

PHYS-E0562 Nuclear Engineering, advanced course

Course staff:

Lecturer: **Jaakko Leppänen**, Research Professor (VTT) / Adjunct Professor (Aalto)¹

Assistant: **Ville Valtavirta**, Senior Scientist (VTT)²

Lecturer (special topic): **Joona Kurki**, Research Team Leader (VTT)

Lecturer (special topic): **Elina Syrjälähti**, Design Engineer (TVO)

Lecturer (special topic): **Janne Heikinheimo**, Senior Scientist (VTT)

Lecturer (special topic): **Jaakko Kuopanportti**, Design Engineer (Fortum)

Schedule:

Lectures: Friday 9:15 – 12:00

Exercises: Tuesday 8:15 – 10:00

1st Mid-term exam: TBD (covers lectures 1 - 6)

2nd Mid-term exam: TBD (covers lectures 7 - 12)

Exam: TBD

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Lecture topics: (preliminary order)

Lecture 1 – Introduction to course topics

Lecture 2 – Deterministic transport theory

Lecture 3 – Monte Carlo simulation

Lecture 4 – Diffusion theory

Lecture 5 – Burnup calculation

Lecture 6 – Basics of heat transfer and coolant flow

Lecture 7 – Spatial homogenization

Lecture 8 – Nodal diffusion methods

Lecture 9 – System-scale thermal hydraulics

Lecture 10 – Nuclear fuel behavior

Lecture 11 – Reactor dynamics

Lecture 12 – Design and simulation of reactor operating cycle

Lecture slides form sufficient course material, but text book:

W. M. Stacey, “Nuclear Reactor Physics”, Wiley, 2001

can be used as support. Excellent on-line material on reactor physics:

<https://www.nuclear-power.net/nuclear-power/reactor-physics/>