

# SCHOOL OF SCIENCES

BIOCHEMISTRY • BIOLOGY • BIOMEDICAL SCIENCE • CHEMISTRY • COMPUTER SCIENCE • ENGINEERING PHYSICS  
 MATHEMATICS • NATURAL SCIENCE • PHYSICS

## ADMINISTRATION

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DR. PASCAL BEDROSSIAN, *Chair, Mathematics/Computer Science*

DR. STANLEY EISEN, *Director, Pre-Professional Health Programs*

BROTHER EDWARD SALGADO, *Chair, Biology Department*

DR. JOHN A. VARRIANO, *Chair, Physics/Natural Science*

## FACULTY

### BIOLOGY

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MIGUEL B. ARELLANO, *Assistant Professor*

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## SCHOOL OF SCIENCES

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RELBUE M. MORGAN

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BROTHER ROBERT STAUB, FSC

B.S., St. Mary's College; M.A., Ph.D., University of Minnesota

LYLE D. WESCOTT, JR.

B.S., Georgia Institute of Technology; Ph.D., Pennsylvania State University

**PART-TIME FACULTY**BROTHER KEVIN MALACHY RYAN, FSC, *Assistant Professor*

B.S., M.Ed., St. Mary's College

LYNDA R. MILLER, *Lab Coordinator*

B.A., Southern Illinois University, M.S., Memphis State University

**MISSION**

THE SCHOOL OF SCIENCES offers programs leading to Bachelor of Science degrees in Biochemistry, Biology, Biomedical Science, Chemistry, Computer Science, Mathematics, Natural Science, Physics, and Engineering Physics, as well as a Bachelor of Arts degree in Mathematics. Students seeking to enter schools of medicine, dentistry, pharmacy or any health related professional school traditionally enroll in the School of Sciences. The baccalaureate degrees in Biochemistry, Biology, Biomedical Science, and Chemistry are designed to meet the entrance requirements of all health related professional schools.

The course of study for each degree program is designed to meet these criteria:

1. Critical thinking, an active, purposeful, organized and disciplined effort to make sense out of our world and our lives, is the essential foundation of lifelong learning.
2. The knowledge bases and skills needed to deal effectively with the challenge of living in contemporary society are multidisciplinary.
3. A person should be able to make personal and professional decisions within religious and ethical contexts.

The degree programs are constructed to produce graduates who will be able to excel as professionals in science, who will succeed in pursuing further education in graduate or professional schools, and who will use their science background as a foundation for careers in other areas such as business, law, education, and engineering.

**DUAL DEGREES**

Dual degrees are being offered in the School of Science between Computer Science and Mathematics. See Page 91 for details.

**DEGREE REQUIREMENTS**

In order to graduate, a student must complete 122 semester credit hours with an overall grade point average of 2.0 or above and a minimum 2.0 grade point average in the satisfaction of major requirements. In addition, every student must satisfy the requirements of 6 hours in English composition; a minimum of 18 hours in humanities/social science that must include at least 3 hours in literature, 6 hours in religious studies, 3 hours in moral values course work, and 6 hours in the social sciences. All Math and Natural Science requirements, and sometimes some of the other above requirements, are already specified for the majors in Science. Details on permitted or recommended courses can be found in the General Education section of this catalog.

**COURSE REQUIREMENTS FOR B.S. IN BIOCHEMISTRY**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 113 Principles of Chemistry I & Lab .....	4	CHEM 114 Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Comp II .....	3
MATH 131 Calculus I .....	3	SPCH 125 Speech Communication .....	3
BIOL 111 Principles of Biology I & Lab .....	4	BIOL 112 Principles of Biology II & Lab .....	4
Orientation .....	0	Social Science Elective .....	3
Interdisciplinary Studies (IDS 101) .....	3		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 211 Organic Chemistry I & Lab .....	4	CHEM 212 Org. Chem. II & Lab .....	4
BIOL 217 Anatomy & Physiology I & Lab .....	4	Religious Studies Elective .....	3
MATH 201 (Applied Statistics) .....	3	BIOL 218 Anatomy & Physiology II & Lab .....	4
PHYS 201 Introductory Physics I & Lab .....	4	PHYS 202 Introductory Physics II & Lab .....	4
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15</b>

<b>JUNIOR YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 315 Biochemistry I & Lab .....	4	CHEM 316 Biochemistry II .....	3
CHEM 330 Research Seminar I .....	0	BIOL 421 Cell/Molecular Biology & Lab .....	4
BIOL 311 & lab (Genetics) .....	4	CHEM 214 Quantitative Analysis & Lab .....	4
ENG 211, 212, 221, or 222 .....	3	Foreign Language II <sup>1</sup> .....	3
Foreign Language I <sup>1</sup> .....	3		
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>14</b>

<b>SENIOR YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
BIOL 415 Immunology & Lab .....	4	CHEM 431 Research Seminar II .....	2
Social Science Elective .....	3	BIOL 321 Microbiology & Lab .....	4
Religious Studies Elective .....	3	CHEM 311 Organic Qualitative Analysis .....	3
Moral Values Elective .....	3	CHEM 438 Lipids .....	3
Free electives <sup>2</sup> .....	2	CS 240 Bioinformatics .....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

<sup>1</sup> Must be in the same language.

<sup>2</sup> Note: Math 100, Math 101, Math 103, Math 117, Eng 100, and Chem 101 do not fulfill the "Free Electives" requirement.

**COURSE REQUIREMENTS FOR B.S. IN BIOLOGY**

This paradigm applies to all biology majors including students seeking to enter health-related professional schools and other graduate programs.

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
BIOL 111 & 111L Principles of Biology I & Lab.....	4	BIOL 112 & 112L Principles of Biology II & Lab.....	4
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Comp II .....	3
Interdisciplinary Studies (IDS 101) .....	3	MATH 131 Calculus I .....	3
Elective <sup>1,2</sup> .....	3	Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
Biology Elective & Lab <sup>3</sup> .....	4	BIOL 275 Biological Careers Choices .....	1
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
PHYS 201 & 201L Introduction to Physics I & Lab .....	4	PHYS 202 & 202L Introduction to Physics II & Lab.....	4
Religious Studies Elective .....	3	Biology Elective & Lab .....	4
		Social Science Elective.....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>16</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 311 & 311L Genetics & Lab .....	4	BIOL 362 Biology Seminar .....	1
MATH 201 Applied Statistics .....	3	Biology Elective & Lab .....	4
Chemistry & Lab <sup>4</sup> .....	4	Biology Elective & Lab .....	4
Literature Elective .....	3	Religious Studies Elective .....	3
		Moral Values Elective.....	3
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>
SUMMER: BIOL 463 Research I <sup>5</sup> .....	1		

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 464 Research II <sup>5</sup> .....	2	BIOL 465 Research III <sup>5</sup> .....	2
Biology Elective & Lab .....	4	Biology Elective & Lab .....	4
Biology Elective .....	3	Biology Elective .....	3
Elective.....	3	Social Science Elective.....	3
BIOL 499 Senior Comprehensive.....	0	Elective .....	3
<b>Total .....</b>	<b>12</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

Minimum GPA of 2.0 in biology courses is required for graduation. Transfer students must take at least 20 hours of biology at or above the 300 level at Christian Brothers University.

**BIOLOGY ELECTIVES** (*Students should choose at least one course from each group*)

Group I: BIOL 211 Embryology; 217 Anatomy & Physiology I; 218 Anatomy & Physiology II; 236 Nutrition; BIOL 312 Vertebrate Physiology; 414 Histology; 451 Neuroscience.

Group II: BIOL 212 Comparative Anatomy; 216 Botany; 335 Invertebrate Zoology; 413 Parasitology.

Group III: BIOL 346 Evolution; 381 Animal Behavior; 412 Ecology.

Group IV: BIOL 321 Microbiology; 367 Pharmacology; 415 Immunology; 421 Cell/Molecular Biology.

<sup>1</sup> Students may be asked to take MATH 117 and/or CHEM 101 if they do not place into MATH 131 and/or CHEM 113

<sup>2</sup> Minimum of 9 hours of free electives; no more than 6 hours can be in Biology unless the minimum exceeds 122 hours.

<sup>3</sup> Minimum of 30 hours of biology electives must include at least one course from each of the four groups listed above; minimum of 16 hours of biology electives must be at or above the 300 level.

<sup>4</sup> Recommended: CHEM 312 or 315-316 Biochemistry or CHEM 214 Quantitative Analysis; any chemistry course with a lab at the 200 level or above will satisfy the requirement.

<sup>5</sup> Substitute BIOL 461-462 only with permission of the Chair or Course Director. Students who take BIOL 461 and 462 Independent Research will have to make up three credits in biology in order to complete the 122 hours required minimum.

**COURSE REQUIREMENTS FOR B.S. IN BIOLOGY**

Concentration In Environmental Studies

This paradigm applies to all biology majors including students seeking to enter health-related professional schools and other graduate programs.

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
BIOL 111 & 111L Principles of Biology I & Lab.....	4	BIOL 112 & 112L Principles of Biology II & Lab.....	4
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Comp II .....	3
Interdisciplinary Studies (IDS 101) .....	3	MATH 131 Calculus I .....	3
Elective <sup>1,2</sup> .....	3	Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
Biology Elective & Lab <sup>3</sup> .....	4	BIOL 275 Biological Careers Choices .....	1
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
PHYS 201 & 201L Introduction to Physics I & Lab .....	4	PHYS 202 & 202L Introduction to Physics II & Lab.....	4
Religious Studies Elective .....	3	Biology Elective & Lab .....	4
		Social Science Elective.....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>16</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 311 & 311L Genetics & Lab .....	4	BIOL 362 Biology Seminar .....	1
MATH 201 Applied Statistics .....	3	Biology Elective & Lab .....	4
CHEM 312 & 312L Biochemistry & Lab <sup>4</sup> .....	4	Biology Elective & Lab .....	4
Literature Elective .....	3	Religious Studies Elective .....	3
		Moral Values Elective.....	3
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>
SUMMER: BIOL 463 Research I <sup>5</sup> .....	1		

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 464 Research II <sup>5</sup> .....	2	BIOL 465 Research III <sup>5</sup> .....	2
Biology Elective & Lab .....	4	Biology Elective & Lab .....	4
Biology Elective .....	3	Biology Elective .....	3
Elective.....	3	Social Science Elective.....	3
BIOL 499 Senior Comprehensive.....	0	Elective .....	3
<b>Total .....</b>	<b>12</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

Minimum GPA of 2.0 in biology courses is required for graduation. Transfer students must take at least 20 hours of biology at or above the 300 level at Christian Brothers University.

**BIOLOGY ELECTIVES** *(These groups are different from groups for Biology and Biomedical Science majors.)*

Group I: BIOL 312 Vertebrate Physiology; 421 Cell Biology; 451 Neuroscience.

Group II: BIOL 216 Botany; 321 Microbiology; 335 Invertebrate Zoology; 413 Parasitology.

Group III: BIOL 346 Evolution; 381 Animal Behavior; 412 Ecology.

Recommended free electives: BIOL 107 Environmental Biology; CE 305 Environmental Site Assessment; CE 404 Solid and Hazardous Waste Management; CE 405 Remediation of Organically Contaminated Soil and Water; CE 406 Air Pollution; CHEM 214 Quantitative Analysis.

<sup>1</sup> Students may need to take MATH 117 and/or CHEM 101 if they do not place into MATH 131 Calculus I and/or CHEM 113.

<sup>2</sup> Recommended free elective for environmental track students.

<sup>3</sup> Minimum of 30 hours of biology electives must include at least one course from each of the three groups previously listed; minimum of 16 hours of biology electives must be at or above the 300 level.

<sup>4</sup> Recommended chemistry elective: CHEM 312 Biochemistry or CHEM 315-316

<sup>5</sup> May substitute BIOL 461-462 only with permission of the Chair or Course Director. Students who take BIOL 461 and 462 Independent Research will have to make up three credits in biology in order to complete the 122 hours required minimum.

**COURSE REQUIREMENTS FOR B.S. IN BIOMEDICAL SCIENCES**

This paradigm applies to students who are seeking to enter medical, dental, or veterinary schools.

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
BIOL 111 & 111L Principles of Biology I & Lab.....	4	BIOL 112 & 112L Principles of Biology II & Lab.....	4
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Comp II .....	3
Interdisciplinary Studies (IDS 101) .....	3	MATH 131 Calculus I .....	3
Elective <sup>1,2</sup> .....	3	Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
BIOL 211 & 211L Embryology & Lab.....	4	BIOL 275 Biological Careers Choices .....	1
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
PHYS 201 & 201L Introduction to Physics I & Lab .....	4	PHYS 202 & 202L Introduction to Physics II & Lab.....	4
Literature Elective .....	3	Biology Elective & Lab .....	4
		Social Science Elective.....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>16</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 311 & 311L Genetics & Lab.....	4	BIOL 362 Biology Seminar.....	1
MATH 201 Applied Statistics .....	3	BIOL 321 Microbiology & Lab & Lab.....	4
CHEM 315 & 315L Biochemistry I & Lab.....	4	CHEM 316 Biochemistry II.....	3
BIOL 312 & 312L Vert. Physics & Lab.....	4	PHIL 322 Medical Ethics .....	3
		Religious Studies Elective .....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>14</b>
SUMMER: BIOL 463 Research I <sup>5</sup> .....	1		

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
BIOL 464 Research II <sup>5</sup> .....	2	BIOL 465 Research III <sup>5</sup> .....	2
BIOL 413 Parasit. & Lab.....	4	BIOL 414 Histol. & Lab (or BIOL 321 & Lab) .....	4
BIOL 415 Immunology & Lab .....	4	Biology Elective <sup>3</sup> .....	3
Religious Studies Elective .....	3	Social Science Elective.....	3
BIOL 499 Senior Comprehensive.....	0	Elective .....	3
<b>Total .....</b>	<b>13</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

**BIOLOGY ELECTIVES**

- Group I: BIOL 211 Embryology; 217 Anatomy & Physiology I; BIOL 218 Anatomy & Physiology II; 236 Nutrition; 451 Neuroscience.  
 Group II: BIOL 212 Comparative Anatomy; 216 Botany; 335 Invertebrate Zoology.  
 Group III: BIOL 346 Evolution; 381 Animal Behavior; 412 Ecology.  
 Group IV: BIOL 367 Pharmacology; 415 Immunology; 421 Cell Biology.

Minimum GPA of 2.0 in biology courses is required for graduation. Transfer students must take at least 20 hours of biology at or above the 300 level at Christian Brothers University.

<sup>1</sup> Students may need to take MATH 117 and/or CHEM 101 if they do not place into MATH 131 and/or CHEM 113.

<sup>2</sup> Minimum of 9 hours of free electives; no more than 4 hours could be in biology unless the minimum exceeds 128 hours.

<sup>3</sup> One biology elective must be taken from the Group III list

**COURSE REQUIREMENTS FOR B.S. IN CHEMISTRY**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Composition II .....	3
MATH 131 Calculus I .....	3	MATH 132 Calculus II .....	3
Interdisciplinary Studies (IDS 101) .....	3	Religious Studies Elective .....	3
Social Science Elective .....	3	Free Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>16</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
ENG 211 Intro to Literature I <sup>1</sup> .....	3	CHEM 214 & 214L Quantitative Analysis & Lab .....	4
MATH 231 Differential Equations .....	3	MATH 232 Calculus III .....	3
PHYS 150 & 150L Physics I & Lab .....	4	PHYS 251 & 251L Physics II & Lab .....	4
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 351 & 351L Physical Chemistry I & Lab .....	4	CHEM 352 & 352L Physical Chemistry II & Lab .....	4
CHEM 330 Research Seminar .....	0	CHEM 415 & 415L Analytical Chemistry & Lab .....	4
Moral Values Elective .....	3	MATH 308 Statistics .....	3
PHYS 252 & 252L Physics III & Lab .....	4	Foreign Language II <sup>2</sup> .....	3
Foreign Language I <sup>2</sup> .....	3	Free Electives .....	3
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>17</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 312 & 312L Biochemistry & Lab .....	4	CHEM 422 & 422L Inorganic Chemistry & Lab .....	4
Social Science Elective .....	3	CHEM 431 Research Seminar II .....	2
Religious Studies Elective .....	3	Chemistry Elective (Upper Division) .....	3
Free Electives .....	5	Free Electives .....	6
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

The maximum number of credits in chemistry applicable to the degree is 52 hours.

Transfer students must take at least 15 hours of the required Chemistry courses numbered at or above the 300 level at Christian Brothers University

MATH 100, 101, 103, 117; ENG 100; and CHEM 101 do not fulfill the free electives requirement.

<sup>1</sup> ENG 212, 221, or 222 may be substituted.

<sup>2</sup> Must be same language

**COURSE REQUIREMENTS FOR B.S. IN CHEMISTRY (PRE-MED)**

<b>FRESHMAN YEAR Semester I</b>		<b>Credits</b>	<b>Semester II</b>		<b>Credits</b>
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4		CHEM 114 & 114L Principles of Chemistry II & Lab .....	4	
BIOL 111 & 111L Principles of Biology I & Lab.....	4		BIOL 112 & 112L Principles of Biology II & Lab.....	4	
ENG 111 English Composition I .....	3		ENG 112 English Composition II.....	3	
MATH 131 Calculus I .....	3		MATH 132 Calculus II .....	3	
Interdisciplinary Studies (IDS 101) .....	3		Religious Studies Elective .....	3	
Orientation .....	0				
<b>Total .....</b>	<b>17</b>		<b>Total .....</b>	<b>17</b>	
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<b>SOPHOMORE YEAR Semester I</b>			<b>Semester II</b>		
CHEM 211 & 211L Organic Chemistry I & Lab .....	4		CHEM 212 & 212L Organic Chemistry II & Lab .....	4	
BIOL 211 & 211L Vertebrate Embryology & Lab.....	4		CHEM 214 & 214L Quantitative Analysis & Lab.....	4	
MATH 231 Differential Equations .....	3		MATH 232 Calculus III.....	3	
PHYS 150 & 150L Physics I & Lab.....	4		PHYS 251 & 251L Physics II & Lab.....	4	
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>15</b>	
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<b>JUNIOR YEAR Semester I</b>			<b>Semester II</b>		
BIOL 311 & 311L Genetics & Lab .....	4		CHEM 352 & 352L Physical Chemistry II & Lab.....	4	
CHEM 351 Physical Chemistry & Lab .....	4		CHEM 415 & 415L Analytical Chemistry & Lab .....	4	
CHEM 330 Research Seminar.....	0		MATH 308 Statistics .....	3	
PHYS 252 & 252L Physics III & Lab.....	4		Foreign Language II <sup>1</sup> .....	3	
Foreign Language I <sup>1</sup> .....	3				
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>14</b>	
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<b>SENIOR YEAR Semester I</b>			<b>Semester II</b>		
CHEM 312 & 312L Biochemistry & Lab .....	4		CHEM 422 & 422L Inorganic Chemistry & Lab.....	4	
ENG 211 Intro to Literature I <sup>2</sup> .....	3		CHEM 431 Research Seminar II .....	2	
Religious Studies Elective .....	3		Chemistry Elective (Upper Division).....	3	
Social Science Elective.....	3		Social Science Elective.....	3	
Free Electives .....	1		Moral Values Elective .....	3	
<b>Total .....</b>	<b>14</b>		<b>Total .....</b>	<b>15</b>	

**Total credits required for the degree 122.**

The maximum number of credits in chemistry applicable to the degree is 52 hours.

Transfer students must take at least 15 hours of the required Chemistry courses numbered at or above the 300 level at Christian Brothers University

MATH 100, 101, 103, 117; ENG 100; and CHEM 101 do not fulfill the free electives requirement.

<sup>1</sup> Must be same language.

<sup>2</sup> ENG 212, 221, or 222 may be substituted.

**COURSE REQUIREMENTS FOR B.S. IN CHEMISTRY (PRE-PHARMACY)**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
BIOL 111 & 111L Principles of Biology I & Lab.....	4	BIOL 112 & 112L Principles of Biology II & Lab.....	4
ENG 111 English Composition I .....	3	ENG 112 English Composition II.....	3
MATH 131 Calculus I .....	3	MATH 132 Calculus II .....	3
Interdisciplinary Studies (IDS 101) .....	3	Religious Studies Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
BIOL 217 & 217L Anatomy/Physiology I & Lab.....	4	CHEM 214 & 214L Quantitative Analysis & Lab.....	4
MATH 231 Differential Equations .....	3	MATH 232 Calculus III .....	3
PHYS 150 & 150L Physics I & Lab.....	4	PHYS 251 & 251L Physics II & Lab.....	4
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 351 & 351L Physical Chem I & Lab.....	4	BIOL 218 & 218L Anatomy & Physiology II & Lab .....	4
CHEM 330 Research Seminar .....	0	CHEM 352 & 352L Physical Chemistry II & Lab.....	4
ENG 211 Intro to Literature I <sup>1</sup> .....	3	CHEM 415 & 415L Analytical Chemistry & Lab .....	4
PHYS 252 & 252L Physics III & Lab.....	4	MATH 308 Statistics .....	3
Social Science Elective.....	3		
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 312 & 312L Biochemistry & Lab .....	4	CHEM 422 & 422L Inorganic Chemistry & Lab.....	4
Foreign Language I <sup>2</sup> .....	3	CHEM 431 Research Seminar II .....	2
Religious Studies Elective .....	3	Chemistry Elective (Upper Division) .....	3
Social Science Elective.....	3	Foreign Language II <sup>2</sup> .....	3
Moral Values Elective .....	3	Free Electives .....	1
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>13</b>

**Total credits required for the degree 122.**

A maximum of 52 hours in chemistry are applicable to the degree.

Transfer students must take at least 15 hours of the required Chemistry courses numbered at or above the 300 level at Christian Brothers University

Recommended for some Pharmacy Schools: Biology 415 and Lab-Immunology, (Fall, Senior Year), Biology 321 and Lab-Microbiology (Spring, Senior Year).

MATH 100, 101, 103, 117; ENG 100; and CHEM 101 do not fulfill the free electives requirement.

<sup>1</sup> ENG 212, 221, or 222 may be substituted.

<sup>2</sup> Must be same language

**COURSE REQUIREMENTS FOR B.S. IN CHEMISTRY (PRE-FORENSICS)**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
BIOL 111 & 111L Principles of Biology I & Lab.....	4	BIOL 112 & 112L Principles of Biology II & Lab.....	4
ENG 111 English Composition I .....	3	ENG 112 English Composition II.....	3
MATH 131 Calculus I .....	3	MATH 132 Calculus II .....	3
Interdisciplinary Studies (IDS 101) .....	3	SOC 101 Introduction to Sociology.....	3
Orientation .....	0		
<b>Total .....</b>	<b>17</b>	<b>Total .....</b>	<b>17</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
CHEM 211 & 211L Organic Chemistry I & Lab .....	4	CHEM 212 & 212L Organic Chemistry II & Lab .....	4
MATH 231 Differential Equations .....	3	CHEM 214 & 214L Quantitative Analysis & Lab.....	4
PHYS 150 & 150L Physics I & Lab.....	4	MATH 232 Calculus III.....	3
Religious Studies Elective .....	3	PHYS 251 & 251L Physics II & Lab.....	4
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 351 & 351L Physical Chem I & Lab.....	4	CHEM 352 & 352L Physical Chemistry II & Lab.....	4
CHEM 330 Research Seminar.....	0	CHEM 415 & 415L Analytical Chemistry & Lab .....	4
ENG 211 Intro to Literature I <sup>1</sup> .....	3	BIOL 321 & 321L Microbiology & Lab .....	4
PHYS 252 & 252L Physics III & Lab.....	4	Foreign Language II <sup>2</sup> .....	3
Foreign Language I <sup>2</sup> .....	3		
<b>Total .....</b>	<b>14</b>	<b>Total .....</b>	<b>15</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
CHEM 312 & 312L Biochemistry & Lab .....	4	CHEM 422 & 422L Inorganic Chemistry & Lab.....	4
BIOL 311 & 311L Genetics & Lab .....	4	CHEM 431 Research Seminar II .....	2
Elective.....	1	Chemistry Elective (Upper Division).....	3
PHIL 219 Social & Political Philosophy.....	3	MATH 308 Statistics .....	3
Religious Studies Elective.....	3	SOC 220 Social Justice and Services.....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15</b>

**Total credits required for the degree 122.**

A maximum of 52 hours in chemistry are applicable to the degree.

MATH 100, 101, 103, 117; ENG 100; and CHEM 101 do not fulfill the free electives requirement.

Transfer students must take at least 15 hours of the required Chemistry courses numbered at or above the 300 level at Christian Brothers University

Recommended Electives: ANTH 126 Forensic Anthropology & Lab (Fall, Senior year) and BIOL 421 & Lab Cell/Molecular Biology (Spring, Senior year).

<sup>1</sup> ENG 212, 221, or 222 may be substituted.

<sup>2</sup> Must be same language

**COURSE REQUIREMENTS FOR B.S. IN COMPUTER SCIENCE**

<b>FRESHMAN YEAR Semester I</b>		<b>Credits</b>	<b>Semester II</b>		<b>Credits</b>
ENG 111 English Composition I .....	3		CS 172 Intermediate Programming & Lab .....	4	
CS 171 Introduction to Programming & Algorithms .....	3		ECE 250 Digital Design .....	3	
MATH 131 Calculus I .....	3		ENG 112 English Composition II .....	3	
Interdisciplinary Studies (IDS 101) .....	3		MATH 132 Calculus II .....	3	
Social Science Elective <sup>1</sup> .....	3		Religious Studies Elective .....	3	
Orientation .....	0				
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>16</b>	
<hr/>			<hr/>		
<b>SOPHOMORE YEAR Semester I</b>			<b>Semester II</b>		
CS 234 Data Structures & Lab .....	4		CS 360 Object Oriented Design .....	3	
Social Science Elective <sup>1</sup> .....	3		MATH 141 Discrete Mathematics .....	3	
PHYS 150 & 150L Physics I & Lab .....	4		PHYS 251/202 Physics II & Lab .....	4	
Option Elective .....	6		Option Elective .....	6	
<b>Total .....</b>	<b>17</b>		<b>Total .....</b>	<b>16</b>	
<hr/>			<hr/>		
<b>JUNIOR YEAR Semester I</b>			<b>Semester II</b>		
CS 471 Database Design .....	3		CS 370 Operating Systems .....	4	
Option Elective .....	6		CS 400 Internship .....	4	
Philosophy Elective <sup>2</sup> .....	3		Option Elective .....	6	
CS 295 Data Communication .....	3		Literature Elective .....	3	
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>15</b>	
<hr/>			<hr/>		
<b>SENIOR YEAR Semester I</b>			<b>Semester II</b>		
CS 481 Project I .....	1		CS 482 Project II .....	3	
Option Elective .....	9		CS 440 Algorithms .....	3	
Religious Studies Elective .....	3		Option Elective .....	6	
<b>Total .....</b>	<b>13</b>		Minor Elective .....	3	
			<b>Total .....</b>	<b>15</b>	

**Total credits required for the degree 122.**

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A maximum of 47 credits in Computer Science is applicable toward the degree.

Transfer students must take at least one half of the required computer related courses numbered 300 or above at Christian Brothers University.

**Note:** A minor is required in both the Engineering and Information Systems Options. The minor may not be in Computer Engineering, Computer Science, or Information Technology Management.

**Bioinformatics Option:** The minor for the Bioinformatics option must be either Biology or Chemistry. The minor in Biology includes BIOL 111, 111Lab, 112, 112Lab, 311, 311Lab, 321, 321Lab, 421, 421Lab. Other required courses are BIOL/CS 240; CHEM 113, 113Lab, 114, 114Lab, 211, 211Lab, 212, 212Lab. The minor in Chemistry includes CHEM 113, 113Lab, 114, 114Lab, 211, 211Lab, 212, 212Lab, 315, 315Lab, 316. Other required courses are BIOL/CS 240; BIOL 111, 111Lab, 112, 112Lab, 311, 311Lab.

**Engineering Option:** required courses are ECE 221, 251, 350; MATH 231; two from ECE 451, 453, 454, 456, 457, and 480-489 Special Topics.

**Forensics Option:** The minor for the Forensics option must be Biology which includes BIOL 111, 111L, 112, 112L, 217, 217Lab, 218, 218Lab, 321, 321Lab. Other required courses are MATH 201; CHEM 113, 113Lab, 114, 114Lab; ANTH 126, 126Lab, 301.

**Information Systems Option:** required courses are ECON 214, 215; ITM 351, 455, 470; MGMT 352 and MKTG 311.

<sup>1</sup> Six hours of Social Sciences must be in the same field whether it is History, Political Science, Psychology, or Sociology.

<sup>2</sup> Must satisfy the moral values requirement

**COURSE REQUIREMENTS FOR B.S. IN COMPUTER SCIENCE & B.S. IN MATHEMATICS**

<b>FRESHMAN YEAR Semester I</b>		<b>Credits</b>	<b>Semester II</b>		<b>Credits</b>
ENG 111 English Composition I .....	3		CS 172 Intermediate Programming & Algorithms & Lab.....	4	
CS 171 Introduction to Programming & Algorithms .....	3		ECE 250 Digital Design .....	3	
MATH 131 Calculus I .....	3		ENG 112 English Composition II.....	3	
Interdisciplinary Studies (IDS 101) .....	3		MATH 132 Calculus II .....	3	
Social Science Elective <sup>1</sup> .....	3		PHYS 150 & 150L Physics I & Lab.....	4	
Orientation .....	0				
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>17</b>	
<hr/>			<hr/>		
<b>SOPHOMORE YEAR Semester I</b>			<b>Semester II</b>		
CS 234 Data Structures & Lab.....	4		CS 360 Object Oriented Design.....	3	
MATH 231 Differential Equations .....	3		MATH 232 Calculus III.....	3	
PHYS 251 & 251L Physics II & Lab.....	4		CS 295 Data Communications .....	3	
ECE 221 Circuit I.....	3		ECE 251 Microprocessor Architecture.....	3	
Religious Studies Elective .....	3		ENG Literature Elective .....	3	
			Social Science Elective <sup>1</sup> .....	3	
<b>Total .....</b>	<b>17</b>		<b>Total .....</b>	<b>18</b>	
<hr/>			<hr/>		
<b>JUNIOR YEAR Semester I</b>			<b>Semester II</b>		
CS 471 Database Design .....	3		CS 370 Operating Systems.....	3	
MATH 401 Linear Algebra .....	3		CS 400 Internship.....	3	
MATH 329 Applied Numerical Analysis .....	3		ECE 450 Computer Networks .....	3	
MATH Elective.....	3		MATH 402 Abstract Algebra.....	3	
ECE 350 Systems Architecture.....	3		MATH 414 Real Analysis.....	3	
			MATH 405 Discrete Math .....	3	
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>18</b>	
<hr/>			<hr/>		
<b>SENIOR YEAR Semester I</b>			<b>Semester II</b>		
MATH 413 Complex Analysis.....	3		CS 440 Algorithms.....	3	
MATH 481 Math Seminar I.....	1		MATH 482 Math Seminar II.....	2	
CS 481 Computer Science Project I.....	1		CS 482 Computer Sciences Project II.....	3	
Philosophy Elective <sup>2</sup> .....	3		Foreign Language.....	3	
Foreign Language .....	3		ECE Elective .....	3	
ECE Elective .....	3		Religious Studies Elective .....	3	
<b>Total .....</b>	<b>14</b>		<b>Total .....</b>	<b>15</b>	

**Total credits required for the degree 131.**

MATH 482 & CS 482 can be met by a single project if the student's project has both significant Math and CS content.

<sup>1</sup> Six hours of social science must be in the same field whether it is History, Political Science, Psychology, or Sociology.

<sup>2</sup> Must satisfy the moral values requirement.

**COURSE REQUIREMENTS FOR B.S. IN ENGINEERING PHYSICS**

<b>FRESHMAN YEAR Semester I</b>		<b>Credits</b>	<b>Semester II</b>		<b>Credits</b>
ENG 111 English Composition I .....	3		CHEM 115 & 115L General Chemistry .....	4	
ECE 112/ME 112 Computers in Engineering .....	3		ENG 112 English Composition II .....	3	
MATH 131 Calculus I .....	3		MATH 132 Calculus II .....	3	
ME 112 Solids Modeling .....	3		PHYS 150 & 150L Physics I & Lab .....	4	
Interdisciplinary Studies (IDS 101) .....	3				
Orientation .....	0				
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>14</b>	
<b>SOPHOMORE YEAR Semester I</b>			<b>Semester II</b>		
ECE 221 Circuit Analysis I .....	3		ECE 201 Engineering Instrumentation .....	2	
MATH 231 Differential Equations .....	3		MATH 232 Calculus III .....	3	
PHYS 251 & 251L Physics II & Lab .....	4		ECE 222 Circuit Analysis II .....	3	
Literature Elective .....	3		ME 305 Thermodynamics I .....	3	
Religious Studies Elective .....	3		PHYS 252 Physics III .....	3	
<b>Total .....</b>	<b>16</b>		<b>Total .....</b>	<b>14</b>	
<b>JUNIOR YEAR Semester I</b>			<b>Semester II</b>		
ECE 331 Electronics I .....	3		Engineering Elective <sup>1</sup> .....	3	
ECE 341 Junior Lab .....	2		ENGR/PHYS/MATH Elective <sup>1</sup> .....	3	
PHYS 252L Physics III Lab .....	1		PHYS 347 Special Relativity .....	2	
PHYS 353 Solid State Physics .....	3		Moral Values Elective .....	3	
PHYS 380 Advanced Mech .....	3		Social Science Elective <sup>2</sup> .....	3	
PHYS 447 Quantum Mechanics .....	3		Elective .....	3	
<b>Total .....</b>	<b>15</b>		<b>Total .....</b>	<b>17</b>	
<b>SENIOR YEAR Semester I</b>			<b>Semester II</b>		
MATH 309 Probability .....	3		PHYS 452 Advanced Physics Lab .....	1	
PHYS 337/ECE 406 E & M Fields .....	3		PHYS 460 Theoretical Physics .....	3	
PHYS 415/415L Optics & Lab .....	4		PHYS 492 Research II .....	2	
PHYS 491 Research I .....	0		PHYS 499 Comprehensives .....	0	
Religious Studies Elective .....	3		Engineering Elective <sup>1</sup> .....	3	
Free Elective .....	3		Social Science Elective <sup>2</sup> .....	3	
			Elective .....	3	
<b>Total .....</b>	<b>16</b>		<b>Total .....</b>	<b>15</b>	

**Total credits required for the degree 122.**

Transfer students must take at least one-half of the required courses numbered above 300 at CBU.

<sup>1</sup> Engineering electives must be numbered 300 or above and can be from any field of engineering but must be approved by the Physics Department.

<sup>2</sup> The two social science electives must be in the same field.

**COURSE REQUIREMENTS FOR B.S. IN MATHEMATICS**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
ENG 111 English Composition I .....	3	ENG 112 English Composition II .....	3
MATH 131 Calculus I .....	3	MATH 132 Calculus II .....	3
Foreign Language .....	3	Foreign Language .....	3
Religious Studies Elective .....	3	Science Elective <sup>1</sup> .....	4
Interdisciplinary Studies (IDS 101) .....	3	Social Science Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>16</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
ENG Literature Elective .....	3	CS 172 & Lab or ECE 112 Comp. Science <sup>2</sup> .....	3-4
MATH 231 Differential Equations .....	3	Elective .....	3
Social Science Elective .....	3	MATH 141 Discrete Mathematics .....	3
Philosophy Elective <sup>6</sup> .....	3	MATH 232 Calculus III .....	3
Science Elective <sup>1</sup> .....	4	Minor Elective <sup>3</sup> .....	4
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>16-17</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
MATH 401 Linear Algebra .....	3	MATH 402 Abstract Algebra .....	3
Mathematics Elective <sup>4</sup> .....	3	Mathematics Elective <sup>4</sup> .....	3
Minor Electives <sup>3</sup> .....	7	Religious Studies Elective .....	3
Elective .....	3	Minor Electives <sup>3</sup> .....	4
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>13</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
MATH 413 Complex Analysis .....	3	MATH 414 Real Analysis .....	3
MATH 481 Seminar I .....	1	MATH 482 Seminar II .....	2
Mathematics Elective <sup>4</sup> .....	3	Minor Electives <sup>3</sup> .....	3
Minor Electives <sup>3</sup> .....	4	Electives .....	6
Electives .....	5		
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>14</b>

**Total credits required for the degree 122.**

A maximum of 47 credits in mathematics is applicable toward the degree.

Transfer students must take at least one half of the required mathematics courses numbered above 300 at Christian Brothers University.

Forensics Option: The minor for Forensics option must be Biology which includes BIOL 111, 111Lab, 112, 112Lab, 217, 217Lab, 218, 218Lab, 321, 321Lab. Other required courses are CHEM 113, 113Lab, 114, 114Lab; 214, 214Lab; ANTH 126, 126Lab, 301.

Bioinformatics Option: The minor for the Bioinformatics option must be Biology which includes BIOL 111, 111Lab, 112, 112Lab, 311, 311Lab, 321, 321Lab, 421, 421Lab. Other required courses are BIOL/CS 240; CS 440; CHEM 113, 113Lab, 114, 114Lab, 211, 211Lab, 212, 212Lab.

<sup>1</sup> Science electives must include at least 8 hours in one of Biology, Chemistry, or Physics outside the area chosen for the minor.

<sup>2</sup> Students who will take CS 172 should take CS 171 first.

<sup>3</sup> Minor electives must be chosen to obtain a minor in one of Bioinformatics, Biology, Chemistry, Computer Science, Forensics, or Physics. Credits necessary for the minor vary with the requirements for that minor. Reduce free electives by the difference of those credits required by the chosen minor and those listed as minor elective credits in this paradigm.

<sup>4</sup> The Mathematics electives must be chosen from MATH 301, 308, 309, 329, 405, or 470-479.

<sup>5</sup> Must satisfy moral values requirement.

**COURSE REQUIREMENTS FOR B.A. IN MATHEMATICS**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
ENG 111 English Composition I .....	3	ENG 112 English Composition II .....	3
MATH 131 Calculus I .....	3	MATH 132 Calculus II .....	3
Foreign Language <sup>1</sup> .....	3	Foreign Language <sup>1</sup> .....	3
Religious Studies Elective (200 Level) .....	3	Science Elective <sup>2</sup> .....	4
Interdisciplinary Studies (IDS 101) .....	3	Social Science Elective .....	3
Orientation .....	0		
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>16</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
ENG Literature Elective .....	3	ENG Literature Elective .....	3
MATH 231 Differential Equations .....	3	MATH 141 Discrete Mathematics .....	3
Foreign Language <sup>1</sup> .....	3	MATH 232 Calculus III .....	3
Religious Studies Elective (300 Level) .....	3	Foreign Language <sup>1</sup> .....	3
Science Elective <sup>2</sup> .....	4	History Elective .....	3
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>15</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
MATH 401 Linear Algebra .....	3	CS 172 & Lab or ECE 112 Comp. Science <sup>4</sup> .....	3-4
Mathematics Elective <sup>3</sup> .....	3	MATH 402 Abstract Algebra .....	3
Philosophy Elective .....	3	Mathematics Elective <sup>3</sup> .....	3
Liberal Arts Elective <sup>5</sup> .....	3	Philosophy Elective .....	3
Elective .....	3	Liberal Arts Elective <sup>5</sup> .....	3
<b>Total .....</b>	<b>15</b>	<b>Total .....</b>	<b>15-16</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
MATH 413 Complex Analysis .....	3	MATH 414 Real Analysis .....	3
MATH 481 Seminar I .....	1	MATH 482 Seminar II .....	2
Mathematics Elective <sup>4</sup> .....	3	Electives .....	9
Minor Electives <sup>3</sup> .....	4		
Electives .....	5		
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>14</b>

**Total credits required for the degree 122.**

A maximum of 47 credits in mathematics is applicable toward the degree.

Transfer students must take at least one half of the required mathematics courses numbered above 300 at Christian Brothers University.

<sup>1</sup> A minimum of 12 credits in a modern foreign language is required.

<sup>2</sup> The required science electives must be from only one of these fields: Biology, Chemistry or Physics.

<sup>3</sup> The mathematics electives must be chosen from MATH 301, 308, 309, 329, 405, or 470-479.

<sup>4</sup> Students who will take CS 172 should take CS 171 first.

<sup>5</sup> A total of 51 credits in the Arts must be distributed in such a way that 12 credits are in one of the Social Sciences, Philosophy, Religious Studies or History.

**COURSE REQUIREMENTS FOR B.S. IN NATURAL SCIENCE**

<b>FRESHMAN YEAR Semester I</b>		<b>Credits</b>	<b>Semester II</b>		<b>Credits</b>
BIOL 111 & 111L Principles of Biology I <sup>1</sup> .....		4	BIOL 112 & 112L Principles of Biology II <sup>1</sup> .....		4
CHEM 113 & 113L Principles of Chemistry I.....		4	CHEM 114 & 114L Principles of Chemistry II.....		4
ENG 111 English Composition I.....		3	ENG 112 (English Comp II).....		3
MATH 117/131.....		3	MATH 106/131/132 .....		3
Interdisciplinary Studies (IDS 101) .....		3			
Orientation .....		0			
<b>Total .....</b>		<b>17</b>	<b>Total .....</b>		<b>14</b>
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<b>SOPHOMORE YEAR Semester I</b>			<b>Semester II</b>		
Science Area I <sup>2</sup> .....		4	Science Area I .....		4
PHYS 150/201 Physics I & Lab <sup>3</sup> .....		4	PHYS 251/202 Physics II & Lab <sup>3</sup> .....		4
Business/Computer Elective .....		3	Moral Values Elective .....		3
Literature Elective.....		3	Social Science Elective.....		3
<b>Total .....</b>		<b>14</b>	<b>Total .....</b>		<b>14</b>
<hr/>					
<b>JUNIOR YEAR Semester I</b>			<b>Semester II</b>		
Science Area I .....		4	Science (Any Area) .....		3
Science (Any Area) .....		3	Religious Studies Elective.....		3
Religious Studies Elective.....		3	Electives .....		9
Social Science Elective.....		3			
Electives .....		3			
<b>Total .....</b>		<b>16</b>	<b>Total .....</b>		<b>15</b>
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<b>SENIOR YEAR Semester I</b>			<b>Semester II</b>		
NSCI 410 Senior Thesis I .....		1	NSCI 411 Senior Thesis II .....		1
Science (Any Area) .....		3	Science (Any Area) .....		3
Electives .....		12	Electives .....		12
<b>Total .....</b>		<b>16</b>	<b>Total .....</b>		<b>16</b>

**Total credits required for the degree: 122.**

Transfer students must take at least one-half of the required courses numbered at or above the 200 level at CBU, and this must include at least two courses (6 to 8 hours excluding NSCI 410,411) at or above the 300 level.

CHEM 101 does not supply any credit for Major Requirements. It can supply 3 credit hours of Free Electives.

General education, science, and free electives can be chosen to satisfy the following options.

**Forensics Option:** The following courses are recommended: ANTH 126/126L, 301; BIOL 217/217L, 218/218L 321/321L, 414/414L; CHEM 211/211L, 212/212L, 312/312L; MATH 201

**Professional Writing Option:** A certificate in professional writing is earned by taking four upper level writing courses chosen from ENG 370, 371, 373, 375, 377, 376, 389.

**Sales/Marketing Option:** The following courses are recommended: MKTG 311, 334, 338, 348.

**Teaching Licensure Option:** Refer to the School of Arts section of the Catalog where paradigms for teaching licensure (grades 7-12) are listed. These paradigms are part of a five-year plan where the student earns a Master of Arts in Teaching.

<sup>1</sup> Students who choose Physics as Science Area I can take BIOL 109 & 109L instead of BIOL 111, 111L, 112 & 112L.

<sup>2</sup> Students must have at least 26 hours of science (biology, chemistry, or physics) at or above the 200+ level. At least 12 of these 26 hours must be in the same field (Science Area I). At least 8 of these 26 hours must be at the 300+ level (including NSCI 410 & 411).

<sup>3</sup> Students who choose Physics as Science Area I must take PHYS 150, 251, 252 and the associated labs.

**COURSE REQUIREMENTS FOR B.S. IN PHYSICS**

<b>FRESHMAN YEAR Semester I</b>	<b>Credits</b>	<b>Semester II</b>	<b>Credits</b>
CHEM 113 & 113L Principles of Chemistry I & Lab .....	4	CHEM 114 & 114L Principles of Chemistry II & Lab .....	4
ENG 111 English Composition I .....	3	ENG 112 English Composition II .....	3
ECE 112/ME 112 Computers in Engineering .....	3	MATH 132 Calculus II .....	3
MATH 131 Calculus I .....	3	PHYS 150/201 Physics I & Lab .....	4
Interdisciplinary Studies (IDS 101) .....	3		
Orientation .....	0		
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>14</b>

<b>SOPHOMORE YEAR Semester I</b>		<b>Semester II</b>	
Elective <sup>1</sup> .....	3	MATH 232 Calculus III .....	3
ECE 221 Circuit Analysis I .....	3	PHYS 252 Physics III .....	3
MATH 231 Differential Equations .....	3	Philosophy or Literature Elective .....	3
PHYS 251 & 251L Physics II & Lab <sup>3</sup> .....	4	Moral Values Elective .....	3
Literature Elective .....	3	ECE 201 Engineering Instrumentation .....	2
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>14</b>

<b>JUNIOR YEAR Semester I</b>		<b>Semester II</b>	
MATH 309 Probability .....	3	PHYS 347 Special Relativity .....	2
PHYS 252L Physics III Lab .....	1	PHYS 448 Quantum Mechanics II .....	3
PHYS 380 Advanced Mechanics .....	3	Religious Studies Elective .....	3
PHYS 447 Quantum Mechanics I .....	3	Social Science Elective <sup>3</sup> .....	3
Social Science Elective <sup>3</sup> .....	3	Math Modeling Elective <sup>4</sup> .....	3
Thermodynamics Elective <sup>2</sup> .....	3-4	Mathematics Elective <sup>4</sup> .....	3
<b>Total .....</b>	<b>16-17</b>	<b>Total .....</b>	<b>17</b>

<b>SENIOR YEAR Semester I</b>		<b>Semester II</b>	
PHYS 337/ECE 406 E & M Fields .....	3	PHYS 452 Advanced Physics Lab .....	1
PHYS 353 Solid State Physics .....	3	PHYS 460 Theoretical Physics .....	3
PHYS 415 & 415L Optics & Lab .....	4	PHYS 492 Research II .....	2
PHYS 491 Research I .....	0	PHYS 499 Comprehensives .....	0
Mathematics Elective <sup>4</sup> .....	3	Mathematics Elective <sup>4</sup> .....	3
Religious Studies Elective .....	3	Elective <sup>1</sup> .....	3-4
<b>Total .....</b>	<b>16</b>	<b>Total .....</b>	<b>12-13</b>

**Total credits required for the degree 122.**

Transfer students must take at least one-half of the required courses numbered above 300 at CBU.

<sup>1</sup> A maximum of 3 elective hours may be in physics.

<sup>2</sup> Choose either ME 305: Thermodynamics I (3 credits) or CHEM 351 & 351L: Physical Chemistry I & Lab (4 credits).

<sup>3</sup> Two Social Science electives are required and must be in the same field.

<sup>4</sup> All Mathematics electives must be at the 300+ level.

**MINORS IN THE SCHOOL OF SCIENCES**

At least 50% of required courses for a minor must be taken at CBU.

**MINOR IN BIOLOGY:** A minor in Biology requires BIOL 111 and BIOL 112 and laboratory corequisites plus 15 hours in BIOL courses numbered 200 or above including 7 hours in BIOL courses numbered 300 and above and earned at CBU. See the information about the Bioinformatics Option and the Forensics Option on the pages associated with the B.S. in Computer Science and the B.S. in Mathematics.

**MINOR IN CHEMISTRY:** A minor in Chemistry requires a minimum of 23 hours in CHEM courses excluding CHEM 101, 115, and 115L. At least 7 of the hours must be in CHEM courses numbered 300 or above and earned at CBU.

**MINOR IN COMPUTER SCIENCE:** A minor in Computer Science requires the following courses CS 172, 172L, 234, 234L, 360, 471; MATH 141 or 405; and one course selected from CS 370, 440, 460-469.

**MINOR IN MATHEMATICS:** A minor in Mathematics requires 21 hours in MATH courses including MATH 131, 132, 231, 232, and three MATH courses numbered 300 or above. At least 6 hours in MATH courses numbered 300 or above must be earned at CBU.

**MINOR IN PHYSICS:** A minor in Physics requires the following courses: PHYS 150, 150L, 251, 251L, 252, 252L, and at least 9 hours in PHYS courses numbered 300 or above. At least 5 hours in PHYS courses numbered 300 or above must be earned at CBU, and no more than 4 hours in PHYS courses numbered 300 or above may be earned via challenge exams.