

# 24.536 Reactor Experiments 407.403 Advanced Nuclear Lab

## Reactor Operations Demo and Point Kinetics Simulations

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24.536 Reactor Experiments  
Point Kinetics Simulations & Reactor Operations Demo

(Feb. 2018)

## Discussion Outline

Review from previous class, the “extra” discussion of Point Kinetics for step change in  $\rho$ , and HW#2

### Reactor Operations Demo

We will take a short break after the demo.

### Numerical Solution of IVPs (Euler’s Method)

This will just be a short overview with focus on the Point Kinetics Eqns.

### Solution of the Point Kinetics Equations in Matlab

Done interactively in Matlab -- you can work hands-on if you have Matlab installed on your computer

### Homework #3 (see details in [rexpts\\_hw3sp18.pdf](#))

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## Review: Previous Lecture(s) and HW#2



Any Questions:

**General Operational Control Concepts**

**Reactor Startup Demo**

**Review of Reactor Kinetics and Dynamics**

**Space-Time Kinetics → Point Kinetics**

**The Generation Time Formulation**

**Solution to the Kinetics Eqns. (step change in  $\rho$ )**

$$\rho = \Lambda\omega + \sum_i \frac{\beta_i\omega}{\omega + \lambda_i} \quad \text{and} \quad \frac{P(t)}{P_0} = \frac{P_1}{P_0} e^{\pm t/\tau} \quad \text{and} \quad \frac{P_1}{P_0} = \frac{\beta}{\beta - \rho}$$

**Homework #2** (see details in [rexpts\\_hw2sp18.pdf](#))

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## Interactive Lecture...



Today, **most of the lecture material will be presented interactively:**

With **UMLRR Online**: **Reactor Operations Demo**

With **PC tablet**: **Numerical Solution of IVPs**

With **Matlab**: **Numerical Solution of the Kinetics Eqns.**  
**(with several hands-on examples...)**

Thus, this PowerPoint file is very short --  
and we will go to the **Summary** right now...

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## Summary and Take-Aways



Understand and apply the **analytical solution** to the Point Kinetics Eqn. in various situations.

A good understanding of several typical **operational transients** that can occur **in real systems**.

How to **use Matlab** to numerically simulate some **typical low-power reactor transients...**

**HW #3 (due at usual time on Sunday):**  
**Reactor Operations Demo and Matlab Simulations**  
(see details in [rexpts\\_hw3sp18.pdf](#))