

MECH 6339 Multidisciplinary Design Optimization

Project 3

Due Friday May 13 at 8am in eLearning

200 points

Multi-disciplinary Design Optimization with Three or more Disciplines

You are tasked with solving a multi-disciplinary design optimization (MDO) problem. Here are the requirements:

- Students choose topic and problem to solve (an individual project based on your current work or interests)
- The number of disciplines involved must be greater than or equal to 3
- A hi-fidelity code (e.g.; 3D FEM; CFD analysis, etc) must be used for at least 1 of the disciplines
- Must use surrogate model to represent the hi-fidelity model discipline. Then, perform surrogate-based optimization using this surrogate model.
- Must use optimization under uncertainty (OUU) techniques. In your solution you must show solutions with and without use of OUU techniques and compare the solutions.
- A neatly written, comprehensive report (in AIAA conference paper format) must be presented.

Task 1: Formulate your MDO problem. Present the objective function, design variables, and all constraints. Clearly show all analysis steps required to arrive at your equations in this optimization problem formulation. Further, provide some explanation why you have formulated the problem in this manner.

Task 2: Considering the formulation you chose in Task 1, comment on options for optimization algorithms that are most appropriate to solve this problem. You might consider applicability of the algorithm, computational efficiency versus setup time, etc.

Task 3: Now numerically solve the design optimization problem. Provide a comprehensive summary of the results of the design optimization; note any challenges; note interesting findings.

Task 4: Ensure that all your responses in this assignment are clearly documented in a report format. It is important to prepare a very professional report. Students should use the AIAA conference paper format using the AIAA template. Matlab codes used in the optimization and other supporting calculations (e.g.; spreadsheets) should be submitted as well.