

# WORCESTER POLYTECHNIC INSTITUTE

## MECHANICAL ENGINEERING DEPARTMENT

### HOMEWORK – Ch02

**COURSE No.:** ME-5304, C'24  
**COURSE NAME:** Laser Metrology and Opt. Nondestructive Testing (NDT)  
<http://www.wpi.edu/~cfurlong/ME-593N>  
**DATE:** 17 January 2024  
**DUE:** 22 January 2024

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**NOTE:** In all solutions, state explicitly every assumption and/or approximation made, explain every procedure, and justify its use. Dimensional analyses are absolutely necessary. All results must be expressed in appropriate units. PLEASE, ALWAYS SHOW ALL WORK, while writing your results only on one side of the sheet(s) of paper; start each problem on a new sheet. *Attach this sheet to your solution. Show your work using a clear and professional style.*

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**PROBLEM 2.1.** Briefly describe what are (a) radiometry; and (b) photogrammetry.

**PROBLEM 2.2.** Describe, in words and also mathematically, the basic principles and laws of operation of (a) a laser source; and (b) a light emitting diode (LED). Also, list and briefly describe the major types of laser sources and LEDs and their fundamental principles of operation.

**PROBLEM 2.3.** Describe, in words and mathematically, the basic principles of operation of lenses based on (a) reflection; (b) refraction; and (c) diffraction.

**PROBLEM 2.4.** Lenses can be designed using continuous and discrete approaches. Describe, in words and mathematically, the basic theory of optical design based on discrete approaches.

**PROBLEM 2.5.** Briefly describe what are (a) optical aberrations; and (b) the major different types of optical aberrations in lenses.

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