

HOOSIER STEM ACADEMY

SCIENCE
TECHNOLOGY
ENGINEERING
MATHEMATICS



Course Catalogue IUPUI Spring 2023



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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 better, participants will receive a \$1,375 stipend to help cover the cost of tuition, fees, and materials.

The Hoosier STEM Academy is now launching the Spring 2021 course catalog. Instruction 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 their dual credit credential.

Application Process

1. **Go to** <http://graduate.iupui.edu/admissions/apply.shtml>
2. **Click on: Begin your application for graduate or professional school at IUPUI**
3. **If you are new to IUPUI:** click on **"Create New Guest Account"**.
4. If you have been an IU or IUPUI student in the past, you will need access to our university e-mail and passphrase, including a new feature at IU that requires an additional dual authentication or "Duo" log-in.
 - We recommend that you complete this initial registration step with assistance from UITs, by calling our help desk, available 24/7 at (317) 247-HELP or <https://kb.iu.edu/d/abxl#iupui>. They will walk you through the initial process to regain access to your IU/IUPUI account, reset your passphrase, and assist you with the new Duo authentication.
 - Once you have your IU log-in information, Click on **"Log in with Guest acct/User ID"**

Application Steps

The first screen asks about your intentions by selecting one of two options:

Either choice below is acceptable for Hoosier STEM Academy. However, we recommend that you apply as a Graduate Non-Degree (GND) Student initially:

- To apply to a degree (Master's, PhD, professional) or Graduate Certificate program (Select this only if you are certain you will complete a certificate or MS degree. This will require letters of recommendation, transcripts, a personal statement, and GRE scores).
- **To apply to a Graduate Non-degree (GND) Program to explore courses for future enrollment in a graduate/professional degree program or to take continuing education courses (We recommend selecting this option)**

There are six sections to the on-line Graduate Non-Degree (GND) application.

1. Personal Information
2. Additional Information
3. Application Information (Academic Program: Grad Non-Degree; Academic Plan: Graduate Non-Degree program; Enrollment Summer 2018)
4. Department Information (Do not complete the red survey link for "Departmental Information" – it is not needed for this program)
5. Affirmation Statement
6. Submit and Pay Fee (\$60)

You do not have to send transcripts, letters of reference, or a personal statement as a GND Student.

Once you submit the application, you will receive an e-mail acceptance, usually within ~ 72 hours.

Next Steps

1. **For new IU/IUPUI Students:** Create your IU University username (e-mail address) and passphrase <https://one.iu.edu/task/iu/create-my-first-iu-account>

2. **Duo Authentication:** More information about the Duo phone app here:
<https://kb.iu.edu/d/bfgm>

3. **Register for classes at the One.IU Student Center** ([One.iu.edu](https://one.iu.edu) → Student Center SIS)
 (Detailed instructions https://ittraining.iu.edu/sis/sis-job-aids/cross-module-general-job-aids/student_center/Student_Registration.pdf)

4. **Tuition and Fees: 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.** At IUPUI, Graduate tuition is **\$347.22** per credit hour plus fees. For a 3-credit hour course,
 Tuition: \$1,041.66 plus Fees: \$258.61 = Total Cost: \$1,300.27 Parking: \$160 per semester =
 Total cost (with parking): \$1,460.77

5. **Academic Calendar: Fall 2020:**
<https://studentcentral.iupui.edu/calendars/official-calendar.html?term=Fall%202020&category=>

6. **Parking Services:** A semester ST (student) pass costs ~\$160.
<https://parking.iupui.edu>

7. **To obtain your Crimson Card** (student ID) after acceptance to the Graduate School: <https://crimsoncard.iu.edu>. Your Crimson Card is a combination of: Official ID Card, Payment Card, Discount Card to local restaurants & attractions, Printing Card, and Library Card. Once you are on campus, plan to visit the Crimson Card office on the 2nd floor of the [IUPUI Campus Center](#).

IU online course instructions

1. Getting Started – Using Online Class Search – Beginning your search is simple. You can search directly from the IU Online, online.iu.edu, by going to the 'Classes' tab on the menu at the top of the page. From there, if you select 'Search Classes' you will see a menu such as the example at the right. You can make your search as broad or specific as you need, but we suggest at minimum, filling out the 'semester' and putting in a keyword for a subject such as "statistics" or even "stats". There is also the enhanced search if you need other specific options.

2. Need More Info – Getting Course Descriptions – If you've found a class you're interested in, you use the One.IU public class search to find additional information, such as what time the class meets and the course description. You do not have to fill out every field, but at minimum you must select the 'Institution' (the campus), the 'Term', the 'Course Career', the 'Subject', and the 'Mode of Instruction' as highlighted in the example.

3. Register – Sign Up for the Class You Want – Once you’ve found a class you want to take; you need to register for it with the campus offering the course. For example, if you want to register for a physics course at IU East, you must register with IU East.

If you are a current IU Student – To register for an online undergraduate or graduate course offered at your campus of enrollment, you can register through One.IU as you would for any other class. To register for an online **graduate** course at a campus other than your campus of enrollment, you must contact the graduate department offering the course. See more at <http://online.iu.edu/classes/how-register.php>

If you are not a Current IU Student – You must first apply to the IU campus offering the course. To register for an online **graduate** course you must contact the department offering the course.

~~~~~  
~ We’re looking forward to working with you as a member of the Hoosier STEM Academy. Please contact me if you have any questions.

Sincerely,  
Dr. Kathleen A. Marrs  
Associate Professor of Biology  
(317) 278-4551  
[kmarrs@iupui.edu](mailto:kmarrs@iupui.edu)

### **Questions**

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







## **IUPUI Courses**

### ***Anatomy***

| TITLE                                        | COMPONENT         | CREDITS | CLASS | STATUS | TIME | DAY | ATTRIBUTE |
|----------------------------------------------|-------------------|---------|-------|--------|------|-----|-----------|
| <b>ANAT-D 700 Research</b>                   | Practicum         | 2       | 23422 | Open   | ARR  | ARR |           |
| <b>ANAT-D 860</b>                            | Independent Study | 1-10    | 21126 | Open   | ARR  | ARR |           |
| <b>ANAT-D 878 Anatomy Teaching Practicum</b> | Practicum         | 2       | 23191 | Open   | ARR  | ARR |           |

### **ANAT-D 700 Educational Research Practicum**

This course is designed to provide students with structured and supervised educational research experiences, as well as critical reviews of individual performance.

2 Credits.

### **ANAT-D 860 Research**

1-10 Credits

### **ANAT-D 878 Anatomy Teaching Practicum**

This course is designed to provide each student with supervised teaching experiences in Gross Anatomy, Histology, and Neuroscience, as well as critical reviews of all teaching duties.

2 Credits.

### ***Biochemistry***

| TITLE                                              | COMPONENT         | CREDITS | CLASS | STATUS | TIME | DAY | Attribute |
|----------------------------------------------------|-------------------|---------|-------|--------|------|-----|-----------|
| <b>BIOC-B 811 Advanced Intermediary Metabolism</b> | Lecture           | 1-3     | 25545 | Open   | ARR  | ARR |           |
| <b>BIOC-B 855 Research</b>                         | Independent Study | 1-12    | 21138 | Open   | ARR  | ARR |           |



## **BIOC-B 811 Advanced Intermediary Metabolism**

Tutorial instruction in specialized areas of metabolism.

1-3 Credits.

## **BIOC-B 855 Research**

1-12 Credits.

## ***Biology***

| TITLE                                         | COMPONENT       | CREDITS | CLASS | STATUS | TIME                    | DAY | Attribute |
|-----------------------------------------------|-----------------|---------|-------|--------|-------------------------|-----|-----------|
| <b>BIOL-57310 Stem Cell Biology</b>           | Lecture         | 3       | 25311 | Open   | 4:30 p.m.-5:45 p.m.     | TR  |           |
| <b>BIOL- 59500 Special Assignments-Purdue</b> | IND             | 1-3     | 21143 | Open   | ARR                     | ARR |           |
| <b>BIOL- 69600 Seminar</b>                    | Seminar         | 1       | 21144 | Open   | ARR                     | ARR |           |
| <b>BIOL- 69600 Seminar</b>                    | Seminar         | 1       | 32163 | Open   | ARR                     | ARR |           |
| <b>BIOL- 69700 Special Topics</b>             | Lecture         | 3       | 28140 | Open   | 1:30 p.m. – 2:45 p.m.   | TR  |           |
| <b>BIOL- 69700 Special Topics</b>             | Lecture         | 3       | 27430 | Open   | 10:30 a.m. – 11:45 a.m. | TR  |           |
| <b>BIOL- 69700 Special Topics</b>             | Lecture         | 3       | 28140 | Open   | 1:30 p.m. – 2:45 p.m.   | TR  |           |
| <b>BIOL- 69700 Special Topics</b>             | Lecture         | 3       | 28289 | Open   | 4:30 p.m. – 5:30 p.m.   | W   |           |
| <b>BIOL-T 582 Advanced Field Zoology</b>      | Lecture, Online | 3       | 32695 | Open   | ARR                     | ARR | Online    |
| <b>BIOL-T 591 History of Life</b>             | Lecture, Online | 3       | 32771 | Open   | ARR                     | ARR | Online    |



### **BIOL-57310 Stem Cell Biology**

In this course, students will develop a clear understanding of stem cells' defining features, activities and potential utility. Stem cell research is pursued in nearly all areas of medicine. This course focuses on important definitions and characteristics of stem cells and develops a general overview of stem cell biology. The course builds on this overview of stem cell biology by examining specific examples of developmental biology, methodology and the potential applications of stem cell therapy.

3 Credits.

### **BIOL- 59500 Special Assignments-Purdue**

Special work, such as directed reading, independent study or research, supervised library, laboratory, or field work, or presentation of material not available in the formal courses of the department.

1-4 Credits.

### **BIOL- 69600 Seminar**

Each semester there are several separate seminar offerings. They will likely be on the following topics: biochemistry, crystallography, ecology and population biology, genetics, mechanisms of development, microbiology, neurobiology, and plant physiology.

1 Credit.

### **BIOL- 69700 Special Topics**

The frontiers of biology. Critical examination of developments in the various specialties represented by the members of the department. Currently advanced work in the following and related fields can be offered: molecular genetics; structure and biosynthesis of biologically significant molecules, including the use of X-ray diffraction; the nature of biological specificity and enzyme catalysis; the fine structure and chemistry of subcellular particles, cells, and tissues; microbial and plant metabolism; comparative biochemistry; genetics and physiology of viruses, bacteria, fungi, protozoa, helminths, and cells of higher forms of life; the genetics, structure, development, and physiology of plants and animals, including endocrinology and work physiology; neurobiology, ecology, systematics, and evolution of microorganisms, plants, and animals; host-parasite relationships including immunology; and the teaching of biology.

3 Credits.



## **BIOL-T 582 Advanced Field Zoology**

This course will cover areas related to ecology - specifically in the areas of wildlife biology, wildlife management, and conservation biology. There will be some bias towards vertebrate and behavioral ecology.

3 Credits.

## **BIOL-T 591 History of Life**

This course examines the evolutionary history of life based on the fossil record and genetic codes of existing organisms. It also explores the history of changing philosophies regarding life's origin, from creation story-based religious views to the non-teleological views of modern evolutionary theory.

3 Credits.

## ***IU Online***

| TITLE                                    | COMPONENT | CREDITS  | CLASS | STATUS | TIME | DAY | ATTRIBUTE                |
|------------------------------------------|-----------|----------|-------|--------|------|-----|--------------------------|
| <b>BIOL – T 570 Evolution</b>            |           | <b>3</b> | 33024 |        | OL   | OL  | Northwest<br>100% online |
| <b>BIOL-T 582 Advanced Field Zoology</b> |           | 3        | 32695 |        | OL   | OL  | East<br>100% online      |
| <b>BIOL-T 591 History of Life</b>        |           | 3        | 32771 |        | OL   | OL  | Kokomo<br>100% Online    |

## **BIOL – T 570 Evolution**

Provides a rigorous exploration of the theory of evolution; the conceptual core of biology. Topics include origins and history of life; the interplay of heredity and environment in shaping adaptations; molecular, behavioral, and social evolution; patterns of speciation, extinction, and their consequences; methods of inferring evolutionary relationships among organisms.

## **BIOL – T 582 Advanced Field Zoology**

This is a 100% online class taught by IU East. No on-campus class meetings are required. A distance education fee will apply; check your campus bursar website for more information. If IU e-Texts are not used for this class, textbooks and other materials are available at your home campus bookstore.

This class is offered as part of a collaborative academic program.



Please consult with your advisor to ensure this class will count toward your degree requirements.

Above class meets 100% Online through Asynchronous instruction. For more information visit <https://covid.iu.edu/learning-modes/index.html>

## **BIOL – T 591 History of Life**

This course examines the evolutionary history of life based on the fossil record and genetic codes of existing organisms. It also explores the history of changing philosophies regarding life's origin, from creation story-based religious views to the non-teleological views of modern evolutionary theory.

## ***Chemistry & Chemical Biology***

| TITLE                                         | COMPONENT         | CREDITS | CLASS | STATUS | TIME                  | DAY | Attribute                                                                                                                                    |
|-----------------------------------------------|-------------------|---------|-------|--------|-----------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CHEM-54200 Inorganic Chemistry</b>         | Lecture           | 3       | 21333 | Open   | 6:00 p.m. – 7:15 p.m. | MW  |                                                                                                                                              |
| <b>CHEM-59900 Special Assignment</b>          | Independent Study | 1-4     | 21337 | Open   | ARR                   | ARR | Student must complete arrangements prior to registration                                                                                     |
| <b>CHEM-59900 Special Assignment</b>          | Independent Study | 1-4     | 22369 | Open   | ARR                   | ARR | Student must complete arrangements prior to registration                                                                                     |
| <b>CHEM-59900 Special Assignment</b>          | Independent Study | 1-4     | 22370 | Open   | ARR                   | ARR | Student must complete arrangements prior to registration                                                                                     |
| <b>CHEM-69500 Seminar</b>                     | Seminar           | 0       | 21335 | Open   | 3:55 p.m.- 5:30 p.m.  | W   | This is an S or F Graded Section                                                                                                             |
| <b>CHEM-69500 Seminar</b>                     | Seminar           | 1       | 21336 | Open   | 3:55 p.m.- 5:30 p.m.  | W   | This is an S or F Graded Section                                                                                                             |
| <b>CHEM-69600 Special Topics in Chemistry</b> | Lecture           | 3       | 27198 | Open   | 4:30 p.m.- 5:45 p.m.  | TR  | Class will meet at the stated days and times listed here for the first 3 weeks of the semester via zoom and In Person for the last 13 weeks. |



## **Chem- 54200 Inorganic Chemistry**

A survey of the chemistry of main group and transition elements in which descriptive chemistry is wedded to qualitative theories of bonding and structure.

3 Credits.

## **CHEM- 59900 Special Assignment**

Directed reading or special work not included in other courses.

1-4 Credits

## **CHEM-69500 Seminar**

Group meeting for review and discussion of important current literature in analytical, biological, inorganic, organic, and physical chemistry. Each graduate student is required to attend the seminar of his/her major subject.

0-1 Credit

## **CHEM- 69600 Special Topics in Chemistry**

Lectures on selected topics of current interest.

3 Credits

## ***IU Online***

| TITLE                                         | COMPONENT | CREDITS | CLASS | STATUS | TIME | DAY | ATTRIBUTE            |
|-----------------------------------------------|-----------|---------|-------|--------|------|-----|----------------------|
| <b>CHEM-T 510<br/>Inorganic<br/>Chemistry</b> |           | 3       |       | 33709  | OL   | OL  | 100%<br>Asynchronous |

## **CHEM-T 510 Inorganic Chemistry**

This course introduces fundamental concepts of inorganic chemistry including descriptive chemistry, bonding in coordination chemistry, organometallic chemistry, special topics in inorganic chemistry and biological inorganic chemistry.



## Computer Science

| TITLE                                                                      | COMPONENT         | CREDITS | CLASS | STATUS | TIME                              | DAY | Attribute                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------|-------------------|---------|-------|--------|-----------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CSCI- 50700<br/>Object-<br/>Oriented Design<br/>and<br/>Programming</b> | Lecture<br>online | 3       | 22743 | Open   | 6:00<br>p.m.<br>–<br>8:40<br>p.m. | T   | Computer science graduate standing or instructor consent required. This class is taught distance synchronous video. This is a synchronous distance course. Instruction will take place online at specific times/days listed in the class details. Meetings required. |
| <b>CSCI- 55800<br/>Multimedia</b>                                          | Lecture<br>online | 3       | 26127 | Open   | 3:00<br>p.m.<br>–<br>4:15<br>p.m. | TR  | Computer science graduate standing or instructor consent required. This class is taught distance synchronous video. This is a synchronous distance course. Instruction will take place online at specific times/days listed in the class details. No                 |



|                                                           |                   |   |       |      |                               |    |                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------|-------------------|---|-------|------|-------------------------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                   |   |       |      |                               |    | on-campus meetings required.                                                                                                                                                                                                                                                      |
| <b>CSCI- 59000<br/>Topics in<br/>Computer<br/>Science</b> | Lecture<br>online | 3 | 32218 | Open | 3:00<br>p.m.-<br>4:15<br>p.m. | TR | Computer science graduate standing or instructor consent required. This class is taught distance synchronous video. This is a synchronous distance course. Instruction will take place online at specific times/days listed in the class details. No on-campus meetings required. |
| <b>CSCI- 59000<br/>Topics in<br/>Computer<br/>Science</b> | Lecture<br>online | 3 | 32144 | Open | 3:00<br>p.m.-<br>5:40<br>p.m. | M  | Computer science graduate standing or instructor consent required. This class is taught distance synchronous video. This is a synchronous distance course. Instruction will take place online at specific times/days listed in the class details. No on-campus                    |



|  |  |  |  |  |  |  |                    |
|--|--|--|--|--|--|--|--------------------|
|  |  |  |  |  |  |  | meetings required. |
|--|--|--|--|--|--|--|--------------------|

## **CSCI – 50700 Object – Oriented Design and Programming**

An advanced exploration of the object-oriented model and programming. Topics range from a review of the object model to advanced concepts such as abstraction mechanisms, standard library/packages, OO design using an OO language, the syntax and the semantics of constructs.

3 Credits.

## **CSCI- 55800 Multimedia**

This is a course with emphasis on visual media such as image and video processing, transmission, understanding and retrieval. We discuss various types of media, methods for media creation, editing, and algorithms for media indexing, transmission, and recognition. Students will not only learn fundamental principles of signal, frequency, filtering, and transformation, but also gain hands-on experiences in creating multimedia contents for Internet access, implementing multimedia display for visualization, and developing basic algorithms for information extraction and retrieval for multimedia. This course will have lab training and topic discussion sessions where students will be actively involved in presenting research papers. Several exercises and projects will be assigned in addition to the presentation.

3 Credits.

## **CSCI- 59000 Topics in Computer Science**

Directed study for students who wish to undertake individual reading and study on approved topics.

3 Credits.

## ***IU Online***

| TITLE                                                                    | COMPONENT | CREDITS | CLASS | STATUS | TIME      | DAY       | ATTRIBUTE                    |
|--------------------------------------------------------------------------|-----------|---------|-------|--------|-----------|-----------|------------------------------|
| <b>CSCI-A 542<br/>Technical<br/>Foundations<br/>of<br/>Cybersecurity</b> |           | 3       | 9866  |        | <b>OL</b> | <b>OL</b> | <b>100%<br/>Asynchronous</b> |



|                                                          |  |   |      |  |    |    |                              |
|----------------------------------------------------------|--|---|------|--|----|----|------------------------------|
| <b>CSCI-B 561<br/>Advanced<br/>Database<br/>Concepts</b> |  | 3 | 8837 |  | OL | OL | <b>100%<br/>Asynchronous</b> |
|----------------------------------------------------------|--|---|------|--|----|----|------------------------------|

## **CSCI-A 542 Technical Foundations of Cybersecurity**

This course will enable students to build a technical foundation in cybersecurity by introducing concepts in secure systems design, cryptography, operating systems security, software security, and computer network security. The course will focus on developing a theoretical understanding of cybersecurity concepts and the ability to apply these concepts in practice.

## **CSCI-B 561 Advanced Database Concepts**

Database models and systems: especially relational and object-oriented; relational database design theory; structures for efficient data access; query languages and processing; database applications development; views. Transaction management: concurrency and recovery.

## ***Mathematics***

| TITLE                                                                     | COMPONENT         | CREDITS | CLASS | STATUS | TIME                              | DAY | Attribute                                                                                                                                                                                      |
|---------------------------------------------------------------------------|-------------------|---------|-------|--------|-----------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MATH-5110<br/>Linear<br/>Algebra with<br/>Applications</b>             | Lecture           | 3       | 21878 | Open   | 4:30<br>p.m.<br>–<br>5:45<br>p.m. | TR  | Traditional campus- based face-to-face instruction. Prerequisite: MATH 26100                                                                                                                   |
| <b>Math- 51800<br/>Advanced<br/>Discrete<br/>Mathematics</b>              | Lecture<br>online | 3       | 30392 | Open   | 4:30<br>p.m.<br>–<br>5:45<br>p.m. | MW  | This is a synchronous distance course. Instruction will take place online at the specific times/days listed in the class details. No on campus meetings are required. Prerequisite: MATH 26600 |
| <b>MATH-<br/>52800<br/>Advanced<br/>Mathematics<br/>For<br/>Engineers</b> | Lecture           | 3       | 21879 | Open   | 4:30<br>p.m.-<br>5:45<br>p.m.     | TR  | Traditional face-to-face instruction. Prerequisite: MATH 53700                                                                                                                                 |



|                                                    |                   |     |       |      |                       |     |                                                                                                                                                                                       |
|----------------------------------------------------|-------------------|-----|-------|------|-----------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>and Physicists II</b>                           |                   |     |       |      |                       |     |                                                                                                                                                                                       |
| <b>MATH-53000 Funct Complex Vrb I</b>              | Lecture           | 3   | 26530 | Open | 4:30 p.m. – 5:45 p.m. | MW  | This is a synchronous distance course. Instruction will take place online at the specific times/days listed in the class details. No on campus meetings are required.                 |
| <b>MATH-67400 Mathematical Physics II</b>          | Lecture           | 3   | 23878 | Open | 6:00 p.m. – 7:15 p.m. | TR  | Traditional face-to-face instruction. It is expected that students have completed MATH 57400.                                                                                         |
| <b>MATH-69200 Topics in Applied Mathematics</b>    | Independent Study | 1-3 | 22383 | Open | ARR                   | ARR | Before registering, student must contact individual math professor for course requirements and department permission. For more information call the Math Department at (317) 274-6918 |
| <b>MATH-69300 Topics in Analysis</b>               | Lecture           | 3   | 32866 | Open | 6:00 p.m. – 7:15 p.m. | TR  | Traditional campus-based face-to-face instruction.                                                                                                                                    |
| <b>MATH-69400 Topics in Differential Equations</b> | Lecture           | 1-3 | 25087 | Open | ARR                   | ARR | Student must contact individual math professor for course requirements and department permission. For                                                                                 |



|                                      |         |     |       |      |     |     |                                                                                                                                                                   |
|--------------------------------------|---------|-----|-------|------|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      |         |     |       |      |     |     | more information call the Math Department at (317) 274-6918                                                                                                       |
| <b>MATH-69700 Topics in Topology</b> | Lecture | 1-3 | 24867 | Open | ARR | ARR | Student must contact individual math professor for course requirements and department permission. For more information call the Math Department at (317) 274-6918 |

### **MATH-5110 Linear Algebra with Applications**

Real and complex vector spaces; linear transformations; Gram-Schmidt process and projections; least squares; QR and LU factorization; diagonalization, real and complex spectral theorem, Shur triangular form; Jordon canonical form, quadratic forms.

3 Credits.

### **Math- 51800 Advanced Discrete Mathematics**

The course covers mathematics useful in analyzing computer algorithms. Topics include recurrence relations, evaluation of sums, integer functions, elementary number theory, binomial coefficients, generating functions, discrete probability, and asymptotic methods.

3 Credits.

### **MATH- 52800 Advanced Mathematics for Engineers and Physicists II**

Courses MA 52700 and 52800 constitute a two-semester sequence covering a broad range of subjects useful in early graduate engineering courses. Topics in MA 52800 include divergence theorem, Stokes' theorem, complex variables, contour integration, calculus of residues and applications, conformal mapping, and potential theory.

3 Credits.



### **MATH- 53000 Funct Complex Vrbl I**

Complex numbers and complex-valued functions of one complex variable; differentiation and contour integration; Cauchy's theorem; Taylor and Laurent series; residues; conformal mapping; special topics.

3 Credits.

### **MATH-56300 Advance Geometry**

Topics in Euclidean and non-Euclidean geometry.

3 Credits.

### **MATH- 57200 Introduction to Algebraic Topology**

Singular homology theory; Eilenberg-Steenrod axioms; simplicial and cell complexes; elementary homology theory; Lefschetz fixed point theorem.

3 Credits.

### **MATH- 67400 Mathematical Physics II**

MATH 67400 is a continuation of MATH 57400, Mathematical Physics I. Students should learn more advanced notions and theorems of various mathematical theories that have direct applications to physics.

3 Credits.

### **MATH-69200 Topics in Applied Mathematics**

Research topics of current interest in applied mathematics to be chosen by the instructor.

1-3 Credits.

### **MATH- 69300 Topics in Analysis**

Research topics in analysis and their relationships to other branches of mathematics. Topics of current interest will be chosen by the instructor.

1-3 Credits.

### **Math-69400 Topics in Differential Equations**

Research topics in differential equations related to physics and engineering. Topics of current interest will be chosen by the instructor.

1-3 Credits.



## **MATH- 69700 Topics in Topology**

Research topics in topology and their relationships to other branches of mathematics. Topics of current interest will be chosen by the instructor.

1-3 Credits.

## ***Physics***

| TITLE                                  | COMPONENT                | CREDITS | CLASS | STATUS | TIME                  | DAY | Attribute |
|----------------------------------------|--------------------------|---------|-------|--------|-----------------------|-----|-----------|
| <b>PHYS-59000 Reading and Research</b> | Independent Study online | 1-6     | 22119 | Open   | ARR                   | ARR |           |
| <b>PHYS-68500 Physics Seminar</b>      | Seminar                  | 0       | 22120 | Open   | 3:30 p.m. – 5:00 p.m. | R   |           |

## **PHYS-59000 Reading and Research**

Reading and research in Physics.

1-6 Credits.

## **PHYS-68500 Physics Seminar**

0 Credits.

## ***Statistics***

| TITLE                                    | COMPONENT      | CREDITS | CLASS | STATUS | TIME                  | DAY | Attribute                                                                                                                                                                                                                        |
|------------------------------------------|----------------|---------|-------|--------|-----------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STAT- 51100 Statistical Methods I</b> | Lecture online | 3       | 22235 | Open   | 3:00 p.m. – 4:15 p.m. | MW  | This is an online hybrid class which includes a combination of online instruction with no specific time/day meetings (asynchronous). No on-campus meetings are required. It is expected that students have completed MATH 16500. |



|                                                               |                                |     |       |      |     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------|--------------------------------|-----|-------|------|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STAT-51500<br/>Statistical<br/>Consulting<br/>Problems</b> | Independent<br>Study<br>online | 1-3 | 22238 | Open | ARR | ARR | Consent of<br>advisor<br>required.<br>Taught in a<br>hybrid distance<br>format. No<br>required face-<br>to-face<br>meetings on-<br>campus.<br>Braodcast live<br>via zoom.<br>Students<br>expected to<br>attend and<br>participate in<br>live discussion<br>via zoom.<br>Theoretical<br>developments<br>and literature<br>reviews.<br>Projects on<br>real/simulated<br>data analysis.<br>Presentations at<br>the Stat<br>Seminar |
| <b>STAT-51500<br/>Statistical<br/>Consulting<br/>Problems</b> | Independent<br>Study<br>online | 1-3 | 26762 | Open | ARR | ARR | Consent of<br>advisor<br>required.<br>Taught in a<br>hybrid distance<br>format. No<br>required face-<br>to-face<br>meetings on-<br>campus.<br>Braodcast live<br>via zoom.<br>Students<br>expected to<br>attend and<br>participate in<br>live discussion<br>via zoom.<br>Theoretical<br>developments<br>and literature<br>reviews.<br>Projects on<br>real/simulated<br>data analysis.<br>Presentations at                        |



|                                                                            |         |   |       |      |                                |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------|---------|---|-------|------|--------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                            |         |   |       |      |                                |    | the Stat Seminar                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>STAT- 51700<br/>Statistical<br/>Inference</b>                           | Lecture | 3 | 22239 | Open | 4:30<br>p.m.-<br>5:45<br>p.m.  | MW | This is a traditional hybrid course which includes a combination of online and on-campus instruction. Regular meetings on-campus are expected. It is expected that students have completed STAT 51100 or 51600.                                                                                                                                                                                                                                  |
| <b>STAT- 52800<br/>Introduction<br/>to<br/>Mathematical<br/>Statistics</b> | Lecture | 3 | 22240 | Open | 4:30<br>p.m. –<br>5:45<br>p.m. | TR | Taught in a Hybrid-Traditional format. Required in-person meetings on-campus. Broadcast live via zoom. All students expected to attend and participate in face-to-face or live via zoom classes. Lectures will be recorded and uploaded on Canvas for later reviewing. The remaining lectures pre-recorded and viewed asynchronously during the week. 12 quizzes administered during the class times or take-home and un-proctored. Face-to-face |



|  |  |  |  |  |  |  |                                                       |
|--|--|--|--|--|--|--|-------------------------------------------------------|
|  |  |  |  |  |  |  | problem solving sessions by TA. Virtual office hours. |
|--|--|--|--|--|--|--|-------------------------------------------------------|

## **STAT- 51100 Statistical Methods I**

Descriptive statistics; elementary probability; sampling distributions; inference, testing hypotheses, and estimation; normal, binomial, Poisson, hypergeometric distributions; one-way analysis of variance; contingency tables; regression.

3 Credits.

## **STAT-51500 Statistical Consulting Problems**

A written report of a consultation problem involving a designed experiment or sample in which the student participates with a faculty member.

1-3 Credits

## **STAT- 51700 Statistical Inference**

A basic course in statistical theory covering standard statistical methods and their application. Estimation including unbiased, maximum likelihood and moment estimation; testing hypotheses for standard distributions and contingency tables; confidence intervals and regions; introduction to nonparametric tests and linear regression.

3 Credits.

## **STAT- 52800 Introduction to Mathematical Statistics**

Distribution of mean and  $s^2$  in normal samples, sampling distributions derived from the normal distribution, Chi square, t and F. Distribution of statistics based on ordered samples. Asymptotic sampling distributions. Introduction to multivariate normal distribution and linear models. Sufficient statistics, maximum likelihood, least squares, linear estimation, other methods of point estimation, and discussion of their properties. Cramer-Rao inequality and Rao-Blackwell theorem. Tests of statistical hypotheses, simple and composite hypotheses, likelihood ratio tests, power of tests.

3 Credits.



## ***IU Online***

| TITLE                                                | COMPONENT | CREDITS | CLASS | STATUS | TIME | DAY | Attribute                                  |
|------------------------------------------------------|-----------|---------|-------|--------|------|-----|--------------------------------------------|
| <b>STAT-S 520<br/>Introduction<br/>to Statistics</b> |           | 3       | 7647  |        | OL   | OL  | 100%<br>Asynchronous<br>with<br>Instructor |

### **STAT-S 520 Introduction to Statistics**

Basic concepts of data analysis and statistical inference, applied to 1-sample and 2-sample location problems, the analysis of variance, and linear regression. Probability models and statistical methods applied to practical situations and actual data sets from various disciplines.

Elementary statistical theory, including the plug-in principle, maximum likelihood, and the method of least squares.

## ***Technology***

| TITLE                                             | COMPONENT         | CREDITS | CLASS | STATUS | TIME                              | DAY | Attribute                                                                                                                                                                          |
|---------------------------------------------------|-------------------|---------|-------|--------|-----------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tech- 58100<br/>Workshop in<br/>Technology</b> | Lecture<br>online | 3       | 27445 | Open   | 6:00<br>p.m.<br>–<br>8:45<br>p.m. | W   | Students will<br>meet during<br>class time,<br>synchronous,<br>via zoom; rest<br>of online<br>instruction<br>will be<br>asynchronous.<br>No on-campus<br>meetings are<br>required. |

### **Tech- 58100 Workshop in Technology**

Advanced study in various fields of technology.

3 Credits.



