Instructions

This document contains the Final Assignment for the course ME-469 Nanoscale Heat Transfer.

This is a **group work** and focuses on two main topics, Nanophotonics and Hydrovoltaics. Each group is expected to submit a written report including:

a) a short, critical analysis of the assigned papers: (i) main findings (ii) methodology (iii) discussion of the underlying physics (iv) controversial aspects (Hint: read not only the paper but also its supplementary information)

b) a report of the two lab experiences on 01.05.2025 and 22.05.2025. This must include the details of the data collection, a presentation and technical discussion of the results. **Note: all group members are expected to participate in the laboratory experiences**.

c) *Full Grade Question*: transfer matrix method code for calculating also absorption.

Any well-commented code-file used for data analysis should be added in Appendix and provided to the TAs.

The **deadline** for the submission of the Final Assignment is 09.06.2025 **at** $23:59h$ **CEST**.

Topic 1: Nanophotonics

Readings:

a) **Nanometre optical coatings based on strong interference effects in highly absorbing media**, Nature Materials volume 12, pages20–24 (2013). *Link*: https://www.nature.com/articles/nmat3443

b) **Resonant light trapping in ultrathin films for water splitting**, Nature Materials volume 12, pages158–164 (2013). *Link*: https://www.nature.com/articles/nmat3477

Modelling [Full Grade Question]: expand the Transfer Matrix Method Code developed in Project 1 to solve also for lossy materials (i.e. non-zero imaginary part of the refractive index) and calculate the absorption of a structure.

Topic 2: Hydrovoltaics

Readings:

a) **Achieving Ultrahigh Voltage Over 100 V and Remarkable Freshwater Harvesting Based on Thermodiffusion Enhanced Hydrovoltaic Generator**, Adv. Energy Mater. 2024, 2400529. *Link*: https://doi.org/10.1002/aenm.202400529