal points, principal points, nodal points, aperture stop, field stop, entrance pupil, exit pupil, and marginal and chief rays;
6. Printout of your Zemax merit function used for optical optimization (show primary forms if multiple versions are used to achieve optimization);
7. Printouts of spot diagrams and MTFs, and any other plots that help your explanation, to clearly illustrate the optimization procedure and resulting image quality (not every plot you looked at, but sufficient to show a reasonable procedure and achievement of your objectives);
8. Discussion of practicality of your system, any remaining problems in the design, and your thoughts about what will be required to solve them.
9. References for work you used to help guide your solution.

Schedule: The following deadlines must be met...

Proposed project topic submitted via email (2-3 sentence description)
Description of optical specifications (with modified topic if necessary)
First-order design layout with calculations of cardinal points, etc.
Initial image-quality summary (with 1st-order mods if necessary)

Written report

In-class oral report (on assigned date)

Thu, March 19, 5:00 pm

Thu, March 26, 5:00 pm

Thu, April 2, 5:00 pm

Thu, April 9, 5:00 pm

Fri, Apr 24, 5:00 pm

Week of April 27