

# SCHOOL OF SCIENCE & ENGINEERING

## Mission Statement

The School of Science & Engineering prepares graduates to be leaders who are able to coordinate multidisciplinary teams to research, design, and implement solutions in the areas of applied mathematics, biochemistry, biology, computer science, cybersecurity, and engineering. As such, the School of Science & Engineering instructs students in the foundational concepts and skills of the sciences through a Christian worldview. Graduates are able to apply the scientific method, analyze observations quantitatively and qualitatively, integrate knowledge between scientific disciplines, value scientific inquiry as a means of exploring God's general revelation in the natural world. These skills enable graduates to serve effectively in their professions, and to give God-honoring leadership in the home, church, community and world.

The Biology and Biochemistry programs prepare students for careers in science and for a wide variety of professional schools, including graduate programs in biology, biochemistry, and health professions such as medicine, nursing, physician assistant, dentistry, chiropractic, pharmacy, and physical therapy. The biological sciences exert more influence in our society than ever before, and faculty strive to be in the vanguard of an approach to education based on inquiry and critical thinking within the framework of a Christian worldview.

The Computer Science, Cybersecurity, and Applied Mathematics programs provide theoretical and applied understanding of computer systems and mathematical principles, which have an increasing influence on the global exchange of information. Computer systems are increasingly applied to solving business problems, developing mobile applications, storing information, and artificial intelligence. Cybersecurity addresses problems that could compromise the confidentiality, integrity, or accessibility of systems and data. Mathematics is increasingly applied to organizing information about, modeling, and understanding the physical world. All courses within these majors are presented in the context of a biblical worldview, which guides the use of computer systems and mathematical techniques. Courses are taught with updated and industry-recognized software, programming languages, and data analysis tools. Students are equipped to succeed in related courses, to use mathematics to solve practical problems, to integrate new computer systems, and to prepare for future work in industry, business, government, or graduate school.

The Engineering and Mechanical Engineering programs prepare graduates to be engineering leaders who are able to coordinate multidisciplinary teams to research, design, and implement solutions with consideration of standard procedures, ethical practices, contemporary technologies, and the impact on creation for God-honoring service to the profession, community, and world.

**NOTE:** WHEN A STUDENT RECEIVES A "U" GRADE FOR THE LAB PORTION OF A SCIENCE COURSE, HE/SHE RECEIVES CREDIT FOR THE COURSE, BUT THE COURSE DOES NOT COUNT FOR LABORATORY SCIENCE CREDIT IN CORE CURRICULUM.

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# Applied Mathematics Major

## Bachelor of Science

Students in the Applied Mathematics major learn to apply fundamental knowledge of mathematics, statistics, and computing to solving quantitative problems in areas related to business, finance, data analytics, statistics, technology, and the natural sciences. The core curriculum provides students with an understanding of ideas that have shaped human thinking in mathematics and the humanities, arts, and sciences. The required courses in the major provide a broad perspective that gives students the context to comprehend God's intricate design of the universe and humanity, and how mathematics has shaped current practices in society, science, and technology. Graduates are well prepared for employment in industry, government, and education, or for further graduate studies in related applied fields. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** mathematics course in core curriculum: MAT2121.

**Required Courses . . . . . 50 cr**

BUS2011	Introduction to Business Analysis . . . . .	2
BUS3835	Professional Skills Seminar . . . . .	2
COS2005	Python Programming . . . . .	4
MAT2055	Statistics . . . . .	4
MAT2122	Calculus and Analytic Geometry II . . . . .	4
MAT2221	Foundations of Mathematics I . . . . .	2
MAT2222	Foundations of Mathematics II . . . . .	2
MAT3211	Linear and Abstract Algebra . . . . .	4
MAT3223	Calculus and Analytic Geometry III . . . . .	4
MAT3225	Discrete Mathematics . . . . .	2
MAT3226	Applications of Digital Logic . . . . .	2
MAT3245	Geometry . . . . .	4
MAT3335	Differential Equations with Applied Linear Algebra . . . . .	4

MAT4845	Senior Project [OCE, WCE] . . . . .	2
MAT4995	Mathematics Internship . . . . .	1
<b>Select 7 elective courses from the following:</b>		
MAT3252	Statistics for Engineering . . . . .	4
EGR3337	Signals and Systems . . . . .	3
EGR4339	Numerical Analysis . . . . .	3
EGR4841	Research . . . . .	1
	(REPEATABLE FOR 4 CR MAXIMUM)	
DAL3255	Data Modeling . . . . .	4
DAL4275	Business and Economic Forecasting . . . . .	4

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SEE PAGE 58 FOR EXPLANATION AND PREREQUISITES.

# Applied Mathematics Minor . . . . . 18 cr

The applied mathematics minor is designed to add quantitative problem solving and rigor to other related majors, especially those in fields of business, finance, technology, and science.

**Required Courses:** MAT2121, 2122, 2221, 3225; six MAT-prefix credits 3000 level or above.

# Biochemistry Major

## Bachelor of Science

Biochemistry is the study of carbohydrates, proteins, lipids, nucleic acids, and the processes of these molecules in the body. A rapidly developing and relatively new discipline within the sciences, biochemistry intersects with physiology, medicine, cell biology, genetics, etc. In recent years the pace of biochemical discovery has accelerated due to the profound transformation wrought by recombinant DNA technology. Biochemistry majors will be well prepared to enter the work force or pursue graduate degrees, medical school, or other professional training. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science courses PHY1101/1101L or PHY1201/1201L; mathematics course MAT2121.
- **Biochemistry majors** must receive a C- or better in all prerequisite courses. In addition, biochemistry majors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Required Courses .....47–48 cr

BIO1011/1011L	Principles of Biology I .....	4
BIO1012	Principles of Biology II .....	4
BIO3235/3235L	Biochemistry .....	5
BIO3246/3246L	Genetics or	
BIO4841/CHE4841	Research/Chemistry Research. ....	4–5
BIO3335	Molecular Medicine .....	4
BIO4359L	Biotechnology Lab .....	2
BIO4835	Senior Seminar [OCE, WCE] .....	2
CHE1021/1021L	Principles of Chemistry I .....	4
CHE1022/1022L	Principles of Chemistry II .....	4
CHE3101/3101L	Organic Chemistry I .....	5
CHE3102/3102L	Organic Chemistry II .....	5
PHY1102/1102L	Fundamentals of Physics II .....	4

Students are strongly encouraged to take additional BIO courses to count towards the general elective requirements.

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# Biology Major

## Bachelor of Science

Through a sequence of core courses, the biology major provides students with a comprehensive study of the various sub-disciplines of biology including cell and molecular biology, organismal biology, genetics, and ecology. Opportunities for research, independent study, and practical internships further strengthen each student's degree and résumé. The major is a flexible program that contains four unique tracks: Cellular and Molecular Biology, General Biology, and Pre-Medical/Pre-Professional Biology. After completing the biology core requirements, students are able to select from a wide variety of science electives to prepare for any profession in the biological sciences: Clinical Health Sciences, including medical, dental, veterinary, physician assistant, doctor of nurse practitioner, public health, physical therapy, chiropractic, etc.; Research Sciences, including biomedical industry, M.S. and Ph.D. programs in cellular and molecular biology, plant and environmental science, forensic science, genetics, etc. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

## Cellular and Molecular Biology Track (49–51 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Biology Core ..... 19 cr

BIO1011/1011L	Principles of Biology I.....	4
BIO1012	Principles of Biology II.....	4
BIO2113/2113L	Principles of Biology III.....	4
BIO4835	Senior Seminar [OCE, WCE].....	2
CHE3101/3101L	Organic Chemistry I.....	5

### Required Courses .....26–27 cr

BIO3145/3145L	Microbiology.....	4
BIO3246/3246L	Genetics.....	5
BIO3347	Cell Physiology <b>or</b>	
BIO3348/3348L	Cell Biology.....	4–5
CHE1022/1022L	Principles of Chemistry II.....	4
CHE3102/3102L	Organic Chemistry II.....	5
PHY1101/1101L	Fundamentals of Physics I <b>or</b>	
PHY1201/1201L	Engineering Physics I.....	4

### Selectives ..... 4–5 cr

BIO3157/3157L	Human Anatomy.....	4
BIO3158/3158L	Human Physiology.....	4
BIO3235/3235L	Biochemistry.....	5
BIO3236	Immunology.....	4
BIO3335	Molecular Medicine.....	4
BIO4359L	Biotechnology Lab.....	2
BIO4841/CHE4841	Research/Chemistry Research.....	1–4
BIO4995	Biology Internship.....	1–4
MAT courses numbered 2122 or higher		
PHY courses numbered 1102 or higher		
Au Sable Institute* courses		

Students are strongly encouraged to take additional BIO, MAT, PHY, or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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SEE PAGE 58 FOR EXPLANATION AND PREREQUISITES.

\* SEE RELATED INFORMATION ON PAGES 23, 45–46, 215

## General Biology Track (50 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Biology Core ..... 19 cr

BIO1011/1011L	Principles of Biology I	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I	5

### Required Courses ..... 9 cr

BIO3246/3246L	Genetics	5
PHY1101/1101L	Fundamentals of Physics I or	
PHY1201/1201L	Engineering Physics I	4

### Biology Electives ..... 22 cr

BIO1025	Medical Terminology	2
BIO2015	Sustainable Urban Agriculture	2
BIO2825/2825L	Honors Topics in Biology	2 or 4
BIOX805	Topics in Biology	2–4
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy	4
BIO3158/3158L	Human Physiology	4

BIO3159	Pathophysiology	3
BIO3175/3175L	Ecology	4
BIO3235/3235L	Biochemistry	5
BIO3236	Immunology	4
BIO3276/3276L	Field Biology	4
BIO3277/3277L	Conservation Biology	4
BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO3335	Molecular Medicine	4
BIO4841/CHE4841	Research/Chemistry Research	1–4
Au Sable Institute* courses		4–8
Additional BIO-prefix courses numbered 2116 or higher		
MAT-prefix courses numbered 2055 or higher		

Students are strongly encouraged to take additional BIO, MAT, PHY or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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## Pre-Medical/Pre-Professional Biology Track (56–58 cr)

- **Theological Philosophy** course in core curriculum: PHI2016.
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L\*; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Biology Core ..... 19 cr

BIO1011/1011L	Principles of Biology I*	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I*	5

### Required Courses ..... 31 cr

BIO3235/3235L	Biochemistry*	5
BIO3246/3246L	Genetics	5
BIO3335	Molecular Medicine	4
CHE1022/1022L	Principles of Chemistry II*	4
CHE3102/3102L	Organic Chemistry II*	5
PHY1101/1101L	Fundamentals of Physics I* or	
PHY1201/1201L	Engineering Physics I*	4
PHY1102/1102L	Fundamentals of Physics II* or	
PHY1202/1202L	Engineering Physics II*	4

### Selectives ..... 6–8 cr

BIO1025	Medical Terminology	2
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy*	4
BIO3158/3158L	Human Physiology*	4
BIO3159	Pathophysiology	3
BIO3236	Immunology	4

BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO4841/CHE4841	Research*/Chemistry Research*	1–4
BIO4995	Biology Internship	1–4
Au Sable Institute** courses		4

Students desiring to take BIO3157 Human Anatomy and BIO3158 Human Physiology are encouraged to declare a health sciences minor.

Students are strongly recommended to have a GPA of 3.5 or higher in order to be competitive for professional programs. Students are strongly encouraged to take additional BIO courses and PSY1005, 2108, and SOC1035 to count towards the 16 credits in the enhanced curriculum (free electives) needed for the total of 125 credits for the degree program. Courses should be selected based in part on material covered in entrance exams and requirements for the student's desired professional program. Additionally, students should gain experience through research or internship opportunities.

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\* COURSES TYPICALLY NEEDED FOR THE MCAT OR MEDICAL SCHOOL RÉSUMÉ

\*\* SEE RELATED INFORMATION ON PAGES 23, 45–46, 215

**SCIENCE & ENGINEERING****Biology Minor. . . . . 16 cr**

**Required Courses:** BIO1011/1011L, BIO1012; BIO2113/2113L; 4 credits selected from courses with BIO-prefix numbered 3000 or higher.

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**Chemistry Minor . . . . . 17–18 cr**

**Required Courses:** CHE1021/1021L, 1022/1022L, 3101/3101L; one course selected from CHE3102/3102L, BIO3235/3235L, 3335.

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**Environmental Science Minor . . . . . 16 cr**

**Required Courses:** BIO2113/2113L, 3175/3175L, SCI1010/1010L; 4 credits selected from BIO3276/3276L, 3277/3277L, approved topics courses, or department chair-approved courses from Au Sable Institute.\*

\*SEE RELATED INFORMATION ON PAGES 23, 45–46, 215

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**Science Minor. . . . . 16 cr**

**Required Courses:** 16 credits in courses with BIO, CHE, or PHY prefixes (must include courses from at least two disciplines)

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**Science and Theology Minor . . . . . 20 cr****Required Courses:**

- Two courses (8 credits) with BIO, CHE, PHY, or SCI prefix
  - 8 credits selected from BIA/BIB prefix (2–4 credits); BIO4841 (2–4 cr); BIO4995 (2–4 credits); PHI3035; PHI3805 (Topics); SCI1008; one additional BIO, CHE, PHY, or SCI prefix course (4 credits)
  - SCI3037
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**Beta Beta Beta Biological Society**

This prestigious National Biology Honors Society exists to provide educational and service opportunities to biology students. Membership is based upon sophomore class standing and earned GPA. Members plan and participate in society-sponsored activities such as guest speakers, career round-table discussions, field trips, research presentations, community service, and social gatherings.

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# Computer Science Major

## Bachelor of Science

The Computer Science major is a four-year program designed to give students the knowledge to develop and use computer algorithms and computer-based systems. In addition, students learn computing and mathematical principles that are used in the analysis and design of such systems. Students are provided with the fundamentals of the mathematics of computers, computer programming, operating systems, database management, and computer security, all of which provide a firm foundation upon which to apply and research new technologies. The program includes training in four broad areas:

- Technical skills in programming and application development
- Applied mathematical skills for computations and simulations
- High-level design and analysis skills
- Application with databases, computer security, and communications

Students completing this program are prepared to function effectively in a variety of careers as software developers, information technology consultants, information technology analysts, database administrators, and systems analysts. Students are also prepared for rigorous graduate programs in the computing sciences. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** mathematics course in core curriculum: C- or better in MAT2055.
- **Students must receive** a grade of C- or better in all COS, CYS, and MIS required courses. Courses with grades below C- must be repeated.

### Core Requirements ..... 12 cr

COS2005	Python Programming .....	4
COS2015	Principles of Computing or	
COS1011	Principles of Computing I and	
COS2112	Principles of Computing II .....	4
MIS2062	Database Management I .....	4

### Computer Science Requirements..... 37 cr

COS3001	C Programming Language .....	2
COS3267	Operating Systems Concepts .....	4
COS3271	Programming I – Java .....	4
COS3272	Programming II – Mobile Application Development .....	4
COS4855	Project Capstone [OCE, WCE] .....	2
COS4995	Computer Science Internship .....	1
CYS2081	Data Communications .....	4
CYS2269	Computer Security Fundamentals .....	4
CYS3065	Systems Analysis and Design .....	4
CYS3265	Tools and Techniques in Computer Science and Cybersecurity .....	4
MAT3225	Discrete Mathematics .....	2
MAT3226	Applications of Digital Logic .....	2

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### Computer Science Minor ..... 16 cr

The computer science minor is designed to introduce students to applications of computer-based systems, the development of computer algorithms, and writing code in various computer languages.

**Required Courses:** COS2005, 3271, 3272; select 4 credits from COS courses numbered 2000 or higher.

## SCIENCE &amp; ENGINEERING

## Associate of Science in Computer Science (AU Online) (60 cr)

The Associate of Science in Computer Science is designed to give students the knowledge to develop and use computer algorithms and computer software. In addition, students learn computing and mathematical principles that are used in the design of such systems. Students are provided with the mathematic fundamentals of computers and computer programming. Students completing this program are prepared to function effectively as software developers and information technology consultants. A.S. graduates are able to transition into one of the existing B.S. programs or pursue an undergraduate degree at another institution. The degree is granted upon successful completion of credits specified here.

- All approved Traditional Undergraduate courses will apply to the corresponding category. Related transfer credits may apply if approved.
- **Scientific & Quantitative Literacy** must include at least one mathematics course and one natural science course; social science courses are optional.

### Core Curriculum .....30–33 cr

#### Biblical Thinking & Living .....6–8 cr

##### Select 2 credits from the following:

BIA1015	Interpreting Scripture.....2
MIN2016	Biblical Interpretation for Study.....2

##### Select 2 credits from the following:

BIA1007	Christian Thinking and Living.....2
BIB1008	History of Redemption.....2
BIB2008	Survey of the New Testament.....2

##### Select 2–4 credits from the following:

PHI2005	Introduction to Philosophy.....4
PHI2016	Ethics.....4
PHI2055	Introduction to Theological Philosophy.....2
PHI3057	Christian Apologetics.....2

#### Leadership & Professionalism .....2 cr

LDR3415	The Self-aware Leader.....2
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#### Effective Communication .....3 cr

COM1075	Public Speaking.....3
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#### Critical Thinking & Information Literacy.....4 cr

(reinforces Effective Communication outcomes)

ENG1107	College Writing & Research.....4
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#### Cultural & Global Engagement.....4 cr

HIS1005	Historical Perspectives on Culture, Belief, and Civilization.....4
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#### Creative Expression .....3–4 cr

(Art, Film, Literature, Music, or Theatre)

Any ART or LIT prefix or any of the below:

COM2008	Film Appreciation.....3
ENG2215	Writing Creative Nonfiction.....2
THE1055	Introduction to Theatre.....2

### Scientific & Quantitative Literacy.....8 cr

#### Select 2–6 credits from the following:

MAT2055	Statistics.....4
MAT2121	Calculus and Analytic Geometry I.....4
MAT3226	Applications of Digital Logic.....2

#### Select 2–6 credits from the following (lab not required):

Any BIO (excludes BIO1025), CHE, PHY, or SCI prefix

BIO2016	Our Changing Climate.....2
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#### Select credits from the following, if needed:

Any ANT, ECO, GEO, or SOC prefix or any of the below:

ICS2045	Socio-cultural Anthropology.....4
POS2005	U.S. National Government.....4
PSY1005	Introduction to Psychology.....4
PSY2108	Lifespan Psychology or
PSY2005	Child and Adolescent Development and
PSY2006	Adult Development.....4

### Computer Science Specialization.....24 cr

COS2005	Python Programming.....4
COS2015	Principles of Computing or
COS1011	Principles of Computing I and
COS2112	Principles of Computing II.....4
COS3271	Programming I – Java.....4
COS3272	Programming II – Mobile Application Development..4
CYS2081	Data Communications.....4
CYS3065	Systems Analysis and Design.....4
MAT3226	Applications of Digital Logic
(SEE SCIENTIFIC & QUANTITATIVE LITERACY REQUIREMENT ABOVE)	

### General Electives .....3–6 cr



## Associate of Science in Computer Science (TR On-Campus) (60 cr)

The Associate of Science in Computer Science is a two-year program designed to give students the knowledge to develop and use computer algorithms and computer software. In addition, students learn computing and mathematical principles that are used in the design of such systems. Students are provided with the fundamentals of the mathematics of computers and computer programming. Students completing this program are prepared to function effectively as software developers and information technology consultants. The degree is granted upon successful completion of credits specified here.

- **Scientific & Quantitative Literacy** mathematics course in core curriculum must be either MAT2055, MAT2121, or MAT3226 (recommended).

### Core Curriculum .....30–33 cr

#### Biblical Thinking & Living ..... 8 cr

- BIA1007 Christian Thinking & Living (or BIB1826 honors) ... 2  
 BIA1015 Interpreting Scripture (or BIA1827 honors) or  
 MIN2016 Biblical Interpretation for Study ..... 2  
 Theological Philosophy (select from list on page 51) ..... 4

#### Effective Communication ..... 3 cr

- COM1075 Public Speaking (or COM1825 Honors) ..... 3

#### Critical Thinking & Information Literacy ..... 4–5 cr

(reinforces Effective Communication outcomes)

- ENG1107 College Writing & Research and, if required,  
 ENG1107L English Composition Lab or  
 LAN1107L English Composition Lab ..... 4-5

#### Cultural & Global Engagement ..... 4–5 cr

- HIS1005 Historical Perspectives on Culture, Belief, and Civilization  
 (or HIS1825 Honors or HIS1826 Honors) and, if required,  
 HIS1005L Historical Perspectives Lab ..... 4-5

#### Creative Expression ..... 3–4 cr

Art, Film, Music, Literature, Theatre (select from list on page 52)

A MAXIMUM OF 2 CREDITS IN MUSIC ENSEMBLES OR THE1045 MAY APPLY

#### Scientific & Quantitative Literacy ..... 8 cr

Mathematics, Natural Science, Social Science (select from list on page 52)  
 MUST INCLUDE AT LEAST ONE MATHEMATICS AND ONE NATURAL SCIENCE COURSE.  
 EXCLUDES BIO1025.

### Computer Science Specialization ..... 24 cr

- COS2005 Python Programming ..... 4  
 COS2015 Principles of Computing or  
 COS1011 Principles of Computing I and  
 COS2112 Principles of Computing II ..... 4  
 COS3271 Programming I – Java ..... 4  
 COS3272 Programming II – Mobile Application Development .. 4  
 CYS2081 Data Communications ..... 4  
 CYS3065 Systems Analysis and Design ..... 4

### General Electives ..... 3–6 cr

# Cybersecurity Major

Bachelor of Science

The Cybersecurity major is designed to give students a strong academic experience in Cybersecurity as it permeates virtually all parts of technology today, providing information security, monitoring computer networks, and preventing and/or mitigating cyber threats. Cybersecurity professionals prescribe and use policies, procedures, and technology to address natural events, hackers, cyber terrorists, and technical problems that could compromise the confidentiality, integrity, or accessibility of systems and data. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** mathematics course in core curriculum: C- or better in MAT2055.
- **Students must receive** a grade of C- or better in all COS, CYS, and MIS required courses. Courses with grades below C- must be repeated.

<b>Core Requirements . . . . . 12 cr</b>	<b>Cybersecurity &amp; Information Systems Requirements. 39 cr</b>
COS2005 Python Programming . . . . .4	COS3267 Operating Systems Concepts . . . . .4
COS2015 Principles of Computing <b>or</b>	CYS2081 Data Communications . . . . .4
COS1011 Principles of Computing I <b>and</b>	CYS2269 Computer Security Fundamentals . . . . .4
COS2112 Principles of Computing II . . . . .4	CYS3065 Systems Analysis and Design . . . . .4
MIS2062 Database Management I . . . . .4	CYS3265 Tools and Techniques in Computer Science and Cybersecurity . . . . .4
	CYS4245 Cybersecurity: Current Practices and Trends . . . . .4
	CYS4369 Introduction to Cryptography . . . . .2
	CYS4465 Computer Firewalls and Penetration Testing . . . . .2
	CYS4466 Digital Forensics . . . . .2
	CYS4855 Senior Capstone [ <b>OCE, WCE</b> ] . . . . .2
	CYS4995 Cybersecurity & Information Systems Internship . . .1
	MAT3226 Applications of Digital Logic . . . . .2
	MIS3185 Server Administration . . . . .4

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# Cybersecurity Minor . . . . . 18 cr

The cybersecurity minor is designed to add awareness of cyber security threats as well as tools and techniques for providing a solid defense against attacks for those in fields such as computer science, accounting, business, and criminal justice.

**Required Courses:** CYS2081, 2269, 4369, 4465, 4466; MIS3185.

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# Engineering Major

## Bachelor of Science

Students in the Engineering major learn to apply fundamental knowledge of mathematics, science, and engineering to the creative development of solutions to complex technical problems. The core curriculum provides students with an understanding of ideas that have shaped human thinking in engineering and the humanities, arts, and sciences. This broad perspective gives students the context to comprehend the intentions of God's plan for human activity and realize the environmental, economic, ethical, sustainable, social, and safety impact of their engineering designs on creation and mankind. Graduates are well prepared to pursue employment in industry and to pursue graduate studies in engineering and related fields. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

The Bachelor of Science in Engineering program is accredited by the Engineering Accreditation Commission of ABET (<https://www.abet.org>), under the General Criteria.

- **Engineering students** must have a laptop computer capable of running applications in Windows (see department-specific recommendations at myUNW and viewing the Information Technology Services page).
- **Scientific & Quantitative Literacy** courses in core curriculum: mathematics course MAT2121; natural science course PHY1201/1201L.

### Engineering Core ..... 47 cr

CHE1021/1021L	Principles of Chemistry I	4
MAT2121	Calculus and Analytic Geometry I (SEE SCIENTIFIC & QUANTITATIVE LITERACY REQUIREMENT ABOVE)	4
MAT2122	Calculus and Analytic Geometry II	4
MAT3223	Calculus and Analytic Geometry III	4
MAT3252	Statistics for Engineering	4
MAT3335	Differential Equations with Applied Linear Algebra	4
PHY1201/1201L	Engineering Physics I (SEE SCIENTIFIC & QUANTITATIVE LITERACY REQUIREMENT ABOVE)	4
PHY1202/1202L	Engineering Physics II	4
EGR1005	Introduction to Engineering	4
EGR2105	Statics	3
EGR2206	Introduction to Engineering Analysis	4
EGR2207	Thermodynamics	3
EGR3115	Materials Science	3
EGR4311	Engineering Design I [WCE]	3
EGR4312	Engineering Design II [OCE]	3

### Concentration ..... 30–34 cr

Select a concentration. Requirements are listed below.

#### Chemical Engineering Concentration (34 cr)

CHE1022/L	General Chemistry II	4
CHE3101/L	Organic Chemistry I	5
EGR3307	Chemical Engineering Thermodynamics	3
EGR3309	Reaction Kinetics and Reactor Design	3
EGR3225	Fluid Mechanics	3
EGR2107	Intro to Circuits	3
EGR3326	Materials Laboratory – Mechanical	2
EGR3215	Control Systems	3
EGR3327	Heat Transfer	3
EGR3328	Thermal-Fluids Lab	2

#### Technical electives ..... 3

Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

#### Civil Engineering Concentration (30 cr)

EGR2145	Surveying Fundamentals	2
EGR2205	Mechanics of Materials	3
EGR2209	Dynamics	3
EGR3225	Fluid Mechanics	3
EGR3245	Structural Analysis	3
EGR3246	Materials Laboratory for Civil Engineering	2
EGR3347	Geotechnical Engineering	3
EGR3348	Soils Testing Laboratory	2
SCI1010/1010L	Environmental Science	4

#### Technical Electives ..... 5

Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

#### Electrical Engineering Concentration (30 cr)

COS3001	C Programming	2
EGR2107	Introduction to Electronics and Electrical Circuits	3
EGR2108	Electronics and Electrical Circuits Laboratory	2
EGR3215	Control Systems	3
EGR3235	Electronic Devices	4
EGR3236	Digital Electronics Laboratory	2
EGR3335	Microcontrollers	2
EGR3337	Signals & Systems	3
EGR3338	Communication Systems Laboratory	2
MAT3226	Applications in Digital Logic	2

#### Technical Electives ..... 5

Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

**SCIENCE & ENGINEERING****Mechanical Engineering Concentration (30 cr)**

EGR2107	Introduction to Electronics and Electrical Circuits ..3
EGR2108	Electronics and Electrical Circuits Laboratory .....2
EGR2125	Design and Manufacturing Laboratory .....2
EGR2205	Mechanics of Materials .....3
EGR2209	Dynamics .....3
EGR3215	Control Systems .....3
EGR3225	Fluid Mechanics .....3
EGR3326	Materials Laboratory for Mechanical Engineering...2
EGR3327	Heat and Mass Transfer .....3
EGR3328	Thermal-Fluids Laboratory .....2

**Technical Electives** .....4  
 Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

**General Engineering Concentration (30 cr)**

EGR2107	Introduction to Electronics and Electrical Circuits ..3
EGR2108	Electronics and Electrical Circuits Laboratory .....2
EGR2205	Mechanics of Materials .....3
EGR3215	Control Systems .....3
COS3001	C Programming .....2
EGR2125	Design and Manufacturing Laboratory .....2
EGR2145	Surveying Fundamentals .....2

**Technical Electives** ..... 17  
 Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

WCE = WRITTEN COMMUNICATION EMPHASIS.  
 OCE = ORAL COMMUNICATION EMPHASIS.  
 SEE PAGE 58 FOR EXPLANATION AND PREREQUISITES.

## Health Sciences Major

### Bachelor of Science

The Health Sciences major is primarily intended for students who intend to pursue the Masters in Nursing, Masters in Physician Assistant, Doctor of Physical Therapy, Masters in Nutrition, Masters in Public Health, etc. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Theological Philosophy** course in core curriculum: PHI2016
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course BIO1011/1011L; mathematics course MAT2055.
- **Health Sciences majors** must receive a C- or better in all prerequisite courses. In addition, Health Sciences majors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, HPE, and HSC prefixes in order to graduate.

**Required Courses** .....45–46 cr

BIO1025	Medical Terminology. ....2
BIO3145/3145L	Microbiology .....4
BIO3157/3157L	Human Anatomy .....4
BIO3158/3158L	Human Physiology .....4
BIO3159	Pathophysiology .....3
CHE1021/1021L	Principles of Chemistry I .....4
CHE1022/1022L	Principles of Chemistry II or
CHE3101/3101L	Organic Chemistry I ..... 4–5
HPE3006	Human Nutrition .....4

HSC4835	Senior Seminar for the Health Sciences [OCE, WCE] .2
HSC4995	Health Sciences Internship .....2
PSY1005	Introduction to Psychology .....4
PSY2108	Lifespan Psychology .....4
BIO, CHE, HPE, KIN, or PHY prefix courses, or other courses approved by Chair of the Department of Biology and Biochemistry. Neither BIO nor CHE courses numbered 1009 or lower may be counted in the major. ....4	

Work experience as a Certified Nursing Assistant is highly recommended.

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## Health Sciences Minor .....24 cr

**Required Course:** BIO1011/1011L; select 20 credits from the following: BIO, CHE, HPE, KIN, PHY, PSY, or SOC prefix courses, or MAT2121, MAT2122. Neither BIO- nor CHE- courses numbered 1009 or lower may be counted in the minor.

## Mathematics Education Major..... see Department of Teacher Education

# Mechanical Engineering Major

## Bachelor of Science

The Bachelor of Science in Mechanical Engineering curriculum provides students with a varied and balanced educational experience through a combination of theoretical concepts and practical applications taught within the context of a Christian worldview. A unique combination of mathematics, sciences, and engineering topics, together with the core curriculum of communications, humanities, social sciences, and Biblical studies, prepares students for professional engineering positions in the field of mechanical engineering. The program focuses on key areas of mechanical engineering including mechanical design, control systems, and thermal sciences. Students learn to analyze, design, build, and test mechanical components, devices and systems. Graduates are well prepared to pursue employment in industry or graduate studies in mechanical engineering. The degree is granted upon successful completion of credits specified here and on pages 56–57 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Engineering students** must have a laptop computer capable of running applications in Windows (see department-specific recommendations at myUNW and viewing the Information Technology Services page).
- **Scientific & Quantitative Literacy** courses in core curriculum: mathematics course MAT2121; natural science course PHY1201/1201L.

### Required Courses ..... 82 cr

CHE1021/1021L	Principles of Chemistry I/Laboratory.....4
MAT2121	Calculus and Analytic Geometry I.....4
(SEE SCIENTIFIC & QUANTITATIVE LITERACY REQUIREMENT ABOVE)	
MAT2122	Calculus and Analytic Geometry II.....4
MAT3223	Calculus and Analytic Geometry III.....4
MAT3335	Differential Equations & Applied Linear Algebra. 4
MAT3252	Statistics for Engineering.....4
PHY1201/1201L	Engineering Physics I/Laboratory.....4
(SEE SCIENTIFIC & QUANTITATIVE LITERACY REQUIREMENT ABOVE)	
PHY1202/1202L	Engineering Physics II/Laboratory.....4
EGR1005	Introduction to Engineering.....4
EGR2206	Introduction to Engineering Analysis.....4
EGR2207	Thermodynamics.....3
EGR2105	Statics.....3
EGR2209	Dynamics.....3
EGR3115	Materials Science.....3
EGR4311	Engineering Design I [WCE].....3
EGR4312	Engineering Design II [OCE].....3

EGR2125	Design & Manufacturing Lab.....2
EGR2205	Mechanics of Materials.....3
EGR2107	Intro to Circuits.....3
EGR2108	Electronic Lab.....2
EGR3205	Machine Design.....3
EGR3225	Fluid Mechanics.....3
EGR3236	Materials Laboratory – Mechanical.....2
EGR3215	Control Systems.....3
EGR3327	Heat and Mass Transfer.....3
EGR3328	Thermal-Fluids Lab.....2

**Selective Technical electives.....6**  
 Select from EGR-prefix courses at the 3000 or 4000 level. Students may not receive credit toward the major for both EGR3246 and EGR3326. A maximum combined 4 credits allowed from EGR4841 and EGR4995.

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