

I have chosen courses in my program to build a strong foundation in reactor physics, advanced numerical methods, and high-performance computing (HPC), equipping me with the necessary skills to develop efficient, scalable algorithms for deterministic neutron transport and model the highly coupled physics of advanced reactors.

NPRE 555 will give me hands-on experience with neutron transport solvers, helping identify methods suited for optimization and parallelization. NPRE 560, focused on reactor kinetics, is crucial for modeling time-dependent phenomena in advanced reactors, ensuring accurate simulations of advanced reactors.

CS 483 introduces parallel programming, such as how to map computations to parallel hardware. CS 484 builds on this by exploring parallelization frameworks like OpenMP and MPI, vital for HPC applications. Together, these courses will help me design efficient parallel solutions for computationally intensive problems inherent to deterministic neutron transport.

CS 555 and CS 556 provide a strong foundation in numerical methods for solving PDEs and linear systems. CS 555 introduces the Finite Element Method (FEM), a method widely used in computational nuclear engineering. These courses will provide the numerical methods foundation necessary for accurate solutions.

CS 554 focuses on parallelizing numerical algorithms for HPC systems. This course will build on my understanding of linear systems from CS 556 and parallel computing from ECE 408/CS 483. While not specific to GPUs, it will grant insights into designing efficient parallel solvers, necessary for deterministic neutron transport codes.

ECE 508 will introduce me to critical optimization techniques such as problem decomposition and memory management. These are essential for adapting deterministic neutron transport to GPUs, as such methods are typically memory-intensive and GPUs have limited memory resources compared to CPUs.

These courses will provide the technical foundation necessary to address the complexities of neutron transport simulations and reactor modeling. I will be equipped to develop efficient and scalable computational tools for next-generation reactors.