

# HOOOSIER

# STEM

SCIENCE  
TECHNOLOGY  
ENGINEERING  
MATHEMATICS

# ACADEMY



## Course Catalog Ball State University Fall 2021



BALL STATE  
UNIVERSITY

Prepared by Julia Ballain  
[jballain@bsu.edu](mailto:jballain@bsu.edu)  
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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 \$1,400 stipend to help cover the cost of tuition, fees, and/or materials.

The Hoosier STEM Academy is now launching the Fall 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: [here](#)
2. Read the information, and then click the "apply now" box. (or go to [application management](#) )
  - 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: [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 [Ball State Bookstore](#) 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](#)

### ***Questions***

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

## **Ball State University Courses**

### **Biology**

<b>CRN</b>	<b>SUBJECT</b>	<b>COURSE</b>	<b>SECTION</b>	<b>CAMPUS</b>	<b>CREDITS</b>	<b>TITLE</b>	<b>DAYS</b>	<b>TIME</b>	<b>ATTRIBUTE</b>
33476	BIO	628	123	M	1	Readings in Biology	TBA	TBA	Special Permission Required and Variable Title Course Offering
12054	BIO	629	1	M	1	Seminar in Biology	F	4:00 p.m. – 4:50 p.m.	Variable Title Course Offering
30397	BIO	629	115	M	1	Fish Life History	TBA	TBA	Special Permission Required and Variable Title Course Offering
33378	BIO	697	219	M	2	Research in Biology	TBA	TBA	Special Permission Required and Variable Title Course Offering

#### **BIO 628 – Readings in Biology**

Directed readings for majors in biology. Individualized program of readings developed under the supervision of a faculty member. Prerequisite: permission of the department chairperson. A total of 6 credits may be earned.

1.000 TO 6.000 Credit hours

#### **BIO 629 – Seminar in Biology**

Review and discussion of the literature related to selected topics of current interest in biological research. Prerequisite: permission of the department chairperson. A total of 2 credits may be earned toward a Master's degree and a total of 10 credits may be earned toward a doctoral degree, but no more than 1 in any one semester or term.

## **BIO 697 – Research in Biology**

Independent research for biology majors at the master's or doctoral level. Students' research projects must be developed in consultation with a faculty member. As many as 6 credits may be applied toward a master's degree. As many as 12 credits may be applied to a doctoral degree. No more than 3 credits may be taken in one semester. Prerequisite: permission of the department chairperson. A total of 6 credits may be earned for the Master's and 12 credits for the PhD, but no more than 3 in any one semester or term.  
1.000 TO 3.000 Credit hours

## ***Chemistry***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
11860	CHEM	500	1	M	1	Chemical Communications	T	4:00 p.m. – 4:50 p.m.	
22200	CHEM	636	1	M	3	Advanced Organic Chemistry	MF	4:00 p.m. – 5:15 p.m.	Special Permission Required
17453	CHEM	670	3	M	3	Research in Chemistry	TBA	TBA	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 636 – Advanced Organic Chemistry**

Topics include nomenclature, bonding, acids and bases, stereochemistry, structure-reactivity relationships, and mechanisms of important reactions. Introduction to synthesis, the disconnect approach, synthons, protecting groups, and functional group interconversions. Prerequisite: CHEM 232 or 235 or equivalent.

3.000 Credit hours

### **CHEM 670 – Research in Chemistry**

Original work at the molecular level on projects based in the current scientific literature. The projects will be directed by graduate faculty and will typically involve aspects of ongoing research. Prerequisite: permission of the department chairperson. A total of 9 credits may be earned.

1.000 TO 9.000 Credit hours

### ***Computer Science***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
33292	CS	621	1	OL	3	Data Analytics	TBA	TBA	

### **CS 621 – Data Analytics**

Discussion of data acquisition, transformation, manipulation and visualization and their applications on large-scale unstructured, semi-structured and structured data. Implementation of data analytics methods, algorithms, software, and systems. Use of large-scale data processing systems. Comparison of the current and future trends for big data analytics. Students are expected to have completed introductory programming courses before enrolling. Not open to students who have credit in CS 321 or 421 or 521.

3.000 Credit hours

### ***Mathematics***

CRN	SUBJECT	COURSE	SECTION	CAMPUS	CREDITS	TITLE	DAYS	TIME	ATTRIBUTE
10423	MATH	511	1	M	3	Abstract Algebra 1	TR	6:30 p.m. – 7:45 p.m.	
21252	MATH	511	880	OL	3	Abstract Algebra 1	TR OL	6:30 p.m. – 7:45 p.m. OL	



30512	MATH	541	800	OL	3	Geomet ry and Topolog y	OL	OL	
34760	MATH	560	820	OL	3	History of Mathem atics	OL	OL	
30333	MATH	614	800	OL	3	Algebrai c Reasoni ng	OL	OL	
32329	MATH	614	800	OL	3	Algebrai c Reasoni ng	OL	OL	
30334	MATH	615	801	OL	3	Number Concept s and Number Theory	OL	OL	
33477	MATH	619	541	M	3	Special Studies in Geomet ry, Algebra , or Topolog y	TBA	TBA	Special Permission Required and Variable Title Course Offering
10588	MATH	620	1	M	4	Probabil ity and Random Variable s	MW	4:00 p.m. – 5:40 p.m.	

30457	MATH	620	800	OL	4	Probability and Random Variables	OL	OL	
30173	MATH	622	1	M	3	Environmental Statistics	TR	5:00 p.m. – 6:15 p.m.	
31756	MATH	624	801	OL	3	Introduction to Statistical Learning	OL	OL	
33243	MATH	629	800	OL	3	Introductory Survival Analysis	OL	OL	
28057	MATH	680	800	OL	3	Special Studies in the Teaching of Mathematics	OL	OL	Special Permission Required and TK20 Teacher Education Course and Variable Title Course Offering
20917	MATH	690	800	OL	3	Curriculum and Instruction in Mathematics Education	OL	OL	TK20 Teacher Education Course
31325	MATH	692	800	OL	0	Actuarial Science Exit Survey	OL	OL	
19238	MATH	694	800	OL	3	Research Methods in Mathematics	OL	OL	Special Permission Required

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**MATH 511 – Abstract Algebra 1**

The theory of groups, including subgroups, cyclic groups, normal subgroups, cosets, Lagrange's Theorem, quotient structures, homomorphism, automorphisms, group actions, Sylow's Theorems, structure of finite abelian groups, generators, and relations. Prerequisite recommended: MATH 311. Not open to students who have credit in MATH 411.  
3.000 Credit hours

**MATH 541 – Geometry and Topology**

Introduction to geometric topology, including piecewise linear structures, Euler's formula, surfaces and solids, knots, graphs, and other topics. Prerequisite recommended: MATH 217, 267. Not open to students who have credit in MATH 441.  
3.000 Credit hours

**MATH 560 – History of Mathematics**

The development of mathematics from pre-history to the seventeenth century. Topics may include number concepts and numeration, algebra, geometry, trigonometry, analytic geometry, and calculus. Prerequisite recommended: MATH 161 or 165. Not open to students who have credit in MATH 460.  
3.000 Credit hours

**MATH 614 – Algebraic Reasoning**

Algebra as the study of patterns, as a symbolic language, as a tool for problem solving, as the study of functions, as generalized arithmetic, and as a way of modeling physical situations. Prerequisite: at least one year of teaching experience or permission of the department chairperson.  
3.000 Credit hours

**MATH 615 – Number Concepts and Number Theory**

Number development, number systems, properties and characteristics of classes of numbers, number sense, number theory, operations and their relationships, and algorithms. Prerequisite: at least one year of teaching experience or permission of the department chairperson.  
3.000 Credit hours

### **MATH 619 – Special Studies in Geometry, Algebra, or Topology**

Individual work under the direction of a faculty member of the department; will involve assigned reading and reports and may involve class attendance in related courses. Prerequisite: permission of the department chairperson. A total of 8 credits may be earned. MATH 619, 669, and 679, singly or in combination, may be taken for a total of no more than 8 credits.  
1.000 TO 8.000 Credit hours

### **MATH 620 – Probability and Random Variables**

Probability set functions, random variables, density and distribution functions, mathematical expectations, marginal and conditional distributions, sampling distributions, and limiting distributions. The mathematical rigor requires a strong background in calculus. Prerequisite recommended: MATH 166 and 215.  
4.000 Credit hours

### **MATH 622 – Environmental Statistics**

Aims to provide an introduction to the types of statistical analyses used in environmental studies. Topics include collecting environmental data with special emphasis on inaccessible and sensitive data, population size estimation, sampling in the wild such as quadrat, recapture, transect and adaptive sampling, composite sampling, ranked set sampling, examining environmental effects by regression-type models, statistical verifiability of environmental standards and regulations, time series, longitudinal, spatial, and temporal methods for the environmental processes. Prerequisite: MATH 320 or permission of the department chairperson.  
3.000 Credit hours

### **MATH 624 – Introduction to Statistical Learning**

Supervised learning: classification, linear discriminant analysis, quadratic discriminant analysis, multiple discriminant analysis, model selection regularization, bootstrap methods. Unsupervised learning: principal component analysis, canonical correlation, clustering methods. Prerequisite: MATH 620 or DSCI 602 or permission of the department chairperson.  
3.000 Credit hours

### **MATH 629 – Introductory Survival Analysis**

Introduction to Survival Analysis and Time-to-Event data; One, Two & K-sample Nonparametric methods for Censored Data; Association between Explanatory Variables with Survival Times using Parametric Models; Introduction to the Cox Regression Model; Additional Topics (Competing risks, Frailty Models, Recurrent Events). Prerequisite: MATH 621 or DSCI

602 or permission of the department chairperson.  
3.000 Credit hours

### **MATH 680 – Special Studies in the Teaching of Mathematics**

The student will work under the direction of a staff member in the Department of Mathematical Sciences. Assigned reading and reports; possible class attendance in related courses. Prerequisite: permission of the department chairperson. A total of 6 credits may be earned.  
1.000 TO 6.000 Credit hours

### **MATH 690 – Curriculum and Instruction in Mathematics Education**

Focuses on the mathematics curriculum, with emphasis on current issues and trends, on teaching strategies, and standards-based teaching. Looking at mathematics curriculum from a K-12 perspective, students will work on understanding these recommendations in light of previous mathematics curriculum experiences. Prerequisite: at least one year of teaching experience or permission of the department chairperson.  
3.000 Credit hours

### **MATH 692 – Actuarial Science Exit Survey**

This 0-credit course consists of an exit survey that should be completed by all students who attain an MA in Actuarial Science from Ball State University. The survey will ask students about professional actuarial exams completed prior to graduation, actuarial internships held during their time in the program, and their employment or education plans after graduation. Offered credit/no credit only. Prerequisite: students will either have completed all course requirements for an MA in Actuarial Science or will complete all requirements by the end of the current semester.  
0.000 Credit hours

### **MATH 694 – Research Methods in Mathematics Education**

Research analysis and methodology in mathematics education. Prerequisite: at least one year of teaching experience, and 18 graduate credits in mathematics or mathematics education, including MATH 690, or permission of the department chairperson.  
3.000 Credit hours

## ***Physics***

<b>CRN</b>	<b>SUBJECT</b>	<b>COURSE</b>	<b>SECTION</b>	<b>CAMPUS</b>	<b>CREDITS</b>	<b>TITLE</b>	<b>DAYS</b>	<b>TIME</b>	<b>ATTRIBUTE</b>
33030	PHYC	675	1	M	3	Statistical Mechanics	MW	4:00 p.m. – 5:15 p.m.	

### **PHYC 675 – Statistical Mechanics**

Thermal physics, kinetic theory, and statistical mechanics. Prerequisite: PHYC 434 or 534, or permission of the department chairperson.  
3.000 Credit hours