

For NPRE 397, your total grade will be earned through a comprehensive project. It is intended to tie together ideas regarding reactor physics and fuel cycle analysis. This will culminate in an independent analysis of fresh and spent fuel isotopic compositions for current and advanced reactors.

The primary work will be to prepare a database, for use with the Cycamore Reactor model in the Cyclus framework. The database should be in xml, json, or another Cyclus-compatible format. The database should contain fresh fuel compositions and spent fuel compositions for reactors of interest as generated by a depletion-capable code such as Scale/Origen or MCNP/Serpent.

The project will be assessed as independent research work, much like a journal article undergoes peer review. I will be looking for :

- Relevance
- Technical Detail
- Analytic Rigor
- Verifiability
- Clarity
- A Conclusion

This work will consist of three deliverables:

- a work plan,
- a database of fresh and spent fuel compositions,
- and a final report.

1. (10 points) **Work Plan: Due 2017.05.30**

To help establish scope and milestones, the first step of the project will be a work plan. Once you submit this plan, I will respond with feedback and appropriate GitHub issues will be assigned. The plan should meet the following guidelines:

- Minimum 500 words.
- Maximum 1000 words.
- Two columns.
- Reasonable margins.
- 10 pt font or larger.
- State the problem to be approached.
- Motivate the problem, explaining its relevance.
- Summarize the current state of existing data.
- Describe the approach and methods you will take to generate the database.
- Propose a prioritized list of reactor types that will be evaluated.
- For each reactor type, identify references for core design parameters.
- Propose a schedule for the analysis.
- Fully describe the data that will be delivered.

Please arrange at least one short meeting with me before the project plan so that I can help you refine your schedule. I would be happy to provide feedback on a draft of your plan (once) before it is due.

2. (20 points) **Database: Due 2017.08.04** Prepare a database, for use with the Cycamore Reactor model in the Cyclus framework. The database should be in xml, json, or another Cyclus-compatible format. The database should contain fresh fuel compositions and spent fuel compositions for reactors of interest as generated by a depletion-capable code such as Scale/Origen or MCNP/Serpent.

3. (60 points) **Final Report: Due 2017.08.04**

Prepare a final document in the style of a journal article or conference proceedings. It should meet the following guidelines:

- Minimum 3000 words.
- Maximum 10000 words.
- Two columns.
- Reasonable margins.
- 10 pt font or larger.
- State the problem that was approached.
- Motivate the problem, explaining its relevance.
- Comprehensively report and cite the current state of the art in the literature.
- Describe the approach, methods, and other elements of your solution.
- Describe in detail: the analysis, software, data, conclusions produced in this work.
- For each reactor type evaluated, tabulate core design parameters.
- Include publication quality graphs and figures.
- Cite and provide data and code generated for this work sufficient to reproduce the conclusions.
- Compare this result to previous results in the literature, reinforce the relevance of the work.
- Suggest future work.