

DEPARTMENT OF MATHEMATICS AND COMPUTING

The Department of Mathematics and Computing provides students with opportunities to earn Bachelor of Science degrees in computer information systems, cybersecurity, data science, and in mathematics. Honors programs and minors are also offered in both disciplines. A degree in engineering is available through Lander University's dual-degree program with Clemson University. Students who complete this dual-degree program receive a bachelor's degree in Engineering from Clemson University and a bachelor's degree in either computer information systems, cybersecurity, data science, or mathematics from Lander University.

The Department's webpage (<http://www.lander.edu/mathcis>) contains information about the individual programs of study, scholarships available for students majoring in computer information systems or mathematics, a link to an on-line application for these scholarships, and links to the home pages of faculty members.

Computer Information Systems Major

Computer information systems are prominent in the modern world. The Computer Information Systems (CIS) major allows students to develop the knowledge and skills required to understand these systems and participate in their creation and maintenance.

The computer information systems major at Lander has three components: core courses, an emphasis within CIS, and a minor outside CIS. The core requirements form the basis of the program by providing the fundamentals necessary for advanced study. The emphasis allows a student to develop a specialization within computer information systems. The minor provides a domain where CIS can be put into practice.

The curriculum and courses are designed and updated to accomplish the following program goals. All students graduating with a Bachelor of Science degree in Computer Information Systems will demonstrate:

- the skills needed to solve CIS problems;
- effective oral and written communications skills;
- the ability to independently research and complete a CIS project; and
- an understanding of the legal and ethical issues they may encounter as CIS professionals.

The CIS core includes courses in problem solving and programming skills (CIS 130, CIS 230, CIS 231, CIS 234), productivity tools, (CIS 102), information management (CIS 120, CIS 320), data communications (CIS 240), computer organization (CIS 335), analysis and design (CIS 321), and database design (CIS 360). It also includes the senior level capstone experience (CIS 499).

Students can choose an emphasis in software development, in networking, or in computer engineering. The software development emphasis requires advanced courses in emerging environments and software development. The networking emphasis covers data communications and computer networking in depth.

The computer engineering emphasis is part of Lander's dual-degree program with Clemson University. Students in the computer information systems/computer engineering dual-degree program must complete specific mathematics and science courses at Lander in order to meet the program requirements of Clemson University. Students completing this program will be awarded both a BS in computer information systems from Lander University with a minor in mathematics, and a BS in computer engineering from Clemson University.

The computer information systems major requires that each student complete a minor. This minor provides competency in a secondary area where CIS can be applied. Students may choose from a number of minors, as indicated in the following table. Other minors (or a second major) offered across campus are eligible for consideration as well. The mathematics minor is suggested for students interested in pursuing graduate studies and is required for students in the computer engineering emphasis.

Minor	Software Development	Networking	Dual Degree
Mathematics	√	√	√
Business Administration	√	√	
Health Care Management	√	√	
Sociology	√	√	
Psychology	√	√	
Political Science	√	√	
Music	√		
Cybersecurity	√	√	

In order to complete a computer information systems degree program in a timely fashion, students should complete the problem solving and programming skills sequence (CIS 130, CIS 230, CIS 231), along with CIS 102 and CIS 120, by the end of their third or fourth semester.

A grade of “C” or better is required in all computer information systems courses applied to the major, with the following exception: a grade of “D” will be allowed in at most one CIS course at the 300- or 400-level. Courses in oral and/or written communication skills (SPCH 101 and WRIT 275) are strongly encouraged.

All students pursuing a degree in computer information systems are required to participate in program assessment activities and an exit interview with the computer information systems faculty during their final year at Lander University.

The program requirements for the CIS major and the dual-degree program are articulated on the individual program worksheets. A successful graduate in the computer information systems major will have competency in the following areas:

Information System Principles. This includes systems theory and concepts, information systems in organizations, decision support systems, and evaluation of systems performance.

Programming Principles. This includes problem solving, algorithm development, and application programming using structured and object-oriented approaches that stress abstraction, programming style, two or more high-level languages, and various software development environments.

Data Organization and Management. This includes data and file structures, access methods, algorithm design and analysis, and relational database organization and design.

Computer Organization. This includes logical organization of computers, levels of abstraction, machine and assembly languages, data representation and addressing, and memory management.

Data Communications and Networking. This includes networking and telecommunications concepts and standards, distributed computing, networked information technologies, protocols, and e-commerce.

System Development Methodology. This includes requirements specifications, analysis, design, implementation, and testing. Also, software tools, system prototyping, robustness of systems, documentation, efficiency, ethics, human-computer interaction, and software development in a team environment.

Information Systems Applications. Each student will have demonstrated competency in an approved application area through completion of a minor or second major in that area.

The following courses will be offered as indicated.
(NOTE: PHYS 203 is offered in the Department of Physical Sciences.)

Every Fall

CIS 102
CIS 130
CIS 230
CIS 231
CIS 243
CIS 344
CIS 250

Every Spring

CIS 120
CIS 130
CIS 140
CIS 230
CIS 234
CIS 240
CIS 260
CIS 343
CIS 499
MATH 125

Even Year Fall

CIS 300
CIS 321
CIS 340

Odd Year Spring

CIS 360
CIS 440
CIS 498
MATH 200
PHYS 203

Odd Year Fall

CIS 202
CIS 335
CIS 341

Even Year Spring

CIS 320
CIS 330

Computer Information Systems Honors Program

Students majoring in computer information systems may earn a “BS Degree with Honors” in computer information systems. To qualify, a student must:

1. Complete the following courses:
MATH 141, MATH 142, MATH 325, CIS 330, CIS 498, and any two of CIS 340, CIS 341, or CIS 440.
2. Complete six credit hours of a foreign language. This foreign language may not be English or the student’s native language.
3. Submit a research proposal by January 15 of the junior year. The proposal must be approved by a majority of the computer information systems faculty and result in a finished product of sufficient quality to:
 - a) Receive three hours of credit (CIS 390), and
 - b) Be accepted for publication or presented at a meeting of a computing society such as the Association for Computing Machinery; or be presented as a seminar to faculty, students, and guests.
4. Graduate with a BS degree in computer information systems with a grade point average of 3.5 in both overall coursework and in computer information systems coursework.

Engineering Dual-Degree Program

Students who wish to combine study in mathematics or computer information systems with a liberal arts program with further study in an engineering discipline may do so under the Lander University-Clemson University Engineering Dual-Degree Program. A student who completes this program of study will benefit from the experience of dividing their academic career between the liberal arts environment of a small university campus and the engineering climate of a large, technically-oriented university. This unique combination of study on two differently oriented campuses provides students with excellent engineering training strongly complemented by study in the humanities and social sciences.

This program can be applied to the following engineering disciplines at Clemson: civil, computer, electrical, industrial, and mechanical. Computer engineering at Clemson may be combined with either a mathematics or a computer information systems major at Lander. The other engineering disciplines are coupled with a mathematics major at Lander.

Students apply for admission to Clemson during their third academic year at Lander University. Acceptance into the Clemson engineering program is at the discretion of that university. Clemson recommends that prospective students enroll in a summer school session at Clemson following their sophomore or junior year at Lander.

A grade of “C” or better is required in all courses applied to the dual-degree program and in all courses that must transfer to Clemson University.

Dual-degree engineering majors enter Clemson University at a level competitive with students already at that university. Successful completion of the program will result in the student being awarded a Bachelor of Science degree in Engineering from Clemson University and a Bachelor of Science degree in their major from Lander University.

Students will have competency in the following areas prior to leaving for Clemson University:

A. COMPUTER INFORMATION SYSTEMS/ENGINEERING DUAL DEGREE

Information System Principles. This includes systems theory and concepts, information systems in organizations, decision support systems, and evaluation of systems performance.

Programming Principles. This includes problem solving, algorithm development, and application programming using structured and object-oriented approaches that stress abstraction, programming style, two or more high-level languages, and various software development environments.

Data Organization and Management. This includes data and file structures, access methods, algorithm design and analysis, and relational database organization and design.

Computer Organization. This includes logical organization of computers, levels of abstraction, machine and assembly languages, data representation and addressing, and memory management.

Data Communications and Networking. Includes networking and telecommunications concepts and standards, distributed computing, networked information technologies, protocols, and electronic commerce.

System Development Methodology. This includes requirements specifications, analysis, design, implementation, and testing. Also, software tools, system prototyping, robustness of systems, documentation, efficiency, ethics, human-computer interaction, and software development in a team environment.

B. MATHEMATICS/ENGINEERING DUAL DEGREE

The Foundations of Mathematics. This includes first and foremost a firm grounding in the major concepts of mathematics needed for continued learning in the field of engineering. Students must learn to analyze a given situation, extract the pertinent facts, and then draw correct conclusions. Specifically included are basic algebraic operations, the elements of set theory, and the fundamentals of logic.

Advanced Algebra. This includes knowledge of the basic constructs of linear algebra.

Analysis. This includes both calculus and differential equations. Students must have knowledge of continuity, differentiation, integration, sequences and series, and multivariable calculus. Students must be able to solve the basic differential equations that arise in engineering applications.

Probability and Statistics. This includes the acquisition and analysis of data, probability, discrete and continuous probability distributions, estimation using confidence intervals, tests of hypotheses, and linear regression.

Mathematics Major

Mathematics is fundamental to both the theoretical and the practical problem-solving components of virtually every field of study. The goal of the mathematics major at Lander University is to provide students with the opportunity and the direction to enjoy the intellectual challenges of mathematics, and to develop the communication skills and the mathematical knowledge necessary to function competently in graduate school and/or in employment. A successful graduate with a mathematics major will have specific competency in:

1. *The Foundations of Mathematics.* This includes first and foremost a firm grounding in the major concepts and applications of mathematics needed for successful continued learning in the field. Students must learn to analyze a given situation, extract the pertinent facts, and then draw correct conclusions. Specifically included are basic algebraic operations, the elements of set theory, and the fundamentals of logic.

2. *Advanced Algebra.* This includes the fields of linear and abstract algebra. Specifically, the student must know the basic concepts and applications in these fields, including a basic understanding of groups, rings, fields, and vector spaces.
3. *Analysis.* This includes calculus and at least one of the fields of real or complex analysis. Students must know the basic concepts and applications of continuity, differentiation, integration, sequences and series, and multivariable calculus. Additionally, all students will be able to solve the basic differential equations that arise in common applications.
4. *Probability and Statistics.* Students must know the basic concepts and applications of acquisition and analysis of data, probability, discrete and continuous probability distributions, estimation using confidence intervals, tests of hypotheses, and linear regression.

The requirements for a degree in mathematics are as follows: twelve hours of calculus (MATH 141, 142, and 241), differential equations (MATH 242), linear algebra (MATH 308), probability and statistics (MATH 311), abstract algebra (MATH 421), real analysis (MATH 431), an introduction to Mathematical Proof (MATH 134), the capstone course (MATH 499), calculus-based physics (PHYS 211), CIS 130, completion of either the abstract algebra or analysis sequence (MATH 422 or MATH 432), nine hours of mathematics content electives at the 300 level or above (except MATH 450 and MATH 451), plus one of the following CIS 230, PHYS 212, MATH 212, or an additional three hours of mathematics content electives at the 300 level or above (except MATH 450 and MATH 451). Students obtaining secondary teacher certification are required to take courses in discrete mathematics, mathematics history, geometry, teaching technologies and teaching methods (MATH 325, MATH 350, MATH 351, MATH 450 and MATH 451, respectively).

A grade of “C” or better is required in all mathematics courses applied to the major with the following exception: a grade of “D” will be allowed in at most one mathematics course provided a GPA of 2.0 is maintained in mathematics courses applied to the major.

During their final year at Lander University, all students seeking a degree in mathematics are required to participate in program assessment activities including an assessment exam in mathematics and an exit interview with the mathematics faculty as part of the capstone course.

Mathematics, Secondary Teacher Certification

Students enrolled in Secondary (History, English, Chemistry, Mathematics) or PK-12 (PE, Art, Music):

Provisional Status

1. Demonstrate professional behaviors and dispositions* at all times.
2. Maintain a minimum 2.75 GPA on Lander coursework; achieve a grade of “B” or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, MONT, and SPED courses (see catalog for further details, including each department’s GPA requirements within the specific content area).
3. Pass **ALL 3** sections of Praxis Core or have exempting SAT/ACT scores on file at Lander University and confirmed by the Department of Teacher Education.
4. Successfully complete other reviews as required by departments in specific content areas.
5. Apply for admission to the professional program in teacher education (see Department of Teacher Education section of catalog for requirements).

Candidate Status

1. Enter candidacy with formal admission to the professional program in teacher education.
2. Demonstrate professional behaviors and dispositions* at all times.
3. Maintain a 2.75 GPA on Lander coursework; achieve a grade of “B” or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, MONT, and SPED courses (see catalog for further details, including each department’s GPA requirements within the specific content area).
4. Take the Praxis II prior to the student teaching semester**
5. Take the PLT (Principles of Learning and Teaching) by the end of the student teaching semester **
6. Successfully complete other departmental requirements, reviews, projects, or milestones.

Students not meeting one or more of the requirements will not progress to Candidate Status.

*Lander University has high expectations for all teacher education majors. Teacher education majors who exhibit unacceptable dispositions may be removed from the program. Procedures for removal are outlined within the Department of Teacher Education handbook.

**Praxis II and PLT must be passed to apply for certification with the South Carolina Department of Education.

The following mathematics courses will be offered as indicated.

Every Fall

MATH 141
MATH 241
MATH 308
PHYS 211

Every Spring

MATH 134
MATH 141
MATH 142
MATH 212
MATH 242
MATH 499
PHYS 212

Even Year Fall

MATH 300
MATH 325
MATH 431
MATH 451

Odd Year Spring

MATH 351
MATH 432

Odd Year Fall

MATH 311
MATH 421
MATH 450

Even Year Spring

MATH 350
MATH 422

Mathematics Honors Program

Students majoring in mathematics may earn a “BS Degree with Honors” in mathematics. To qualify, a student must meet the following conditions:

1. In addition to the normal course requirements for a BS degree in mathematics, the student must complete the following courses:
MATH 432, MATH 422, with a total of 30 credits of coursework in mathematics at the 300-level or above.
2. The student must complete six credit hours of a college level language. This language may not be English or the student’s native language.
3. The student must submit a project proposal no later than January 15 of the junior year. The proposal must be approved by a majority of the full-time mathematics faculty and result in a finished product of sufficient quality to:
 - a) Receive a grade of “A” or “B” (MATH 390) and
 - b) Be accepted for publication or presented at a meeting of a mathematical society; or be presented as a seminar to mathematics faculty, students, and guests.
4. Upon graduation, the student must have a cumulative GPA of 3.5 or better in both overall coursework and in mathematics coursework.

NOTE: In lieu of requirement 1 above, the student may complete an engineering degree at Clemson University under the engineering/mathematics dual-degree program. The student may then substitute an approved engineering project at Clemson for requirement 3 above.

Special situations may require a deviation from these requirements (such as for students seeking teacher certification in mathematics or those in the engineering program). All deviations must be approved by a majority of the mathematics faculty.

Transfer students who wish to pursue an Honors Program in Mathematics must spend at least four full-time semesters (fall or spring) at Lander University and complete at least 21 credit hours of mathematics courses at Lander University. They must also have an overall GPA of 3.5 on all courses transferred and a GPA of 3.5 on mathematics courses transferred.

Cybersecurity Major

Lander University's BS in Cybersecurity prepares students for a career in technical and non-technical cybersecurity-related fields. Students completing the core courses of this program will gain deep technical knowledge to develop and maintain cybersecurity solutions along with an understanding of related non-technical areas including administrative, ethical, and legal aspects of cybersecurity.

The Cybersecurity program at Lander University has two components: core courses and an emphasis. The core requirements form the basis of the program by providing the fundamentals necessary for advanced study. The emphasis allows a student to develop a specialization within cybersecurity. The curriculum and courses are designed and updated to accomplish the following program goals. All students graduating with a Bachelor of Science degree in Cybersecurity will demonstrate:

- an understanding of the fundamental concepts, principles, and current trends in the cybersecurity discipline;
- an understanding of the federal, state, and local cyber defense laws and partners/structures, and ethics;
- an understanding of the fundamental concepts, technologies, components, and issues associated with components of modern computing environments;
- the knowledge to develop and maintain solutions for preserving confidentiality, integrity, and availability of information systems;
- an ability to assess risk management practices and policies for an organization;
- the ability to communicate orally and in writing;
- the ability to self-learn.

The Cybersecurity core courses include courses in problem-solving and programming skills (CIS 130, CIS 230), productivity tools (CIS 102), information management (CIS 120), data communications (CIS 240), networks and computer systems administration (CIS 140, CIS 260), fundamentals of cybersecurity (CIS 243), data-at-rest and data-in-motion forensics (CIS 343, CIS 344), cryptography (CIS 345), cybersecurity planning and management (CIS 346), database design (CIS 360) and the senior-level capstone (CIS 449).

Students can choose an emphasis in Computer Information Systems or Political Science. The Computer Information Systems emphasis focuses on deeper technical skills needed for the professional development and maintenance of cybersecurity solutions. The Political Science emphasis focuses on policy development and compliance, and the legal aspects related to the field of cybersecurity.

A grade of "C" or better is required in all Cybersecurity courses applied to the major, with the following exception: a grade of "D" will be allowed in at most one Cybersecurity major course at the 300- or 400-level.

All students pursuing a degree in cybersecurity are required to participate in program assessment activities and an exit interview with the department faculty during their final year at Lander University.

The program requirements for both cybersecurity emphases are articulated on the individual program worksheets. A successful graduate in the cybersecurity major will have competency in the following areas:

Fundamentals of Cybersecurity. This includes security principles and policies, laws and regulations, basic cryptography, authentication, ethics, malware, computer and network forensics, threat and vulnerability detection, and protection.

Programming Principles. This includes problem-solving, algorithm development, and application programming using structured and object-oriented programming styles.

Forensics of Data-at-rest and Data-in-motion: This includes network and computer vulnerabilities and exploitation, protection against common threats, digital forensic analysis principles, and best practices for digital evidence collection and maintaining the chain of custody.

Cryptography: This includes the inner workings of cryptographic systems and their usage in real-world applications.

Cybersecurity Planning and Management: This includes procedures and processes for planning and management of cybersecurity operations in an organization.

Data Communications and Networking. This includes networking and telecommunications concepts and standards, distributed computing, networked information technologies, protocols, and e-commerce.

The following courses will be offered as indicated.

Every Fall	Every Spring
CIS 102	CIS 120
CIS 130	CIS 130
CIS 230	CIS 140
CIS 243	CIS 230
CIS 346	CIS 231
CIS 344	CIS 240
CIS 231	CIS 343
	CIS 345
	CIS 449
	MATH 125
Even Year Fall	Odd Year Spring
CIS 341	CIS 360
	MATH 200
	Even Year Spring
	CIS 320

Data Science Major

Data Science is an interdisciplinary field of study that deals with capturing, maintaining, processing, and analyzing data as well as effectively communicating the data analysis results. Effective data scientists are able to identify relevant questions, collect data from a multitude of data sources, clean and organize the information, analyze the information, translate results into solutions, and communicate the findings in a way that informs business decisions. Lander University's Data Science program educates and trains students in these skills. After completing our Data Science program, students will be equipped with both the underlying theory and the skills to apply that theory in the real world. All students graduating with a Bachelor of Science degree in Data Science will demonstrate:

1. an ability to apply computing concepts to use, manipulate, and analyze data;
2. the mathematical and statistical understanding of the central algorithms used in the field of data science;
3. the ability to communicate results of data analyses including data visualization;
4. an ability to apply data analyses in real-world scenarios in order to facilitate decision-making;
5. the ability to develop a high-performance machine learning and deep learning system using a large data set;
6. an understanding of ethical principles related to data science.

Lander University's Data Science program offers emphases in three areas: Business Analytics, Computer Information Systems, and Mathematics. Each emphasis is designed to provide courses to deepen the understanding in each area. If a student is more interested in discovering and applying business intelligence for organizations, Business Analytics emphasis provides a curriculum with business contexts. For students interested in careers as data science developers, Computer Information Systems emphasis should be an excellent choice. The Mathematics emphasis offers an opportunity to study theoretical aspects in depth and provides the mathematical skills required by many graduate programs.

The Data Science core courses include courses in problem-solving and programming skills (CIS 130, CIS 230, CIS 234, DSCI 130, DSCI 230), information management (CIS 120), data visualization (DSCI 231), big data analysis (DSCI 330), applied machine and deep learning (DSCI 340, DSCI 440), discrete mathematics (MATH 125), applied linear algebra (MATH 208), supervised and unsupervised machine learning (MATH 213, MATH 214), database design (CIS 360) and the senior-level capstone (DSCI 499).

A grade of "C" or better is required in all Data Science courses applied to the major, with the following exception: a grade of "D" will be allowed in at most one Data Science major course at the 300- or 400-level

All students pursuing a degree in data science are required to participate in program assessment activities and an exit interview with the department faculty during their final year at Lander University.

The program requirements for data science emphases are articulated on the individual program worksheets. A successful graduate in the data science major will have competency in the following areas:

Fundamentals of Data Science. This includes data science history, fundamental data concepts, principles, problem definitions, algorithms, processes for extracting patterns, and legal and privacy issues.

Data Science Programming. This includes fundamental programming techniques for data science such as loading, cleaning, transforming, merging, and reshaping data.

Data Visualization and Analysis. This includes methods and software tools for the visual representation of data and advanced tools for big data analysis including unstructured databases and data management platforms.

Applied Machine Learning. This includes data preparation, pipeline construction, machine learning models and their hyperparameters, overfitting and underfitting, regularization, performance measurement, and application development in the cloud.

Applied Deep Learning. This includes artificial neural networks, deep neural networks, deep learning models and training algorithms, optimizers, preparation of training data, measuring performance, and developing applications over the cloud.

The following courses will be offered as indicated.

Every Fall	Every Spring
CIS 130	CIS 120
CIS 230	CIS 130
DSCI 130	CIS 230
DSCI 230	CIS 234
DSCI 231	DSCI 130
DSCI 330	DSCI 230
DSCI 340	DSCI 440
MATH 208	DSCI 499
MATH 213	MATH 214
	MATH 125
	Odd Year Spring
	CIS 360

Minors Offered

Computer Information Systems Minor

A minor in computer information systems consists of

- CIS 102, CIS 120, CIS 130, CIS 230, CIS 231, CIS 321, and
- one of the following courses: MATH 125, MATH 212, MATH 270, MATH 308, MATH 311, MATH 325.

A grade of “C” or better is required in each course applied to the computer information systems minor.

Cybersecurity Minor

A minor in cybersecurity consists of

- CIS 130, CIS 140, CIS 240, CIS 243, CIS 260, and
- two of the following courses: CIS 343, CIS 344, CIS 345, CIS 443.

A grade of “C” or better is required in each course applied to the cybersecurity minor.

Data Science Minor

A minor in data science consists of 19 credit hours, as follows:

DSCI 130: Introduction to Data Science	3
DSCI 230: Introduction to Data Science Programming	4
MATH 211: Statistical Methods I or MATH 311: Mathematical Statistics	3
Choose one of the following combinations	9
• CIS 360: Database Design, DSCI 231: Data Visualization, and DSCI 330: Big Data Analysis	
• CIS 360: Database Design,	

BA 226: Introduction to Analytical Methods, and
DSCI 330: Big Data Analysis

- MATH 208: Applied Linear Algebra or
MATH 308: Linear Algebra,
MATH 213: Supervised Machine Learning, and
DSCI 340: Applied Machine Learning
- MATH 208: Applied Linear Algebra or
MATH 308: Linear Algebra,
MATH 214: Unsupervised Machine Learning, and
DSCI 440: Applied Deep Learning

TOTAL

19

Some courses in this minor have pre-requisites, such as CIS 120, CIS 230, CIS 102 or CIS 202, and MATH 125 or MATH 325

A grade of “C” or better is required in each course applied to the data science minor.

Information Technology Minor

A minor in information technology consists of

- a mathematics requirement:
MATH 114: Precalculus
MATH 121: Mathematical Applications
MATH 123: Calculus and its Applications
MATH 141: Single Variable Calculus I
or MATH 211: Statistical Methods I
- introductory computer applications courses
CIS 120: Fundamentals of Information Systems and Information Technology
and either
CIS 102: Application Software
or CIS 202: Computer Applications for Engineers (6 credit hours)
(CIS 202 requires completion of MATH 141);
- problem solving and computer programming courses
CIS 130: Problem Solving and Programming Methods
CIS 230: Computer Programming Principles I
- one computer networks or advanced computer information systems course chosen from the following:
CIS 240: Introduction to Data Communications
CIS 250: Introduction to E-Commerce
CIS 320: Information Systems and Practice
CIS 321: Analysis and Design
CIS 360: Database Design

Students must earn a 2.0 GPA in courses in the minor.

Mathematics Minor

A minor in mathematics consists of

- Twelve hours of Calculus (MATH 141, MATH 142, and MATH 241),
- Nine hours from the following: MATH 212, MATH 242, or any three-hour 300- or 400-level mathematics content course.

A grade of “C” or better is required in each course applied to the mathematics minor.

2023- 2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: COMPUTER INFORMATION SYSTEMS
PROGRAM: DUAL ENGINEERING

	Credit Hours
UNIVERSITY REQUIREMENT	
FALS 101: Fine Arts and Lecture Series (Temporarily suspended)	0
GENERAL EDUCATION REQUIREMENTS	
(For approved courses, see General Education: www.lander.edu/gen-ed .)	
A. Core Academic Skills (9 hours)	
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 141: Calculus I	4
B. Humanities and Fine Arts	
(6 hours selected from 2 different disciplines To satisfy Literature requirement at Clemson)	
ENGL 201, ENGL 202, ENGL 204, ENGL 205, ENGL 221, ENGL 241, or ENGL 251	3
To satisfy Non-Literature requirement at Clemson:	
HUMA 285, HUM 330, PHIL 102, PHIL 103, PHIL 205, MUSI 101, MUSI 377, MUSI 378, MUSI 333, or THTR 201	3
C. Behavioral and Social Perspectives	
(6 hours selected from 2 different disciplines)	
ANTH 101, HIST 101, HIST 102, HIST 113, PSYC 101	3
ECON 201, ECON 202, POLS 103, SOCI 101, SOCI 202	3
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R</i>	
D. Scientific and Mathematical Reasoning	
(7 hours selected from 2 different disciplines, 1 lab science required)	
CHEM 111: General Chemistry	4
PHYS 211: General Physics I	4
E. Founding Documents of the United States	
HIST 111R: United States History to 1877 or HIST 112R: United States History since 1877 or POLS 101R: American National Government	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
F. World Cultures	
(NOTE: MUSI 333 satisfies Non-Literature Humanities at Clemson)	
G. LINK 101: Leadership, Involvement, Networking and Knowledge	
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen	
TOTAL GENERAL EDUCATION REQUIREMENTS	37
If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not	

complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

NOTE: Clemson's Global Challenge (6 hours) requirement must be completed at Clemson.

MAJOR PROGRAM CORE REQUIREMENTS

CIS 120: Fundamentals of Information Systems and Information Technology	3
CIS 130: Problem Solving and Programming Methods	4
CIS 230: Computer Programming Principles I	4
CIS 231: Computer Programming Principles II	4
CIS 234: Introduction to C/C++ Programming	1
CIS 240: Introduction to Data Communications	3
CIS 320: Information Systems and Practice	3
CIS 321: Analysis and Design	3
ECE 272: Computer Organization (at Clemson)	
<i>Students take EC 272 at Clemson in place of CIS 335: a core requirement at Lander</i>	
CIS 360: Database Design	3
CIS 499: Project Implementation and Management	3

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

CIS 202: Computer Applications for Engineers	3
MATH 134: Introduction to Mathematical Proof	3
PHYS 212: General Physics II	4

REQUIRED MATHEMATICS MINOR

MATH 142: Calculus II	4
MATH 241: Calculus III	4
MATH 242: Differential Equations	4
MATH 308: Linear Algebra or	3
MATH 325 Discrete Mathematics	3

TOTAL MAJOR PROGRAM REQUIREMENTS 59

ADDITIONAL ELECTIVES 24

Students in this program must complete Clemson University requirements for a BS in Computer Engineering. Credits transferred from Clemson complete the required hours for graduation from Lander University.

NOTES: As schedule permits, the following courses recommended as they can be used to fulfill degree requirements at Clemson.

WRIT 450: (Technical Writing).

SPCH 101: (Oral Communications)

MATH 421, or MATH 431, or MATH 432 may be used for the advanced mathematics or special requirement at Clemson.

TOTAL FOR BS DEGREE 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: COMPUTER INFORMATION SYSTEMS
EMPHASIS: NETWORKING

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills (9 hours)

ENGL 101: Writing and Inquiry I 3
ENGL 102: Writing and Inquiry II 3
Mathematics: Choose one from the following: 3-4
MATH 121: Mathematical Applications
MATH 123: Calculus and its Applications
MATH 141: Calculus I

B. Humanities and Fine Arts

(*6 hours selected from 2 different disciplines) 6

C. Behavioral and Social Perspectives

(*6 hours selected from 2 different disciplines) 6
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)
*MATH 212: Statistical Methods II or MATH 142: Calculus II 3-4
PHYS 203: Electronics 4

E. Founding Documents of the United States

HIST 111R: United States History to 1877 or 3
HIST 112R: United States History since 1877 or
POLS 101R: American National Government
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R

F. World Cultures

3

G. LINK 101: Leadership, Involvement, Networking and Knowledge

1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.

TOTAL GENERAL EDUCATION REQUIREMENTS 35

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

CIS 120: Fundamentals of Information Systems and Information Technology 3
CIS 130: Problem Solving and Programming Methods 4
CIS 230: Computer Programming Principles I 4
CIS 231: Computer Programming Principles II 4

CIS 234: Introduction to C/C++ Programming	1
CIS 240: Introduction to Data Communications	3
CIS 320: Information Systems and Practice	3
CIS 321: Analysis and Design	3
CIS 335: Computer Organization	3
CIS 360: Database Design	3
CIS 499: Project Implementation and Management	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

CIS 102: Application Software or successful completion of exemption exam, or CIS 202: Computer Applications for Engineers	0-3
CIS 250: Introduction to E-Commerce	3
CIS 340: Communication Protocols	3
CIS 341: Theory of Data Communications	3
CIS 440: Special Topics in Networking and Communication	3

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

*MATH 125: or MATH 325: Discrete Mathematics	3
*MATH 211: Statistical Methods I or MATH 311: Mathematical Statistics	3
And one of the following	3-4
MATH 200: Introduction to Modeling and Simulation	
MATH 242: Differential Equations	
MATH 300: Numerical Analysis	
MATH 308: Linear Algebra	

TOTAL MAJOR PROGRAM REQUIREMENTS 55-59

ADDITIONAL ELECTIVES (including required minor*) 26-30

Up to 6 hours may need to be at the 300-level or above.
The remaining hours may be at any level

TOTAL FOR BS DEGREE 120

*Select appropriate courses according to the chosen minor. Approved minors are listed in the catalog's description of the major.

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: COMPUTER INFORMATION SYSTEMS
EMPHASIS: SOFTWARE DEVELOPMENT

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| A. Core Academic Skills (9 hours) | 3 |
| ENGL 101: Writing and Inquiry I | 3 |
| ENGL 102: Writing and Inquiry II | 3 |
| Mathematics: Choose one from the following: | 3-4 |
| MATH 121: Mathematical Applications | |
| MATH 123: Calculus and its Applications | |
| MATH 141: Calculus I | |
| B. Humanities and Fine Arts | 6 |
| (6 hours selected from 2 different disciplines) | |
| C. Behavioral and Social Perspectives | 6 |
| (6 hours selected from 2 different disciplines) | |
| <i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R</i> | |
| D. Scientific and Mathematical Reasoning | 3-4 |
| (7 hours selected from 2 different disciplines, 1 lab science required) | |
| *MATH 212: Statistical Methods II or MATH 142: Calculus II | 4 |
| PHYS 203: Electronics | 4 |
| E. Founding Documents of the United States | 3 |
| HIST 111R: United States History to 1877 or | |
| HIST 112R: United States History since 1877 or | |
| POLS 101R: American National Government | |
| <i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i> | |
| F. World Cultures | 3 |
| G. LINK 101: Leadership, Involvement, Networking and Knowledge | 1 |
| LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen. | |
| TOTAL GENERAL EDUCATION REQUIREMENTS | 35 |

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

- | | |
|-------------------------------------------------------------------------|---|
| CIS 120: Fundamentals of Information Systems and Information Technology | 3 |
| CIS 130: Problem Solving and Programming Methods | 4 |
| CIS 230: Computer Programming Principles I | 4 |

CIS 231: Computer Programming Principles II	4
CIS 234: Introduction to C/C++ Programming	1
CIS 240: Introduction to Data Communications	3
CIS 320: Information Systems and Practice	3
CIS 321: Analysis and Design	3
CIS 335: Computer Organization	3
CIS 360: Database Design	3
CIS 499: Project Implementation and Management	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

CIS 102: Application Software or successful completion of exemption exam, or CIS 202: Computer Applications for Engineers	0-3
CIS 250: Introduction to E-Commerce	3
CIS 330: Software Development: Fundamentals and Techniques	3
CIS 498: Design and Implementation in Emerging Environments	3

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

*MATH 125: or MATH 325: Discrete Mathematics	3
*MATH 211: Statistical Methods I or MATH 311: Mathematical Statistics	3
*And one of the following	3-4
MATH 200: Introduction to Modeling and Simulation	
MATH 242: Differential Equations	
MATH 300: Numerical Analysis	
MATH 308: Linear Algebra	

TOTAL MAJOR PROGRAM REQUIREMENTS 52-56

ADDITIONAL ELECTIVES (including required minor*) 29-33

Up to 9 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

*Select appropriate courses according to the chosen minor. Approved minors are listed in the catalog's description of the major.

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrar-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: CYBERSECURITY
EMPHASIS: COMPUTER INFORMATION SYSTEMS

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see the General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills (9 hours)

ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
Mathematics One of the following:	3-4
MATH 121: Mathematical Applications	
MATH 123: Calculus and its Applications	
MATH 141: Calculus I	

B. Humanities and Fine Arts

(6 hours selected from 2 different disciplines) 6

C. Behavioral and Social Perspectives

(*6 hours selected from 2 different disciplines) 6
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)

MATH 212: Statistical Methods II	3
Laboratory Science	4

E. Founding Documents of the United States

HIST 111R: United States History to 1877 or 3
 HIST 112R: United States History since 1877 or
 POLS 101R: American National Government
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

F. World Cultures 3

G. LINK 101: Leadership, Involvement, Networking and Knowledge 1

LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.

TOTAL GENERAL EDUCATION REQUIREMENTS 35-36

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

CIS 102: Application Software or successful completion of exemption exam,	0-3
CIS 120: Fundamentals of Information Systems and Information Technology	3
CIS 130: Problem Solving and Programming Methods	4

CIS 140: Networking Lab	1
CIS 230: Computer Programming Principles I	4
CIS 240: Introduction to Data Communications	3
CIS 243: Fundamentals of Cyber Security	3
CIS 260: Network and Systems Administration	3
CIS 343: Computer Forensics	3
CIS 344: Network Security and Forensics	3
CIS 345: Introduction to Cryptography	3
CIS 346: Cybersecurity Planning and Management	3
CIS 360: Database Design	3
CIS 449: Cybersecurity Capstone	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

CIS 231: Computer Programming Principles II	4
CIS 320: Information Systems and Practice	3
CIS 341: Theory of Data Communications	3

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

MATH 125: or MATH 325: Discrete Mathematics	3
MATH 211: Statistical Methods I <u>or</u> MATH 311: Mathematical Statistics	3
And one of the following:	3-4
MATH 200: Introduction to Modeling and Simulation	
MATH 242: Differential Equations	
MATH 300: Numerical Analysis	
MATH 308: Linear Algebra	

TOTAL MAJOR PROGRAM REQUIREMENTS 58-62

ADDITIONAL ELECTIVES 22-27

Up to 6 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

* Recommended courses: SOC 101 and PSYC 101

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: CYBERSECURITY
EMPHASIS: POLITICAL SCIENCE

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see the General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills (9 hours)

ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
Mathematics One of the following:	3-4
MATH 121: Mathematical Applications	
MATH 123: Calculus and its Applications	
MATH 141: Calculus I	

B. Humanities and Fine Arts

(6 hours selected from 2 different disciplines) 6

C. Behavioral and Social Perspectives

(6 hours selected from 2 different disciplines)

POLS 103 3

*3 hours from a discipline other than POLS 3

If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)

MATH 212: Statistical Methods II 3

Laboratory Science 4

E. Founding Documents of the United States

HIST 111R: United States History to 1877 or 3

HIST 112R: United States History since 1877 or

POLS 101R: American National Government

If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

F. World Cultures 3

G. LINK 101: Leadership, Involvement, Networking and Knowledge 1

LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen

TOTAL GENERAL EDUCATION REQUIREMENTS 35-36

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours

MAJOR PROGRAM CORE REQUIREMENTS

CIS 102: Application Software or successful completion of exemption exam, 0-3

CIS 120: Fundamentals of Information Systems and Information Technology	3
CIS 130: Problem Solving and Programming Methods	4
CIS 140: Networking Lab	1
CIS 230: Computer Programming Principles I	4
CIS 240: Introduction to Data Communications	3
CIS 243: Fundamentals of Cyber Security	3
CIS 260: Network and Systems Administration	3
CIS 343: Computer Forensics	3
CIS 344: Network Security and Forensics	3
CIS 345: Introduction to Cryptography	3
CIS 346: Cybersecurity Planning and Management	3
CIS 360: Database Design	3
CIS 449: Cybersecurity Capstone	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

POLS 391: Homeland Security	3
And two of the following	6
POLS 303: International Relations	
POLS 311: Constitutional Law	
POLS 312: Civil Liberties and Civil Rights	
POLS 325: International Conflict and Terrorism	
POLS 366: International Law	
POLS 390: Globalization	

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

MATH 125: or MATH 325: Discrete Mathematics	3
MATH 211: Statistical Methods I or MATH 311: Mathematical Statistics	3
And one of the following:	3-4
MATH 200: Introduction to Modeling and Simulation	
MATH 242: Differential Equations	
MATH 300: Numerical Analysis	
MATH 308: Linear Algebra	

TOTAL MAJOR PROGRAM REQUIREMENTS 57-61

ADDITIONAL ELECTIVES 23-28

TOTAL FOR BS DEGREE 120

* Recommended courses: SOC 101 or PSYC 101

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrar-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: DATA SCIENCE
EMPHASIS: BUSINESS ANALYTICS

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills

ENGL 101: Writing and Inquiry I 3
ENGL 102: Writing and Inquiry II 3
MATH 123: Calculus and Its Applications 3

B. Humanities and Fine Arts

(6 hours selected from 2 different disciplines) 6

C. Behavioral and Social Perspectives

(6 hours selected from 2 different disciplines)
ECON 101: Economics in Society 3
Behavioral and Social Perspectives 3
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)
MATH 211 3
Laboratory Science 4

E. Founding Documents of the United States

HIST 111R: United States History to 1877 or
HIST 112R: United States History since 1877 or
POLS 101R: American National Government 3
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

F. World Cultures

3

G. LINK 101: Leadership, Involvement, Networking and Knowledge

1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.

TOTAL GENERAL EDUCATION REQUIREMENTS 35

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

CIS 120: Fundamentals of Information Systems and Information Technology 3
CIS 130: Problem Solving and Programming Methods 4
CIS 230: Computer Programming Principles I 4
CIS 234: Introduction to C/C++ Programming 1

CIS 360: Database Design	3
DSCI 130: Introduction to Data Science	3
DSCI 230: Introduction to Data Science Programming	4
DSCI 231: Data Visualization	3
DSCI 330: Big Data Analysis	3
DSCI 340: Applied Machine Learning	3
DSCI 440: Applied Deep Learning	3
DSCI 499: Data Science Capstone	3
MATH 125: Introduction to Discrete Mathematics	3
MATH 208: Applied Linear Algebra	3
MATH 213: Supervised Machine Learning	3
MATH 214: Unsupervised Machine Learning	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

ACCT 201: Financial Accounting Principles	3
WRIT 275: Business Communications	3
BA 226: Introduction to Analytical Methods	3
BA 304: Management Information Systems	3
BA 325: Advanced Analytical Methods	3

TOTAL MAJOR PROGRAM REQUIREMENTS 64

ADDITIONAL ELECTIVES 21

Up to 9 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrar-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: DATA SCIENCE
EMPHASIS: COMPUTER INFORMATION SYSTEMS

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills

ENGL 101: Writing and Inquiry I 3
 ENGL 102: Writing and Inquiry II 3
 MATH 123: Calculus and Its Applications 3

B. Humanities and Fine Arts

(6 hours selected from 2 different disciplines) 6

C. Behavioral and Social Perspectives

(6 hours selected from 2 different disciplines) 6
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)
 MATH 211 3
 Laboratory Science 4

E. Founding Documents of the United States

HIST 111R: United States History to 1877 or
 HIST 112R: United States History since 1877 or
 POLS 101R: American National Government 3
If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

F. World Cultures

3

G. LINK 101: Leadership, Involvement, Networking and Knowledge

1

LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.

TOTAL GENERAL EDUCATION REQUIREMENTS 35

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

CIS 120: Fundamentals of Information Systems and Information Technology 3
 CIS 130: Problem Solving and Programming Methods 4
 CIS 230: Computer Programming Principles I 4
 CIS 234: Introduction to C/C++ Programming 1
 CIS 360: Database Design 3
 DSCI 130: Introduction to Data Science 3

DSCI 230: Introduction to Data Science Programming	4
DSCI 231: Data Visualization	3
DSCI 330: Big Data Analysis	3
DSCI 340: Applied Machine Learning	3
DSCI 440: Applied Deep Learning	3
DSCI 499: Data Science Capstone	3
MATH 125: Introduction to Discrete Mathematics	3
MATH 208: Applied Linear Algebra	3
MATH 213: Supervised Machine Learning	3
MATH 214: Unsupervised Machine Learning	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

Choose 15 credit hours from the following:	15
CIS 140: Networking Lab	
CIS 231: Computer Programming Principles	
CIS 240: Introduction to Data Communication	
CIS 250: Introduction to E-Commerce	
CIS 320: Information Systems and Practice	
CIS 321: Analysis and Design	
CIS 498: Design and Implementation in Emerging Environments	

TOTAL MAJOR PROGRAM REQUIREMENTS 64

ADDITIONAL ELECTIVES 21

Up to 15 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: DATA SCIENCE
EMPHASIS: MATHEMATICS

	Credit Hours
UNIVERSITY REQUIREMENT	
FALS 101: Fine Arts and Lecture Series (Temporarily suspended)	0
GENERAL EDUCATION REQUIREMENTS (For approved courses, see General Education: www.lander.edu/gen-ed .)	
A. Core Academic Skills	
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 141: Calculus I	4
B. Humanities and Fine Arts (6 hours selected from 2 different disciplines)	6
C. Behavioral and Social Perspectives (6 hours selected from 2 different disciplines) <i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	6
D. Scientific and Mathematical Reasoning (7 hours selected from 2 different disciplines, 1 lab science required)	
MATH 211	3
Laboratory Science	4
E. Founding Documents of the United States	3
HIST 111R: United States History to 1877 or HIST 112R: United States History since 1877 or POLS 101R: American National Government <i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
F. World Cultures	3
G. LINK 101: Leadership, Involvement, Networking and Knowledge	1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.	
TOTAL GENERAL EDUCATION REQUIREMENTS	36
If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.	
MAJOR PROGRAM CORE REQUIREMENTS	
CIS 120: Fundamentals of Information Systems and Information Technology	3
CIS 130: Problem Solving and Programming Methods	4
CIS 230: Computer Programming Principles I	4
CIS 234: Introduction to C/C++ Programming	1
CIS 360: Database Design	3
DSCI 130: Introduction to Data Science	3

DSCI 230: Introduction to Data Science Programming	4
DSCI 231: Data Visualization	3
DSCI 330: Big Data Analysis	3
DSCI 340: Applied Machine Learning	3
DSCI 440: Applied Deep Learning	3
DSCI 499: Data Science Capstone	3
MATH 125: Introduction to Discrete Mathematics	3
MATH 208: Applied Linear Algebra	3
MATH 213: Supervised Machine Learning	3
MATH 214: Unsupervised Machine Learning	3

MAJOR PROGRAM EMPHASIS REQUIREMENTS

MATH 142: Single Variable Calculus II	4
MATH 241: Multivariable Calculus	4
MATH 242: Differential Equations	4
MATH 300, MATH 431, or MATH 432	3

TOTAL MAJOR PROGRAM REQUIREMENTS 64

ADDITIONAL ELECTIVES 20

Up to 12 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: MATHEMATICS

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

A. Core Academic Skills (9 hours)

ENGL 101: Writing and Inquiry I 3
 ENGL 102: Writing and Inquiry II 3
 MATH 141: Calculus I 4

B. Humanities and Fine Arts 6

(6 hours selected from 2 different disciplines)

C. Behavioral and Social Perspectives 6

(6 hours selected from 2 different disciplines)

If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R

D. Scientific and Mathematical Reasoning

(7 hours selected from 2 different disciplines, 1 lab science required)

MATH 142: Calculus II 4
 PHYS 211: General Physics 4

E. Founding Documents of the United States 3

HIST 111R: United States History to 1877 or
 HIST 112R: United States History since 1877 or
 POLS 101R: American National Government

If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.

F. World Cultures 3

G. LINK 101: Leadership, Involvement, Networking and Knowledge 1

LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.

TOTAL GENERAL EDUCATION REQUIREMENTS 37

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

MATH 241: Calculus III 4
 MATH 242: Differential Equations 4
 MATH 308: Linear Algebra 3
 MATH 311: Mathematical Statistics 3
 MATH 499: Capstone 1

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

CIS 130: Problem Solving and Programming Methods	4
MATH 134: Introduction to Mathematical Proof	3
MATH 421: Abstract Algebra I	3
MATH 431: Analysis I	3
MATH 422: Abstract Algebra II <u>or</u> MATH 432: Complex Analysis	3

MAJOR PROGRAM ELECTIVES

300-level or above Mathematics content courses except MATH 450 or MATH 451.	9
A 300-level or above Mathematics content course (except MATH 450 or MATH 451) or one of the following	3-4
MATH 212: Statistical Methods II	
CIS 230: Computer Programming Principles I	
PHYS 212: General Physics	

TOTAL MAJOR PROGRAM REQUIREMENTS 43-44

ADDITIONAL ELECTIVES 41-42

Up to 5 credit hours may need to be 300-level or above.
The remaining hours may be at any level.

TOTAL FOR BS DEGREE 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>

2023- 2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: MATHEMATICS
PROGRAM: DUAL ENGINEERING

	Credit Hours
UNIVERSITY REQUIREMENT	
FALS 101: Fine Arts and Lecture Series (Temporarily suspended)	0
GENERAL EDUCATION REQUIREMENTS	
(For approved courses, see General Education: www.lander.edu/gen-ed .)	
A. Core Academic Skills (9 hours)	
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 141: Calculus I	4
B. Humanities and Fine Arts	
(6 hours selected from two different disciplines)	
To satisfy Literature requirement at Clemson	
ENGL 201, ENGL 202, ENGL 204, ENGL 205, ENGL 221, ENGL 241, or ENGL 251	3
To satisfy Non-Literature requirement at Clemson	
HUMA 285, HUM 330, PHIL 102, PHIL 103, PHIL 205, MUSI 101, MUSI 377, MUSI 378, MUSI 333, or THTR 201	3
C. Behavioral and Social Perspectives	
(6 hours selected from 2 different disciplines)	
HIST 101, HIST 102, HIST 113, ECON 201, ECON 202	
PSYC 101, SOCI 101, SOCI 202, POLS 103, ANTH 101	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R</i>	
D. Scientific and Mathematical Reasoning	
(7 hours selected from two different disciplines, one lab science required)	
MATH 142: Calculus II	4
PHYS 211: General Physics I	4
E. Founding Documents of the United States	
HIST 111R: United States History to 1877 or	
HIST 112R: United States History since 1877 or	
POLS 101R: American National Government	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
F. World Cultures	
NOTE: MUSI 333 satisfies Non-Literature Humanities at Clemson	
G. LINK 101: Leadership, Involvement, Networking and Knowledge	
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.	
TOTAL GENERAL EDUCATION REQUIREMENTS	37

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

NOTE Clemson's Global Challenge (6 hours) requirement must be completed at Clemson.

MAJOR PROGRAM CORE REQUIREMENTS

MATH 241: Calculus III	4
MATH 242: Differential Equations	4
MATH 308: Linear Algebra	3
MATH 311: Mathematical Statistics	3
MATH 499: Capstone Course Mathematics	1

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

CIS 130: Problem Solving and Programming Methods	4
CIS 202: Computer Applications for Engineers	3
MATH 134: Introduction to Mathematical Proof	3
MATH 421: Abstract Algebra I or MATH 431: Analysis I	3
PHYS 212: General Physics II	4
CHEM 111: General Chemistry I	4
Additional Science Requirement	0-4
CHEM 112: General Chemistry II (Electrical or Environmental Engineering)	
GEOL 111: Physical Geology (Environmental or Civil Engineering)	
BIOL 101: General Biology (Environmental Engineering)	
CHEM 112, GEOL 111, or BIOL 101 may be used to complete lab science requirements for Industrial engineering	
<i>Mechanical, or Computer Engineering require only CHEM 111.</i>	

MAJOR PROGRAM ELECTIVES

9

MATH 212: Statistical Methods II or any 300-level or above math content courses
Students in Mechanical Engineering strongly encouraged to take MATH 300 Numerical Analysis.
Students in Electrical Engineering strongly encouraged to take MATH 325: Discrete Mathematics, MATH 431: Analysis I or MATH 432: Complex Analysis

TOTAL MAJOR PROGRAM REQUIREMENTS

45-49

ADDITIONAL ELECTIVES

34-38

Students in this program must complete Clemson University requirement for a BS in Engineering. Credits transferred from Clemson complete the required hours for graduation from Lander University.

TOTAL FOR BS DEGREE

120

NOTES: As schedule permits, the following courses are recommended as they can be used to fulfill degree requirements at Clemson, as noted.

SPCH 101 for students in Civil, Computer, Electrical, and Industrial, engineering programs, as it fulfills the Oral Communication requirement at Clemson.

CIS 230 for Computer and Electrical Engineering.

WRIT 450 Technical Writing for Civil, Computer, Electrical, and Mechanical.

Coursework must include at least 30 credit hours earned in 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrar-office/major-guides.html>

2023-2024 PROGRAM REQUIREMENTS

DEGREE: BACHELOR OF SCIENCE
MAJOR: MATHEMATICS
CERTIFICATION: SECONDARY TEACHER

Credit Hours

UNIVERSITY REQUIREMENT

FALS 101: Fine Arts and Lecture Series (Temporarily suspended) 0

GENERAL EDUCATION REQUIREMENTS

(For approved courses, see General Education: www.lander.edu/gen-ed.)

- A. Core Academic Skills** (9 hours)
- | | |
|----------------------------------|---|
| ENGL 101: Writing and Inquiry I | 3 |
| ENGL 102: Writing and Inquiry II | 3 |
| MATH 141: Calculus I | 4 |
- B. Humanities and Fine Arts**
(6 hours selected from 2 different disciplines) 6
- C. Behavioral and Social Perspectives**
(6 hours selected from 2 different disciplines)
- | | |
|---------------------------------------------|---|
| PSYC 101: General Psychology | 3 |
| Behavioral and Social Perspectives elective | 3 |
- If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.*
- D. Scientific and Mathematical Reasoning**
(7 hours selected from 2 different disciplines, 1 lab science required)
- | | |
|---------------------------|---|
| MATH 142: Calculus II | 4 |
| PHYS 211: General Physics | 4 |
- E. Founding Documents of the United States** 3
- | | |
|------------------------------------------------------------------------------------------------------------------------------------------|--|
| HIST 111R: United States History to 1877 or
HIST 112R: United States History since 1877 or
POLS 101R: American National Government | |
|------------------------------------------------------------------------------------------------------------------------------------------|--|
- If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.*
- F. World Cultures** 3
- G. LINK 101: Leadership, Involvement, Networking and Knowledge** 1
- LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen

TOTAL GENERAL EDUCATION REQUIREMENTS 37

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

MAJOR PROGRAM CORE REQUIREMENTS

MATH 241: Calculus III	4
MATH 242: Differential Equations	4
MATH 308: Linear Algebra	3
MATH 311: Mathematical Statistics	3
MATH 499: Capstone	1

MAJOR PROGRAM ADDITIONAL REQUIREMENTS

CIS 130: Problem Solving and Programming Methods	4
MATH 134: Introduction to Mathematical Proof	3
MATH 325: Discrete Mathematics	3
MATH 350: Mathematics History	3
MATH 351: Geometry	3
MATH 421: Abstract Algebra I	3
MATH 431: Analysis I	3
MATH 422: Abstract Algebra II or MATH 432: Complex Analysis	3
MATH 450: Technology in Secondary Mathematics	3
MATH 451: Secondary Mathematics Methods	3
TOTAL MAJOR PROGRAM REQUIREMENTS	46

TEACHER CERTIFICATION REQUIREMENTS

** EDUC 203: Field Experience I	0.5
* EDUC 223: General Pedagogy	3
* EDUC 250: Adolescent Development and Learning Communities	3
* EDUC 320: Reading and Writing in the Content Area	3
* EDUC 321: Foundations of Reading	3
** EDUC 329: Field Experience II	0.5
** EDUC 429: Clinical Practice A	1
** EDUC 461: Clinical Practice B	11
* EDUC 499: Teacher Education Seminar	1
* SPED 223: PREK-12 Students with Diverse Learning Needs	3
TOTAL TEACHER CERTIFICATION REQUIREMENTS	29

ADDITIONAL ELECTIVES

8

TOTAL FOR BS DEGREE

120

* A Grade of "C" or better is required.

**A Grade of "B" or better is required.

Coursework must include at least 30 credit hours earned in 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses
<https://www.lander.edu/academics/registrars-office/major-guides.html>