

Differential Equations - Course Study Sheet

Course: Differential Equations Cluster: Mathematics and Quantitative Methods

Models change using first- and higher-order equations, systems, qualitative behavior, and numerical methods.

Five-module course map

Module	Active evidence to produce
1. first-order equations	Explain the central idea, complete an application, diagnose one plausible error, and connect it to the next module.
2. second-order linear equations	Explain the central idea, complete an application, diagnose one plausible error, and connect it to the next module.
3. systems of differential equations	Explain the central idea, complete an application, diagnose one plausible error, and connect it to the next module.
4. phase behavior	Explain the central idea, complete an application, diagnose one plausible error, and connect it to the next module.
5. numerical approximation	Explain the central idea, complete an application, diagnose one plausible error, and connect it to the next module.

Reliable learning method

define state variables, form the equation and conditions, solve or approximate, test the solution, and interpret parameters

Representative application

Model cooling with an initial-value problem and compare the analytic solution with stepwise numerical estimates.

Weekly study cycle

1. Preview the objective and write two questions. 2. Attend or engage and capture decisions rather than every sentence. 3. Reconstruct the main idea within 24 hours. 4. Complete independent practice. 5. Analyze the first unsupported move on each error. 6. Use feedback. 7. Schedule a delayed mixed recheck.

Self-check before moving on

Can you explain the idea without notes, complete a fresh task, detect a near-miss, verify the result, and state a limitation? Watch especially for: finding a general solution but failing to use initial conditions, verify it, or restrict the model domain.

What to save

an initial-value model with solution check, graph, parameter meaning, and limitations

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