Modeling Teachers International
Online Course Catalog

All Modeling Teachers International (MTI) courses are delivered in an online, asynchronous format for practicing high school and first-year university instructors (ages 15-20). Courses can be run over a 4-, 8-, or 16-week period.

MTI 501 Next Generation Modeling for the Classroom I (Model Didactics I)

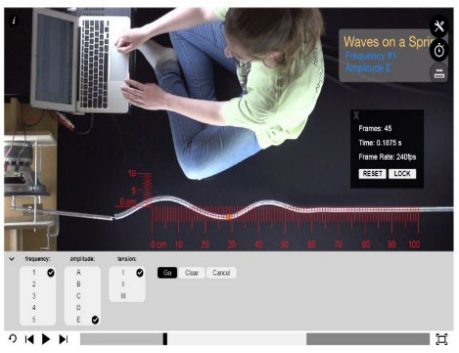
A survey of model theory and contemporary modeling methodology for the science classroom. The course asks: What is a scientific model? How are scientific models developed and used in science? How can model-centered science instruction improve student understanding of the content and nature of science? Topics include models and representations, modeling cycle, large-group white board discussions, and reflective writing. Key concepts and ideas are drawn from introductory mechanics and geometric optics.

MTI 503 Next Generation Modeling for the Classroom II (Model Didactics II)

A continuing review of model theory and model-based inquiry instruction for the science classroom. Topics include advanced classroom modeling techniques, contemporary problems and issues in classroom discourse; eliciting and confronting student pre- and misconceptions, analogical and literal similarity comparisons, thought experiments, model co-construction, and comparative modern learning theory. Key concepts and ideas are drawn from introductory mechanics and geometric optics.

Prerequisite: MTI 501

MTI 601 Numerical Modeling for the Classroom



A survey of numerical modeling for the high school physics classroom with applications for the model-based inquiry classroom. Participants gain practical experience in *Spreadsheet Physics* and *VPython*, and explore the related teaching and research literature. The course ends with a numerical modeling lesson project.

Prerequisite: MTI 501 and 503 (recommended)

MTI 603 Mechanical Wavers for the Classroom

A review of mechanical wave phenomena, model-based inquiry, and the related teaching and research literature. Subject-matter areas include rotational kinematics, spring oscillations, pendulums, wave propagation and interference, resonance, acoustics, and frequency analysis. Additionally, the course examines common student pre-conceptions and misconceptions, classroom technology, and assessment instruments.

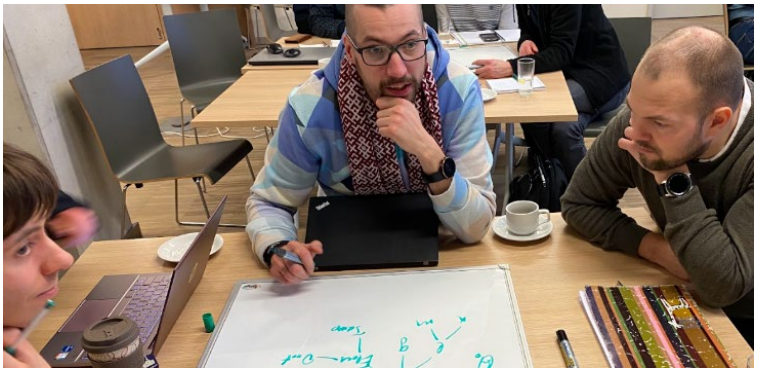
Prerequisite: MTI 501 and 503 (recommended)

MTI 605 Special Relativity and Quantum Mechanics for the Classroom

A survey of the special theory of relativity and non-relativistic quantum mechanics with applications for the model-based inquiry classroom. Key topics include Lorentz transformations, relativistic energy and momentum, free and bound particles, particle scattering, and the hydrogen atom. Additionally, the course examines common student pre-conceptions and misconceptions, classroom technology, and assessment instruments.

Prerequisite: MTI 501 and 503 (recommended)

MTI 607 Electromagnetism for the Classroom



A review of electricity and magnetism, model-based inquiry, and the related teaching and research literature. Key topics include Coulomb's law, electric fields, electric potential energy, DC circuits; Ampere's law of magnetism; Lorentz force; and Faraday's Law of induction. Additionally, the course examines common student pre-conceptions and misconceptions, classroom technology, and assessment instruments.

Prerequisite: MTI 501 and 503(recommended)

MTI 609 Energy, Momentum, and Matter for the Classroom

A survey of energy and momentum concepts in classical and contemporary physics with applications for the model-based inquiry classroom. Key topics include energy conservation, momentum conservation, mass-energy relations, particle scattering, and energy transitions. Special attention is given to the use of system schema, energy pie diagrams, and energy bar diagrams. Additionally, the course examines common student pre-conceptions and misconceptions, classroom technology, and assessment instruments.

Prerequisite: MTI 501 and 503 (recommended)

MTI 701 Particle Physics I for the Classroom

A review of experimental particle physics for the model-based inquiry classroom. Topics include: the special theory of relativity, quantum mechanics, the Standard Model, particle accelerators and detectors, and principles of experimental particle physics.

Prerequisite: MTI 605 (recommended); one-year sequence of university-level introductory physics and one-semester course in modern physics (introductory survey of relativity and quantum mechanics); or, equivalent.

MTI 703 Particle Physics II for the Classroom

A research experience that applies ideas and concepts from Course 600. Teachers gain knowledge and skills in elementary particle physics tools and techniques. The course ends will a research project on charmonium decays using the PANDA $p\bar{p}$ experiment in Darmstadt Germany.

Prerequisite: MTI 701

Modeling Teachers International
Online Course Curriculum Map