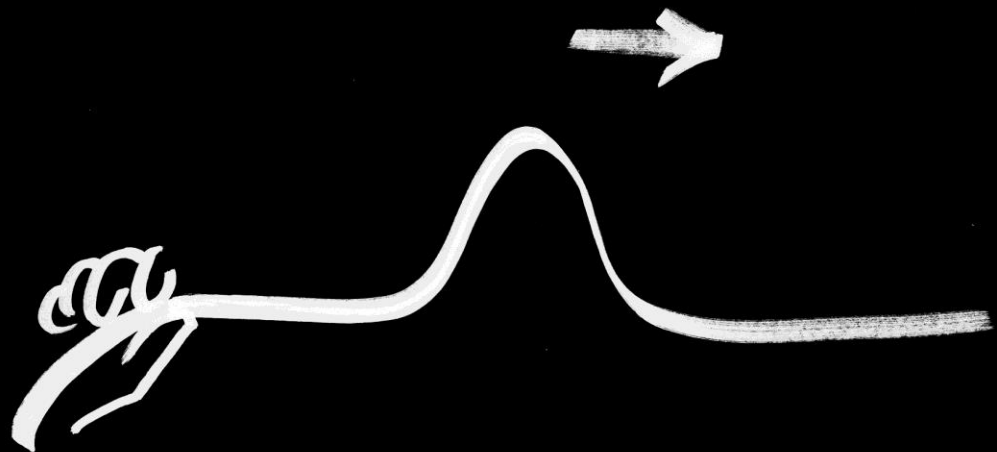


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University of Wisconsin Oshkosh



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Next Generation Modeling Courses for Teachers



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Outline

Introduction

Next Generation Modeling Courses

Pilot Courses (Spring 2018-present)

Questions

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Introduction

Ph.D. in Physics - Particle Physics (University of MN)
M.Ed. – Physics Education (University of MN)

Job Description (Physics Today, Date: Many moons ago)

To teach “UG and graduate courses in Physics and Astronomy, especially those designed for teachers,” and seek “grants for research and support of teacher workshops”

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Need

National

Professional development courses for physics teachers are currently in high demand in the United States (AAEE 2010, NCES 2011, AIP 2014).

Wisconsin

In Wisconsin, over 90% of physics teachers ($N = 78$) report receiving less than 2 hours of “meaningful professional development in physics teaching” through their school districts per year (Lattery 2019).

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Partial solution

Engage Department of Physics/Astronomy resources toward physics teacher professional development. (Don't make the College of Education do all the work for us!)

Physics teacher professional development must be:

- Practical (improve the teaching of their courses)
- Accessible (reduced tuition, online option)
- Effective (anchored to PER, best-teaching practices)

Also on the “wish list”: Professional development should carry incentives such as salary advancement, recognition, equipment stipends, etc.

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Next Generation Modeling Courses

This proposal seeks to create six online graduate-level professional-development courses for physics teachers (grades 10-12):

PHYS CP 500: Modeling and Computation for Teachers (2-3 credits)

PHYS CP 510: Modern Physics for Teachers (2-3 credits)

PHYS CP 520: Electrostatics and Magnetism for Teachers (2-3 credits)

PHYS CP 550: Waves and Applications for Teachers (2-3 credits)

PHYS CP 560: Energy and Matter for Teachers (2-3 credits)

PHYS CP 700: Capstone Project in Modeling for Teachers (3 credits)

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Pilot (2018-present)

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General Features

- PHYS CP (Physics Content Pedagogy) Code
Created/approved by Department (03-27-18)
Approved by Dean and Provost (Fall 18)

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Type of Action Required: Create a new course prefix: PHYS CP (Physics Content-Pedagogy) within the physics curriculum to identify physics content-pedagogy courses designed for physics teacher professional development and certification.

Justification of Proposed Change: The new prefix minimizes confusion with other Physics or Physical Science courses taught within the department. These courses are designed not only to strengthen teacher's physics content knowledge, but also their pedagogical content knowledge. PHYS CP courses will provide a pathway to Higher Learning Commission (HLC) compliance for teachers in the Cooperative Academic Partnership Program (CAPP).

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What is a
“dual enrollment” instructor?

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A **dual enrollment instructor** is a high school instructor credentialed to teach college/university courses for credit at their own high schools.

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Dual-enrollment instructor =
Instructional Academic Staff (IAS)

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Common Question

How do I become a dual enrollment instructor to teach
algebra-based physics for college/university credit?

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Answer

Obtain the endorsement of your local
Department of Physics/Astronomy.

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Answer

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Typical credentials

- Master's Degree in Education (C&I, Educational Leadership, etc.)
- Five years of teaching experience in algebra-based physics
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What does
“in the discipline” mean?

Higher Learning Commission (HLC) Statement*

HLC also recognizes that dual credit faculty members who have obtained a Master of Education degree but not a master's degree in a discipline such as English, Communications, History, Mathematics, etc., may have academic preparation to satisfy HLC's expectations. In this context, the curricula of graduate degrees in the field of Education, when inclusive of graduate-level content in the discipline and **methods courses that are specifically for the teaching of that discipline,** satisfy HLC's dual credit faculty expectations. In other words, the attainment of a Master of Education degree does not demonstrate a qualification to teach dual credit courses in a particular discipline unless it is demonstrated that the content of that faculty member's Master of Education degree is sufficiently related to the discipline of the dual credit course.

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Methods-in-discipline track

Traditional track

College-level algebra based physics
B.S. degree in Education
M.S. degree in Education (Educational Leadership or Science Education)
5 years of teaching experience in algebra-based physics plus an excellent teaching record
Professional Development
Methods-in-discipline courses (18-credits)
Targeted instructional academic staff (IAS)

B.S. degree in Physics
Graduate tutor
M.S. or Ph.D. in Physics
On-campus instructional academic staff (IAS) or TT professor



College/University instructor of algebra-based physics

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a dual-enrollment instructor

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Specific Features

- 2-credit short courses (8 weeks regular semester, 4 weeks summer)
- 1-credit action research project paper (*optional*)
- Fully online (Pivot Interactives, LP, PHET)
- Undergraduate physics content (some calculus)
- Graduate-level physics education content
- Course requirements
 - Physics 171-172
 - Bachelor's degree
 - Teaching certification
- Goals
 - Strength Content Knowledge
 - Research-Based Teaching Practice (PCK, PER, etc)
 - Classroom Technology

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Previous Work – Pilot Courses

	Waves and Apps	Modern Physics	Electrostatics/Mag	Energy Matter
	Spring 2018	Summer 2018	Spring 2019	Summer 2019
Total Registrations	21	21	24	17
Waiting List	0	0	2	0
Early Drops	2	6	6	0
Returning Students	-	10	10	5
Course Completions	19	15	16*	16

Total course completions: 66

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Previous Work – Pilot Courses



Previous Work – Pilot Courses

Course Goals:

To provide high-quality and rigorous physics-teacher professional development that is:

- Accessible
- Practical
- Effective

ASU modeling instruction plus
online virtual laboratories



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Previous Work – Pilot Courses

Participant evaluations (out of 5, mean values)

	Waves and Apps	Modern Physics	Electrostatics/Mag	Energy Matter
	Spring 2018	Summer 2018	Spring 2019	Summer 2019
Appropriately challenging	4.83	4.67	4.50	4.45
Learning a good deal	4.67	4.78	4.50	4.73
Overall effectiveness	5.00	4.89	4.75	4.55

Teacher endorsements
Numbers of returning teachers

Long-term learning assessment measures—underway

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For more information:


**[www.uwosh.edu/phys/
ngmc](http://www.uwosh.edu/phys/ngmc)**

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[Home](#)

[Program Overview](#)

[About Us](#)

[Faculty](#)

[Curriculum Map](#)

[Course Descriptions](#)

[Energy and Matter for Teachers \(Summer 2019\)](#)

[Frequently Asked Questions](#)

[Registration](#)

[Graduate Tuition](#)

[Teacher Comments](#)


[Contact Us](#)

home > for physics teachers

Welcome!

Next Generation Modeling Courses (NGMC) are graduate-level online courses for physics and physical science teachers (grades 6-12) offered through the [University of Wisconsin Oshkosh Department of Physics/Astronomy](#). These professional development courses have four main goals:

- Strengthen subject-matter content knowledge in physics
- Deepen understanding of research-based methods of science teaching; common student learning difficulties; the *Next Generation Science Standards*; and teaching/learning theories in physics education
- Engage teachers in the national conversation about the goals and methods of science teaching through participation in state and national science teaching organizations, local special-interest groups, and action research
- Provide a pathway to Higher Learning Commission (HLC) compliance for teachers in the Cooperative Academic Partnership Program (CAPP)



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Acknowledgements:

- UW Oshkosh Faculty Development Board (sabbatical)
- Peter Bohacek and Dr. Matthew Vonk (Pivot Interactives, UWRF)
- American Modeling Teachers Association
- Wisconsin Association of Physics Teachers
- Physics-teacher participants

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Questions

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**Should physics departments
be sponsoring “graduate level
courses” for physics teachers
with only an algebra-based
physics background?**

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**If physics departments
sponsor “graduate level
courses”, what physics
content level is appropriate?**

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Who can appropriately serve as dual-enrollment instructors (IAS) for the algebra-based physics course in our departments?

- M.S. and Ph.D's in physics?
- B.S./B.A. in physics?
- Experienced/highly recommended instructors w/ algebra-based physics background?

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**Is it the role of physics
departments to provide
physics-teacher professional
development?**