Program Review Document

Preparation Program: *Secondary Physics Education*

Date Submitted: *May 2017*

Certification Level:	☐ B-P ☐ P-5 ☐ 5-9 ☐ 5-12 ☒ 8-12 ☐ P-12	
Preparation Level:	☒ Initial	
Modes of Delivery:	☐ Face-to-Face Only ☐ Online Only ☒ Hybrid	
Degree Type:	☒ Undergraduate ☒ Undergraduate – Cert Only	☐ Graduate (MAT) ☐ Option 6
Program Codes:	**754**	
University Catalog:	https://www.wku.edu/undergraduatecatalog/ http://catalog.wku.edu/graduate/	
WKU Quality Assurance Document:	http://www.wku.edu/cebs/caep/	

SYLLABI: All Professional Education, Methods Syllabi, and a Sampling of Content Area Syllabi are available on the WKU website http://www.wku.edu/cebs/peu/epsb_prds.php.

Program Description

The Physics Education program prepares teachers teach high school physics, physical science, and similar courses. The preparation emphasizes deep understanding in classical as well as modern physics, with students studying major topics at both introductory and advance levels. This program leads to a Bachelor of Science in Physics with a minor in Math, and certification to teach high school physics.
A few initial professional education courses (SMED 101 and 102) are offered in Glasgow. Efforts are underway to extend the offering of these and other SMED courses to Owensboro and Elizabethtown. Content courses are taught exclusively on the main WKU campus.

- **Core Education Courses**

SMED 101. STEP 1: INTRODUCTION TO INQUIRY-BASED APPROACHES TOTEACHING. (3 hrs) Introduction to theory and practice necessary to design and deliver high quality inquiry-based math and science instruction. Students explore and practice the guided inquiry process, create lesson plans and implement them during visits to elementary classrooms. Fieldwork required.

SMED 102. STEP 2: INTRODUCTION TO INQUIRY-BASED LESSON DESIGN.
(3 hrs) Further exploration of inquiry-based learning experiences, developing skills designing, teaching, analyzing, and assessing inquiry-based math and science lessons. Students design lesson plans and implement them during visits to middle school classrooms. Fieldwork required.

SMED 300. MIDDLE GRADES SCIENCE SKILLS AND METHODS. (3 hrs)
Laboratory-based introduction to the science skills and methods needed by middle school teachers.

SMED 301. DESIGNING AND TEACHING INQUIRY-BASED MATHEMATICS AND SCIENCE UNITS. (3 hrs) Develops students' skills in designing, teaching, analyzing, and assessing inquiry-based math and science lessons and units within multiple and diverse field experiences. Fieldwork required.

SMED 310. KNOWING AND LEARNING IN MATHEMATICS AND SCIENCE. (3 hrs) Introduction to theories and principles of cognition and learning with emphasis on knowing and learning in math and science. Introduction to research on learning, memory, individual development, motivation and intelligence. Applications of learning theory will be explicitly tied to design of lesson plans, instruction and assessment.

SMED 320. CLASSROOM INTERACTIONS. (3 hrs) Designed to expand students' abilities to understand how learning theories are applied in instructional settings as students develop, implement and evaluate activities and strategies for teaching diverse students equitably. Fieldwork required.

SMED 340. PERSPECTIVES ON MATHEMATICS AND SCIENCE. (3 hrs) Introduction to the historical, social, and philosophical implications of math and science through investigations of pivotal experiments and findings. Includes integrated laboratory experiences that replicate significant discoveries.

SMED 360. RESEARCH METHODS FOR MATH AND SCIENCE TEACHERS. (3 hrs) Laboratory-based introduction to the tools and techniques used by scientists and mathematicians to further an understanding of the natural world and application of this knowledge to math and science education. Students will design and carry out laboratory investigations, and present written and oral reports of results.

SMED 400. APPLYING MIDDLE GRADE SCIENCE ACROSS DISCIPLINES. (3 hrs) Introduction to the knowledge and skills needed to create middle grades science lessons that incorporate content and real-world examples from different disciplines.

SMED 470. PROJECT-BASED INSTRUCTION. (3 hrs) Methods, techniques, and technologies used to implement and assess problem-based investigations in math and science classrooms. Fieldwork required.

SMED 489. SMED STUDENT TEACHING SEMINAR. (3 hrs) Provides a bridge between the theory and practice of math and science teaching. Methods, techniques, technologies and issues pertinent to math and science instruction in middle grade and secondary classrooms. Field experiences in public schools and/or other appropriate settings away from campus are required.

SEC 490. STUDENT TEACHING. (10 hrs) Must complete a minimum of sixteen weeks in one or two placements depending on certification requirements. Students follow the academic calendar of the school district in which they are placed and are responsible for providing their own transportation to assigned site(s).

- **Core Content Courses**

PHYS 180 – Introductory Modern Physics: Corequisite: PHYS 181 Prerequisite: MATH 117 OR MATH 118 A survey of the physics revolution responsible for laptop computers, fiber optics, and nuclear power. Follows the changes in physical theory from the 1870's through the 1920's, from the geometrical optics and thermodynamics through the theories of relativity and the basic ideas behind quantum mechanics.

PHYS 181 - Intro. Modern Physics Lab: Corequisite: PHYS 180 Prerequisites: MATH 117 or MATH 118 Required for students enrolled in PHYS 180. Laboratory experience focusing on applications of optics, thermodynamics, the structure and behavior of atoms, wavelike properties of particles, and quantization of light, charge and energy.

PHYS 255 – University Physics I: Corequisites: PHYS 256, MATH 227 Prerequisite: MATH 126 with a grade of C or better. This is the first half of a year-long course in calculus-based physics suggested for students in the physical sciences and mathematics. Definitions, concepts and problem solving will be emphasized. Topics include kinetmatics, dynamics, energy, conservation laws, rotation, periodic motion and thermodynamics.

PHYS 256 – University Physics I Lab: Corequisite: PHYS 255 Required for students enrolled in PHYS 255. Students perform physics experiments in mechanics and thermodynamics which stress the fundamental definitions and laws developed in the lecture course. Students gain experience in computerized data acquisition and data analysis using modern techniques and equipment.

PHYS 265 – University Physics II: Corequisites: PHYS 266 Prerequisites: PHYS 255 and MATH 227 both with grades of C or better. This is the second half of a year-long course in calculus-based physics suggested for students in the physical sciences and mathematics. Definitions, concepts, and problem solving will be emphasized. Topics include electricity and magnetism (electric and magnetic fields, forces, energy, potential, charged particle motion, induction, and circuits), sound waves and optics.

PHYS 266 – University Physics II Lab: Corequisites: PHYS 265 Prerequisites: PHYS 255 and MATH 227 Required for students enrolled in PHYS 265. Students perform physics experiments in electricity and magnetism, waves and optics which stress the fundamental definitions and laws developed in the lecture course. Students gain experience in computerized data acquisition and data analysis using modern techniques and equipment.

PHYS 301 – Electrical Measurements Lab: Prerequisites: PHYS 265 and 266. Laboratory experiments in fundamental techniques of electrical measurements. PHYS 302 – Atomic Laboratory: Prerequisite: PHYS 321. Fundamental experiments of historical importance in modern physics.

PHYS 302 - Atomic Physics Laboratory: Prerequisite: PHYS 321. Fundamental experiments of historical importance in modern physics.

PHYS 316 - Computational Physics: Prerequisites: PHYS 265 or permission of the instructor. Use of computers to solve physics problems, model physical systems, and analyze data. Topics include: simulating realistic motion, data analysis, Fourier transform, solutions to Laplace's equation, and Monte Carlo methods

or

PHYS 318 - Data Acquisition using Labview: Prerequisites: PHYS 265 or permission of the instructor. A study of computer assisted measurement and automation techniques. Students receive hands on experience in measuring and controlling physical phenomena through laboratory exercises and projects. Recognized as a LabVIEW Academy course by National Instruments. Offers students the opportunity to become certified LabVIEW associate developers.

PHYS 321 – Intro. Modern Physics II: Prerequisite: Chem 120/121 and Math 237. A study of the quantization phenomena describing the many electron atoms; statistical distribution laws, conductivity, superconductivity and band theory of solids; nuclear structure, nuclear reactions and other selected topics of modern physics.

PHYS 350 – Classical Mechanics I: Prerequisites: PHYS 265. Prerequisites or Co-requisites: MATH 331 and MATH 327. A study of classical mechanics including equations of motion, coordinate systems, the simple harmonic oscillator, damping forces, vector algebra, momentum and energy theorems.

PHYS 398 – Junior Seminar: Prerequisite: PHYS 321 and PHYS 350. Weekly seminar series in current topics in physics. Each student will also prepare for and take comprehensive examination in physics.

PHYS 440 – Electromagnetism 1: Prerequisites: PHYS 350 and MATH 327 and 331. A study of classical electricity and magnetism with emphasis on fields, potentials, conductors, dielectrics, steady currents and radiation.

PHYS 498 – Senior Seminar: Prerequisite: PHYS 398. Weekly seminar series in current topics in physics. Each student will also prepare and give an oral presentation of current research in physics.

- **Supporting Courses**

CHEM 120: COLLEGE CHEMISTRY I – The beginning course in chemistry for science majors and minors. It also can be used for general education requirement. Covering the first half of the standard first year chemistry course, it is recommended that high school chemistry and a strong high school mathematics background precede this course.

CHEM 121: LAB COLLEGE CHEMISTRY I – Laboratory to accompany CHEM 120. One third of each meeting is spent reviewing material from the lecture and the remaining time is used to carry out laboratory investigations. Pre-lab lecture and laboratory meet once each week for three hours per week.

1. INITIAL PREPARATION EARLY FIELD AND CLINICAL EXPERIENCES: The table below delineates the alignment between program courses and the EPSB required categories for early field and clinical experiences.

Course Name	Hours	School Level			EPSB REQUIRED EXPERIENCES CATEGORIES							
		ELEM	MIDDLE	HIGH	a. Engage with diverse students	b. Observe in Family Resource or Youth Services Center	c. Tutor	d. Interact with student families	e. Attend school board	e. Attend school-based council	f. Participate in professional learning community	g. Assist teacher/ other school professionals
SMED 101	30	X			X	X					X	X
SMED 102	30		X		X	X						X
SMED 310	20		X	X	X	X						X
SMED 320	40		X	X	X	X						X
SMED 340	20		X	X	X					X		X
SMED 360	20		X	X	X							X
SMED 470	40		X	X	X		X	X	X		X	X
Total Hours	**200**											

Note: Memorandums of Agreement with P-12 school partners are located under the CAEP Standard 2 link: http://www.wku.edu/cebs/caep/.

2. KENTUCKY TEACHER PERFORMANCE STANDARDS ALIGNMENT: The table delineates how the EPP-wide Initial Preparation Key Assessments, aligned to both Kentucky Teacher Performance and InTASC Standards, are embedded in the program.

KEY ASSESSMENTS					
AREA		**NAME**	**STANDARD ALIGNMENT**		**COLLECTED**
			KTS	**InTASC**	
1	Content Assessment	Praxis II	(1)*	(4,5)	Praxis Report
2	Other Content Assessment	Major GPA	(1)	(4)	Prior to Student Teaching
3	Assessment of Professional Capabilities	Praxis PLT	(2-10)	(1-3,6-10)	Praxis Report
4	Clinical Experiences Measure of Teaching Proficiency	Student Teacher Evaluation	1-10	1-10	SEC 490
5	Measure of Assessment Proficiencies	A: Learning Goals & Pre/Post Assessment B: Analysis of Student Learning	1-3,5-7	1-10	SMED 320
6	Ability to Diagnose and Prescribe for Personalized Student Learning	Design for Instruction	1,2,5,6	1,4-10	SMED 470
7	Application of Content Knowledge and Pedagogical Skills	Teacher Work Sample	1-3,5-7,9	1-10	SMED 489
8	Assessment of Literacy Outcomes	Operational Stance Concerning Content-Area and Discipline-Specific Literacies	1,2,5	1,4-7	SMED 340
9	Dispositions	Dispositions Form	NA	NA	SMED 102, SMED 320, SMED 470, SEC 490
10	KTS Exit Survey	KTS Exit Survey	1-10	1-10	SMED 489

*Assessments are theoretically aligned to standards; however, results cannot be disaggregated into distinct standards for reporting and analysis.

3. COURSE EXPERIENCES ADDRESSING LEARNED SOCIETY SPA STANDARDS: The table below delineates the alignment between program courses and the appropriate SPA standards.

SPA Standard # and Description **National Science Teachers Association**	**Course Alignment**											
	SMED 101	SMED 102	SMED 310	SMED 320	SMED 340	SMED 360	SMED 470	SMED 489	SEC/ MGE 490	SMED 300	SMED 400	
Standard 1: Content Knowledge Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure	X	X	X	X	X	X	X	X	X	X	X	
Standard 2: Content Pedagogy Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students.	X	X	X	X	X	X	X	X	X	X	X	
Standard 3: Learning Environments Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources--including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met.	X	X	X	X	X	X	X	X	X	X	X	
Standard 4: Safety Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom appropriate to their area of licensure	X	X	X	X	X	X	X	X	X	X	X	
Standard 5: Impact on Student Learning Effective teachers of science provide evidence to show that P-12 students' understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach.	X	X	X	X	X	X	X	X	X	X	X	
Standard 6: Professional Knowledge and Skills Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community	X	X	X	X	X	X	X	X	X	X	X	

SPA Standard # and Description **National Science Teachers Association**		Course Alignment											
	PHYS 180	PHYS 181	PHYS 255	PHYS 256	PHYS 265	PHYS 266	PHYS 301	PHYS 302	PHYS 316 or PHYS 318	PHYS 321	PHYS 350	PHYS 440	PHYS 498
Standard 1: Content Knowledge Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
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4. CURRICULUM CONTRACT:

CURRICULUM CONTRACT
Undergraduate Degree Program – B.S., Physics (Reference #754)
Leading to Initial Teacher Certification (Rank III) in Secondary Physics Education, Grades 8-12

Admission Requirements:
To be admitted into this program, candidates must meet all minimal criteria described on the "Transition Points" page under "Transition Point 1: Admission to Education Preparation Programs."

Science/Math Education Component—34 hours	
SMED 101 – Step 1	3 hrs.
SMED 102 – Step 2	3 hrs.
SMED 310 – Knowing & Learning	3 hrs.
SMED 320 – Classroom Interactions	3 hrs.
SMED 340 – Perspectives	3 hrs.
SMED 360 – Research Methods	3 hrs.
SMED 470 – Project-based Instruction	3 hrs.
SMED 489 – Student Teaching Seminar	3 hrs.
SEC 490 – Student Teaching	10 hrs.
Colonnade Plan Component—39 hours	
See WKU catalog website for guidance in selecting appropriate coursework to meet WKU's Colonnade Plan requirements or go to: https://www.wku.edu/colonnade/colonnaderequirements.php	

REQUIRED CORE PHYSICS COURSES (Total = 35 hrs)	
PHYS 180 – Introductory Modern Physics	3 hrs.
PHYS 181 – Introductory Modern Physics Lab	1 hr.
PHYS 255 – University Physics I	4 hrs.
PHYS 256 – University Physics I Lab	1 hr.
PHYS 265 – University Physics II	4 hrs.
PHYS 266 – University Physics II Lab	1 hr.
PHYS 301 – Electrical Measurements Lab	1 hr.
PHYS 302 – Atomic Laboratory	1 hr.
PHYS 316 - Comp Physics or Phys 318 Data Acquisition	3 hrs.
PHYS 321 Intro Modern Physics 2	3 hrs.
PHYS 350 Classical Mechanics I	3 hrs.
PHYS 398 Junior Seminar	0.5 hrs.
PHYS 440 Electromagentism I	3 hrs.
PHYS 498 - Senior Seminar	0.5 hrs.
PHYS____Elective	3 hrs.
PHYS____Elective	3 hrs.
ADDITIONAL REQUIRED COURSES (Total = 23 hrs)	
MATH 136 – Calculus & Analytic Geometry I	4 hrs.
MATH 227 – Calculus & Analytic Geometry II	4 hrs.
MATH 307- Introduction to Linear Algebra	3 hrs.
MATH 237- Multivariable Calculus	4 hrs.
MATH 331- Differential Equations	3 hrs.
CHEM 120 – College Chemistry I	3 hrs.
CHEM 121 – College Chemistry I Lab	2 hr.
Grand Total of Hours	131 hrs.

Mid-Point Assessment Requirements:
To be admitted into the Student Teaching Semester, candidates must meet all minimal criteria described under "Transition Point 2: Admission to Final Clinical Experience."

Program Completion Requirements:
1. To complete a teacher preparation program, candidates must meet all minimal criteria described under "Transition Point 3: Program Exit."
2. Note that additional requirements (described below) must be met in order to be recommended for initial certification.
3. Rules and regulations governing the completion of this program of study have been described above and on the next page. By your signature, you are acknowledging that you understand and accept responsibility for meeting these requirements.

Delineation of EPP-Wide Transition Points – Initial Preparation Program

Transition Point 1: Admission to Education Preparation Programs				
Data Reviewed	***Minimal Criteria***	***Review Cycle***	***Reviewed By***	***Approved By***
Unit Level Data:	***Admission to Teacher Education***			
• Cumulative GPA • CASE test scores • Application to include: – 3 faculty recommendations – Physical (including TB test) – KY criminal background check – Signed KY Code of Ethics	• 2.75+ average or above • Minimum CASE scores required as defined by current state guidelines (demonstrates Critical Thinking and Communication Skills) • 3 positive faculty recommendations (demonstrates their dispositions for teaching indicating their creativity and collaboration skills) • Passing physical • Passing background checks	Each Month	Office of Teacher Services	Professional Education Council
Transition Point 2: Admission to Final Clinical Experience				
Data Reviewed	***Minimal Criteria***	***Review Cycle***	***Reviewed By***	
Unit Level Data	*Successful application to Student Teaching*			
• GPAs and at least 90+ hours completed (including 75% of content courses) • Completion of required field hours • Completion of Key Assessments • Dispositions scores	• 2.75+ GPA (overall, major, minor, and professional education courses); C or higher in all professional education courses • At least 200 hours documented based on requirements of 16 KAR 5:040 • 2+ holistic score; 2+ per KTS measured • All dispositions average "At Standard" (3+)	Each Semester	Office of Teacher Services	Professional Education Council
Transition Point 3: Program Exit				
Data Reviewed	***Minimal Criteria***	***Review Cycle***	***Reviewed By***	
Unit Level Data:	*Program Exit*			
• Candidate student teaching • Teacher Work Sample scores • Dispositions scores	• C or Higher • 2+ holistic score; 2+ per KTS measured • All scores "At Standard" (3+)	Each Semester	Office of Teacher Services	Certification Officer

To be recommended for initial certification, an applicant must document:
Completion of an approved educator preparation program in each desired certification area; Passing score(s) on the appropriate PRAXIS II and PLT exam(s) or other assessments required for each desired certification area; Achievement of at least a 2.75 GPA overall, in each major and minor, and in professional education courses; Attainment of at least a "C" in all professional education courses, including student teaching.

Remediation Opportunities:
TP 1: Candidates may continue to submit Faculty Recommendations until three are positive.
TP 2: Candidates may request additional instruction from faculty and may resubmit Key Assessments in order to improve their scores.
TP 3: Candidates may request additional instruction from faculty and may resubmit the Teacher Work Sample Key Assessment in order to improve their score. Candidates may repeat student teaching.

EPSB Disclaimer: Teacher certification requirements are subject to change. Before registering for the test(s), please refer to the Education Professional Standards Board (EPSB) website at www.epsb.ky.gov for current requirements or contact the Division of Professional Learning and Assessment at 502-564-4606 or toll free 888-598-7667.

By signing below, the candidate ensures that he or she has been advised of, understands, and agrees to adhere to all program requirements, including assessment requirements, of the program.

Candidate Name (printed):

Education Advisor's Signature/Date:

Signature Date

Candidate Signature/Date:

Signature Date

Specialization Advisor's Signature/Date (if needed):

Signature Date

****END OF CURRICULUM CONTRACT****