

# HOOOSIER

# STEM

SCIENCE  
TECHNOLOGY  
ENGINEERING  
MATHEMATICS

# ACADEMY



## Course Catalogue Ball State University Spring 2021

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BALL STATE  
UNIVERSITY

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## **About the Hoosier STEM Academy**

The Hoosier STEM Academy is a partnership among Ball State University, IUPUI, and Purdue University to provide graduate-level STEM courses for current Indiana STEM teachers who wish to be credentialed to teach dual credit courses. Courses are designed specifically to meet the needs of Indiana high school teachers, including courses that use online, blended, and/or distance education instructional designs, as well as traditional face-to-face options. STEM teachers who wish to participate must currently teach in underserved Indiana school corporations and Indiana schools experiencing a shortage of qualified STEM teachers. Participants will also be invited to participate in the Hoosier STEM Academy Mentoring Conference. Upon completion of a course with a grade of C or higher, participants will receive a \$1,375 stipend to help cover the cost of tuition, fees, and/or materials.

The Hoosier STEM Academy is now launching the Spring 2021 course catalog. Instructions for how to apply and register for courses at each of the partner institutions follow the list of offerings. Be sure to read carefully as each campus may have slightly different procedures at this time. Participants may take up to two courses per semester, but may only take a total of 15 hours over the four program semesters. Because graduate courses are challenging, it is suggested that participants take only one course per semester during the academic year.

*Note: Any participant who registers for a course through the Hoosier STEM Academy is responsible for checking with their dual credit provider institution that the course will count toward the dual credit credentials.*

## **Application Process**

### ***Before You Apply***

Students who wish to enroll in one or more courses as a Non-degree Seeking Graduate Student must meet the following admission criteria:

1. Hold an earned bachelor's degree from a college or university that is accredited by its regional accrediting association.
2. Satisfy one of the following:
  - a. An undergraduate cumulative grade point average (GPA) of at least 2.75 on a 4.0 scale (all undergraduate coursework, including work completed prior to the baccalaureate degree, is used to calculate the GPA).
  - b. A cumulative GPA of at least 3.0 on a 4.0 scale in the latter half of the baccalaureate.\*

## **Step 1: Complete the Application**

1. Find information about applying at:  
<https://www.bsu.edu/admissions/graduate/application-process>
2. Read the information, and then click the "apply now" box. (or go to:  
<https://www.bsu.edu/admissions/graduate/application-process> )
  - a. When completing the application, apply as a "non-degree seeking student"
  - b. When prompted, choose the "fee waiver" option at the end of the application process and select the "Con Selmer" fee waiver
  - c. Add the following in the comments field: "Applying as part of the consortium teacher's grant for dual-credit licensure; please waive my application fee."
3. Follow the instructions for submitting your transcripts
4. Ask your school principal to send a letter-confirming that your school is considered underserved and/or is experiencing a shortage of STEM teachers; send letters via email to: Dr. Jill Bradley-Levine, [jsbradleylev@bsu.edu](mailto:jsbradleylev@bsu.edu)
5. In order for applications to be processed and students to register for courses on time. The Graduate School must receive all of your application materials in a timely manner.

## **Step 2: Register for Course(s)**

1. Find information about registering for classes at:  
<http://cms.bsu.edu/academics/advising/scheduling/course-registration>
2. Use the username and password you were sent by the Graduate School to log into [my.bsu.edu](http://my.bsu.edu) (Graduate Students taking online or on-campus classes will receive a username and password (credentials) from the Graduate School within 4-7 days after acceptance. This will be sent to the email address you provided on the graduate application.)
3. Follow steps on the website above to search for and register for a course.
4. Upon registration, students will receive access to their student account and Blackboard online course portal.

\* Nondegree students who later apply to a degree program must meet all entrance requirements of that program and must have maintained at least a 3.0 GPA in their nondegree coursework. No more than 9 hours earned in nondegree status may be applied to an advanced degree program if the person is later admitted as a degree-seeking student. The department in which the student is studying and the dean of the Graduate School will determine which credit hours earned in nondegree status will apply to a degree program. Credit hours must have been completed within the six-year time limit allowed for completion of a master's degree.

### ***Tuition and Fees***

- Tuition and the technology fee for a 3-hour **online course** will be \$1,316 (\$402/credit hour + \$110 technology fee; students taking more than 7 credit hours pay \$168 technology fee)
- Tuition and the technology fee for a 3-hour **on-campus course** will be \$1,783 (\$402/credit hour + \$110 technology fee, \$277 student services fee, \$53 recreation fee, and \$45 transportation fee)
- Lists of required textbooks are available through the Ball State Bookstore; you may purchase or rent texts through the Bookstore: <http://bsu.bncollege.com/> or through other online book sites.
- **Upon completion of a course with a grade of C or better, the Hoosier STEM Academy will send a stipend of \$1,375 to each participant.**
- Also upon completion of a course, students may obtain an official transcript with the course and grade. Official electronic transcripts are \$12; instructions are available here: <http://cms.bsu.edu/about/administrativeoffices/registrar/transcripts/>

### ***Questions***

Please contact Kizmin M. Jones with questions: [kmjones4@bsu.edu](mailto:kmjones4@bsu.edu)

## Ball State University Courses

### Chemistry

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
29265	CHEM	500	1	Main	1	Chemical Communications	T	3:30p.m.-4:20 p.m.	.
42424	CHEM	626	1	Main	3	Advanced Analytical Chemistry	MF	4:00 p.m. – 5:15 p.m.	
27065	CHEM	673	1	Main	1	Seminar in Chemistry	R	3:30 p.m.-4:45 p.m.	Special Permission Required and Variable Title Course Offering

#### **CHEM 500- Chemical Communications**

Use of scientific literature, sources, and classification systems, and current and retrospective searches in the specialized branches of chemistry.

Prerequisite: 20 credits of chemistry or permission of the department chairperson. Not open to students who have credit in CHEM 400.

1.000 Credit hours

#### **CHEM 626 – Advanced Analytical Chemistry**

Survey of modern analytical chemistry. Topics include sampling, wet chemical techniques, nonaqueous systems, and contemporary research and applications in chromatography, spectroscopy, and electrochemistry. Three hours of lecture weekly. Prerequisite: CHEM 225 or equivalent.

3.000 Credit hours

#### **CHEM 673- Seminar in Chemistry**

Critical examination and discussion of recent experimental and theoretical developments in chemistry. Prerequisite: CHEM 400 or 500; permission of the department chairperson. A total of 4 credits may be earned, but no more than 1 in any one semester or term.

1.000 Credit hours

## ***Geology***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
41016	GEOL	602	800	OL	3	Colloquium in Geoscience Research	OL	OL	
42435	GEOL	780	800	OL	3	Geoscience Research Development	OL	OL	Variable Title Course Offering

### **GEOL 602 – Colloquium in Geoscience Research**

Course consists of the discussion of current geoscience research topics. Students will attend research presentations by faculty, visiting scientists, and advanced graduate students. The development of skills in the presentation of the student's own research and the critical review of peer research is an important goal of this course. Prerequisite: graduate standing and the permission of the Graduate Advisor. Open only to graduate students.

3.000 Credit hours

### **GEOL 780 – Geoscience Research Development**

Developing and conducting original geoscience research under the guidance of a research mentor. Prerequisite: permission of the department chairperson. A total of 40 credits may be earned, but no more than 6 in any one semester or term.

1.000 TO 6.000 Credit hours

## ***Mathematics***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	Attribute
42236	MATH	515	1	OL	3	Mathematics of Coding and Communication	OL	OL	

42567	MATH	522	880	OL	3	Theory of Sampling and Surveys	OL	OL	
33292	MATH	570	880	OL	3	Intermediate Analysis	OL	OL	
23474	MATH	621	1	M	4	Theory of Statistics	TR	4:00 p.m.-5:40 p.m.	
42568	MATH	621	800	OL	4	Theory of Statistics	OL	OL	
42439	MATH	623	800	OL	3	Probability, Data Analysis and Statistical Reasoning	OL	OL	
42569	MATH	627	880	OL	3	Generalized Linear Models with Applications	OL	OL	
25572	MATH	631	800	OL	3	Technology for Mathematics Teachers	OL	OL	
42440	MATH	631	801	OL	3	Technology for Mathematics Teachers	OL	OL	

42570	MATH	631	802	OL	3	Technology for Mathematics Teachers	OL	OL	
29347	MATH	693	800	OL	3	Teaching Mathematics through Problem Solving	OL	OL	
38529	MATH	693	801	OL	3	Teaching Mathematics through Problem Solving	OL	OL	
25573	MATH	696	800	Main	3	Action Research in Mathematics Education	OL	OL	Special Permission Required
25731	MATH	697	800	OL	3	Mathematics Teacher Leadership 1	OL	OL	
28057	MATH	680	800	OL	3	Special Studies in the Teaching of Mathematics	OL	OL	
19238	MATH	694	800	OL	3	Research Methods in Mathematics Education	OL	OL	

29330	MATH	694	801	OL	3	Research Methods in Mathem atics Educati on	OL	OL	
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### **MATH 515- Mathematics of Coding and Communication**

Exploration of applications of number theory, group theory and linear algebra to areas such as cryptography and error-correcting codes; applications of graph theory to resource allocation and route planning; other possible topics selected by the instructor. Prerequisite recommended: MATH 215, 217. Not open to students who have credit in MATH 415.

3.000 Credit hours

### **MATH 522 – Theory of Sampling and Surveys**

Survey designs; simple random, stratified, cluster, and systematic sampling; ratio estimates; regression estimates; cost and variance functions.

Prerequisite: MATH 321 or the equivalent. Not open to students who have credit in MATH 422.

3.000 Credit hours

### **MATH 570 – Intermediate Analysis**

Introduction to basic concepts of analysis: the real numbers, sequences, continuous functions, the derivative, and the Riemann integral. Prerequisite recommended: MATH 166 and 215. Not open to students who have credit in MATH 470.

3.000 Credit hours

### **MATH 621 – Theory of Statistics**

Topics from sampling and statistics, estimation theory and tests of hypothesis. Special emphasis on order statistics, quantiles and their applications, classical and Bayesian estimation, sufficiency, completeness, uniqueness, likelihood-based approaches, hypothesis testing based on Neyman-Pearson approach, goodness-of-fit, nonparametric tests, correlation and regression, bootstrapping. Prerequisite: MATH 620 or permission of the department chairperson.

4.000 Credit hours

### **MATH 623 - Probability, Data Analysis and Statistical Reasoning**

Students will select and use appropriate statistical methods to analyze data, develop, and evaluate inferences and predictions that are based on data, and understand and apply the basic concepts of probability. Prerequisite: at least one year of teaching experience or permission of the department

chairperson.

3.000 Credit hours

### **MATH 627 – Generalized Linear Models with Applications**

Methods needed to analyze non-normal data. Topics include exponential family of distributions, an overview of generalized linear models. Models for continuous, discrete, and count data. Prerequisite or parallel: MATH 621 or permission of the department chairperson.

3.000 Credit hours

### **MATH 631 – Technology for Mathematics Teachers**

Modeling, computational, and communication tools used in teaching mathematics. Prerequisite: at least one year of teaching experience or permission of the department chairperson.

3.000 Credit hours

### **MATH 693 – Teaching Mathematics through Problem Solving**

Knowledge and skills for teaching and learning mathematics through problem solving using multiple representations and orchestrating mathematical discourse to promote mathematical reasoning in student-centered mathematics classrooms. Design, select/adapt, and solve worthwhile mathematical tasks to support teaching through problem solving. Prerequisite: at least one year of teaching experience or permission of the department chairperson.

3.000 Credit hours

### **MATH 696 – Action Research in Mathematics Education**

Teachers conduct an action research project in a mathematics classroom and present their findings in a written report. Prerequisite: MATH 694 or permission of the department chairperson.

3.000 Credit hours

### **MATH 697 – Math Teacher Leadership 1**

Development of knowledge and skills for mathematics teacher leadership, with a focus on mathematics coaching. Prerequisite: MATH 690.

3.000 Credit hours

## ***Physics***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
42203	PHYC	565	1	Main	3	Quantum Mechanics	MWF	4:00 p.m. – 4:50 p.m.	

20375	PHYC	683	1	Main	1	Seminar in Physics	R	3:30 p.m.-4:45 p.m.	Variable Title Course Offering
29125	PHYC	685	1	Main	3	Special Studies in Physics	TBA	TBA	Special Permission Required and Variable Title Course Offering

### **PHYC 565 - Quantum Mechanics**

Review of barrier problems, the harmonic oscillator, and angular momentum using matrix methods. Problems involving perturbation theory, one-electron atoms, magnetic moments, spin, relativistic effects, symmetric and anti-symmetric wave functions, the helium atom, transition rates, and scattering theory. Prerequisite: PHYC 464 or 564. Not open to students who have credit in PHYC 465.

3.000 Credit hours

### **PHYSICS 683- Seminar in Physics**

Critical examination and discussion of recent experimental and theoretical developments in physics. Participation in and contribution of a presentation at departmental physics colloquia are expected. A total of 4 credits may be earned.

1.000 TO 4.000 Credit hours

### **PHYSICS 685- Special Topics in Physics: Video Analysis Investigations of Force and Motion**

Special activities in physics involving one or more of the following: experimental work, study of advanced topics in physics, and attendance in prescribed classes. Prerequisite: permission of the department chairperson. A total of 8 credits may be earned.

1.000 TO 8.000 Credit hours