

## Memorandum of Understanding Regarding Voluntary Course Transfer Agreement Pertaining to Bachelor of Science Degrees in Mathematics, Biology, and Chemistry

This voluntary agreement is entered into by and among the signatory institutions of higher education within the State of Texas. Its purpose is to foster enhanced transfer processes for students pursuing a bachelor's degree Mathematics, Biology, or Chemistry, and to increase the number and preparedness of students matriculating from two-year preparatory programs at community colleges into bachelor of science (BS) programs at four-year universities. The intention of this transfer compact is not to change the curriculum of a four-year institution. The intention of this compact is to provide guidance to students with respect to what courses offer the best mechanism for obtaining a baccalaureate degree.

This agreement recognizes the following terms and conditions:

- Course Offerings:** When offering any or all of the courses specifically listed in Annex A, signatory institutions will offer the course(s) consistent with the indicated course description(s) and student learning outcomes as listed in the Academic Course Guide Manual (ACGM).
- Admission:** A student will be admitted into a BS program at a signatory university, or a preparatory program at a signatory community college, if he or she:
  - satisfies all admission requirements applicable to all students for the institution and BS program selected, including enrollment capacity limitations and cumulative GPA requirements; AND
  - has earned a grade of at least "C" for all completed courses as shown in Annex B for the program at one or more of the signatory institutions (or has earned a grade higher than "C" for all courses as shown in Annex B for the program if this requirement is applicable to all students).Note: Students who do not satisfy these criteria may still be eligible for admission to the institution and program selected, but they should be encouraged to contact an admissions advisor at the institution.
- Transfer of Courses:** Students who successfully complete courses shown in Annex A will be able to transfer the course credit hours to a signatory four-year institution upon successful admission to the institution. If the courses completed are part of a degree program to which the student has been admitted, the institution will apply those courses as satisfaction of program requirements, up to the number of credit hours that would be achieved at the four-year institution for a particular course in the degree program. If a course completed is part of a degree program but has fewer credit hours than specified in the program, the institution must determine how to deal with the difference to the overall academic benefit of the student. However, no course with a grade of less than "C" will be transferred or applied to the baccalaureate degree program.
- Assessment:** The signatory institutions will assess the effectiveness of this transfer compact on a periodic basis of at least once every three years, including student performance in upper-division courses and the number of students transferring.
- Retention of Agreement:** Each signatory institution and the Texas Higher Education Coordinating Board will maintain a copy of this transfer compact.
- Advertising:** All signatory institutions will make the broad statewide opportunities afforded under this transfer compact known to the students.

Note: Nothing in this compact is intended to cause an institution to offer a degree program or courses.

**I hereby agree that my institution will participate in the following Statewide Transfer Compacts (please select one or more disciplines below by checking the box and initialing to the right):**

Mathematics \_\_\_\_\_  
 Biology \_\_\_\_\_  Chemistry \_\_\_\_\_

Institution Name

\_\_\_\_\_  
President Signature

\_\_\_\_\_  
Date

THECB 08/30/2013

## **ANNEX A**

In addition to the Academic Course Guide Manual (ACGM), the course descriptions and student learning outcomes for the courses listed below can be viewed at [www.thecb.state.tx.us/Tuning\\_Texas](http://www.thecb.state.tx.us/Tuning_Texas) (or, if a CD-Rom or flash drive is included with this document, by opening the file "Course Descriptions for Transfer Agreements").

<b>Applicable courses for which revised course descriptions and the addition of student learning outcomes were approved for the Fall 2010 ACGM</b>	<b>Applicable courses for which revised course descriptions and the addition of student learning outcomes were approved for the Fall 2012 ACGM</b>	<b>Applicable courses for which revised course descriptions and the addition of student learning outcomes are proposed for the Fall 2014 ACGM</b>
<p style="text-align: center;"> <b>Calculus I, II, III</b>  <b>General Chemistry I, II</b>  <b>General Chemistry Laboratory I, II</b>  <b>University Physics I, II</b>  <b>University Physics Laboratory I, II</b> </p>	<p style="text-align: center;"> <b>Biology for Science Majors I, II</b>  <b>Biology for Science Majors Laboratory I, II</b>  <b>General Botany</b>  <b>General Botany Laboratory</b>  <b>General Zoology</b>  <b>General Zoology Laboratory</b>  <b>Microbiology for Science Majors</b>  <b>Microbiology for Science Majors Laboratory</b>  <b>Organic Chemistry I, II</b>  <b>Organic Chemistry I, II Laboratory</b>  <b>College Physics I, II</b>  <b>College Physics I, II Laboratory</b> </p>	<p style="text-align: center;"> <b>Principles of Financial Accounting</b>  <b>Principles of Managerial Accounting</b>  <b>Business Computer Applications</b>  <b>Business Principles</b>  <b>Business Law</b>  <b>Programming Fundamentals II</b>  <b>Computer Organization</b>  <b>Mathematics for Business &amp; Social Sciences</b>  <b>Calculus for Business &amp; Social Sciences</b> </p>

Note:

1. The addition to the ACGM of student learning outcomes for the course University Physics I was approved by the ACGM Committee on March 31, 2010; these outcomes were revised to add the learning outcome "Solve problems involving the First and Second Laws of Thermodynamics" by the ACGM Committee on October 5, 2011.

<b>Title:</b> <b>TCCN:</b>	<b>Principles of Financial Accounting</b> <b>ACCT 2301</b>
<b>Draft Course Description</b>	<p>This course is an introduction to the fundamental concepts of financial accounting as prescribed by U.S. generally accepted accounting principles (GAAP) as applied to transactions and events that affect business organizations. Students will examine the procedures and systems to accumulate, analyze, measure, and record financial transactions. Students will use recorded financial information to prepare a balance sheet, income statement, statement of cash flows, and statement of shareholders' equity to communicate the business entity's results of operations and financial position to users of financial information who are external to the company. Students will study the nature of assets, liabilities, and owners' equity while learning to use reported financial information for purposes of making decisions about the company. Students will be exposed to International Financial Reporting Standards (IFRS).</p> <p>Prerequisite: MATH 1325 – Calculus for Business and Social Sciences, or equivalent.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Use basic accounting terminology and the assumptions, principles, and constraints of the accounting environment.</li> <li>2. Identify the difference between accrual and cash basis accounting.</li> <li>3. Analyze and record business events in accordance with U.S. generally accepted accounting principles (GAAP).</li> <li>4. Prepare adjusting entries and close the general ledger.</li> <li>5. Prepare financial statements in an appropriate U.S. GAAP format, including the following: income statement, balance sheet, statement of cash flows, and statement of shareholders' equity.</li> <li>6. Analyze and interpret financial statements using financial analysis techniques.</li> <li>7. Describe the conceptual differences between International Financial Reporting Standards and U.S. generally accepted accounting principles.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Principles of Managerial Accounting</b> <b>ACCT 2302</b>
<b>Draft Course Description</b>	<p>This course is an introduction to the fundamental concepts of managerial accounting appropriate for all organizations. Students will study information from the entity's accounting system relevant to decisions made by internal managers, as distinguished from information relevant to users who are external to the company. The emphasis is on the identification and assignment of product costs, operational budgeting and planning, cost control, and management decision making. Topics include product costing methodologies, cost behavior, operational and capital budgeting, and performance evaluation.</p> <p>Prerequisite: ACCT 2301 – Principles of Financial Accounting</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Identify the role and scope of financial and managerial accounting and the use of accounting information in the decision making process of managers.</li> <li>2. Define operational and capital budgeting, and explain its role in planning, control, and decision making.</li> <li>3. Prepare an operating budget, identify its major components, and explain the interrelationships among its various components.</li> <li>4. Explain methods of performance evaluation.</li> <li>5. Use appropriate financial information to make operational decisions.</li> <li>6. Demonstrate use of accounting data in the areas of product costing, cost behavior, cost control, and operational and capital budgeting for management decisions.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Business Computer Applications</b> <b>BCIS 1305</b>
<b>Draft Course Description</b>	<p>Students will study computer terminology, hardware, and software related to the business environment. The focus of this course is on business productivity software applications and professional behavior in computing, including spreadsheets, databases, presentation graphics, and business-oriented utilization of the Internet.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Describe the fundamentals of Information Technology (IT) infrastructure components: hardware, software, and data communications systems.</li> <li>2. Explain the guiding principles of professional behavior in computing.</li> <li>3. Demonstrate proper file management techniques to manipulate electronic files and folders in a local and networked environment.</li> <li>4. Use business productivity software to manipulate data and find solutions to business problems.</li> <li>5. Explain the concepts and terminology used in the operation of application systems in a business environment.</li> <li>6. Identify emerging technologies for use in business applications.</li> <li>7. Complete projects that integrate business software applications.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Business Principles</b> <b>BUSI 1301</b>
<b>Draft Course Description</b>	<p>This course provides a survey of economic systems, forms of business ownership, and considerations for running a business. Students will learn various aspects of business, management, and leadership functions; organizational considerations; and decision-making processes. Financial topics are introduced, including accounting, money and banking, and securities markets. Also included are discussions of business challenges in the legal and regulatory environment, business ethics, social responsibility, and international business. Emphasized is the dynamic role of business in everyday life.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Identify major business functions of accounting, finance, information systems, management, and marketing.</li> <li>2. Describe the relationships of social responsibility, ethics, and law in business.</li> <li>3. Explain forms of ownership, including their advantages and disadvantages.</li> <li>4. Identify and explain the domestic and international considerations for today's business environment: social, economic, legal, ethical, technological, competitive, and international.</li> <li>5. Identify and explain the role and effect of government on business.</li> <li>6. Describe the importance and effects of ethical practices in business and be able to analyze business situations to identify ethical dilemmas and ethical lapses.</li> <li>7. Describe basic financial statements and show how they reflect the activity and financial condition of a business.</li> <li>8. Explain the banking and financial systems, including the securities markets, business financing, and basic concepts of accounting.</li> <li>9. Explain integrity, ethics, and social responsibility as they relate to leadership and management.</li> <li>10. Explain the nature and functions of management.</li> <li>11. Identify strengths, weaknesses, opportunities, and threats of information technology for businesses.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Business Law</b> <b>BUSI 2301</b>
<b>Draft Course Description</b>	<p>The course provides the student with foundational information about the U.S. legal system and dispute resolution, and their impact on business. The major content areas will include general principles of law, the relationship of business and the U.S. Constitution, state and federal legal systems, the relationship between law and ethics, contracts, sales, torts, agency law, intellectual property, and business law in the global context.</p> <p>Prerequisite: High school coursework in U.S. history and government, or equivalent.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Describe the origins and structure of the U.S. legal system.</li> <li>2. Describe the relationship of ethics and law in business.</li> <li>3. Define relevant legal terms in business.</li> <li>4. Explain basic principles of law that apply to business and business transactions.</li> <li>5. Describe business law in the global context.</li> <li>6. Describe current law, rules, and regulations related to settling business disputes.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Programming Fundamentals II</b> <b>COSC 1337</b>
<b>Draft Course Description</b>	<p>This course focuses on the object-oriented programming paradigm, emphasizing the definition and use of classes along with fundamentals of object-oriented design. The course includes basic analysis of algorithms, searching and sorting techniques, and an introduction to software engineering processes. Students will apply techniques for testing and debugging software. (This course is included in the Field of Study Curriculum for Computer Science.)</p> <p>Prerequisite: COSC 1336/1436 – Programming Fundamentals I</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Identify and explain a programming development lifecycle, including planning, analysis, design, development, and maintenance.</li> <li>2. Demonstrate a basic understanding of object-oriented programming by using structs and classes in software projects.</li> <li>3. Use object-oriented programming techniques to develop executable programs that include elements such as inheritance and polymorphism.</li> <li>4. Document and format code in a consistent manner.</li> <li>5. Apply basic searching and sorting algorithms in software design.</li> <li>6. Apply single- and multi-dimensional arrays in software.</li> <li>7. Use a symbolic debugger to find and fix runtime and logical errors in software.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Computer Organization</b> <b>COSC 2325</b>
<b>Draft Course Description</b>	<p>The organization of computer systems is introduced using assembly language. Topics include basic concepts of computer architecture and organization, memory hierarchy, data types, computer arithmetic, control structures, interrupt handling, instruction sets, performance metrics, and the mechanics of testing and debugging computer systems. Embedded systems and device interfacing are introduced.</p> <p>Prerequisite: COSC 1336/1436—Programming Fundamentals I</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Explain contemporary computer system organization.</li> <li>2. Describe data representation in digital computers.</li> <li>3. Explain the concepts of memory hierarchy, interrupt processing, and input/output mechanisms.</li> <li>4. Measure the performance of a computer system.</li> <li>5. Design and develop assembly language applications.</li> <li>6. Explain the interfaces between software and hardware components.</li> <li>7. Explain the design of instruction set architectures.</li> <li>8. Develop a single-cycle processor.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Mathematics for Business &amp; Social Sciences</b> <b>MATH 1324</b>
<b>Draft Course Description</b>	<p>The application of common algebraic functions, including polynomial, exponential, logarithmic, and rational, to problems in business, economics, and the social sciences are addressed. The applications include mathematics of finance, including simple and compound interest and annuities; systems of linear equations; matrices; linear programming; and probability, including expected value.</p> <p>Prerequisite: Successful completion of high school Geometry and Algebra II, or equivalent.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Apply elementary functions, including linear, quadratic, polynomial, rational, logarithmic, and exponential functions to solving real-world problems.</li> <li>2. Solve mathematics of finance problems, including the computation of interest, annuities, and amortization of loans.</li> <li>3. Apply basic matrix operations, including linear programming methods, to solve application problems.</li> <li>4. Demonstrate fundamental probability techniques and application of those techniques, including expected value, to solve problems.</li> <li>5. Demonstrate the ability to combine matrix and probability concepts to model practical applications.</li> </ol>

<b>Title:</b> <b>TCCN:</b>	<b>Calculus for Business &amp; Social Sciences</b> <b>MATH 1325</b>
<b>Draft Course Description</b>	<p>This course is the basic study of limits and continuity, differentiation, optimization and graphing, and integration of elementary functions, with emphasis on applications in business, economics, and social sciences. This course is not a substitute for MATH 2413, Calculus I.</p> <p>Prerequisite: MATH 1324 – Mathematics for Business and Social Sciences, or equivalent.</p>
<b>Draft Course Outcomes</b>	<p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> <li>1. Apply calculus to solve business, economics, and social sciences problems.</li> <li>2. Apply appropriate differentiation techniques to obtain derivatives of various functions, including logarithmic and exponential functions.</li> <li>3. Solve application problems involving implicit differentiation and related rates.</li> <li>4. Solve optimization problems with emphasis on business and social sciences applications.</li> <li>5. Determine appropriate technique(s) of integration.</li> <li>6. Integrate functions using the method of integration by parts or substitution, as appropriate.</li> <li>7. Solve business, economics, and social sciences applications problems using integration techniques.</li> </ol>

***ANNEX B***

***The following pages contain a Program of Study for transfer and a  
Prerequisite Flowchart  
for each of these disciplines:***

***Mathematics***

***Biology***

***Chemistry***

## Community College Program of Study for Transfer to a Mathematics Program

### FRESHMAN YEAR - Recommended Scheduling Sequence\*

First Semester (Fall)	SCH	Second Semester (Spring)	SCH
MATH 2413 Calculus I*	4	MATH 2414 Calculus II	4
Communication Core Curriculum Course	3	Computer Programming Course	3
Core Curriculum Course	3	Communication Core Curriculum Course	3
Core Curriculum Course	3	Core Curriculum Course	3
Core Curriculum Course	3	Core Curriculum Course	3
<b>TOTAL</b>	<b>16</b>	<b>TOTAL</b>	<b>16</b>

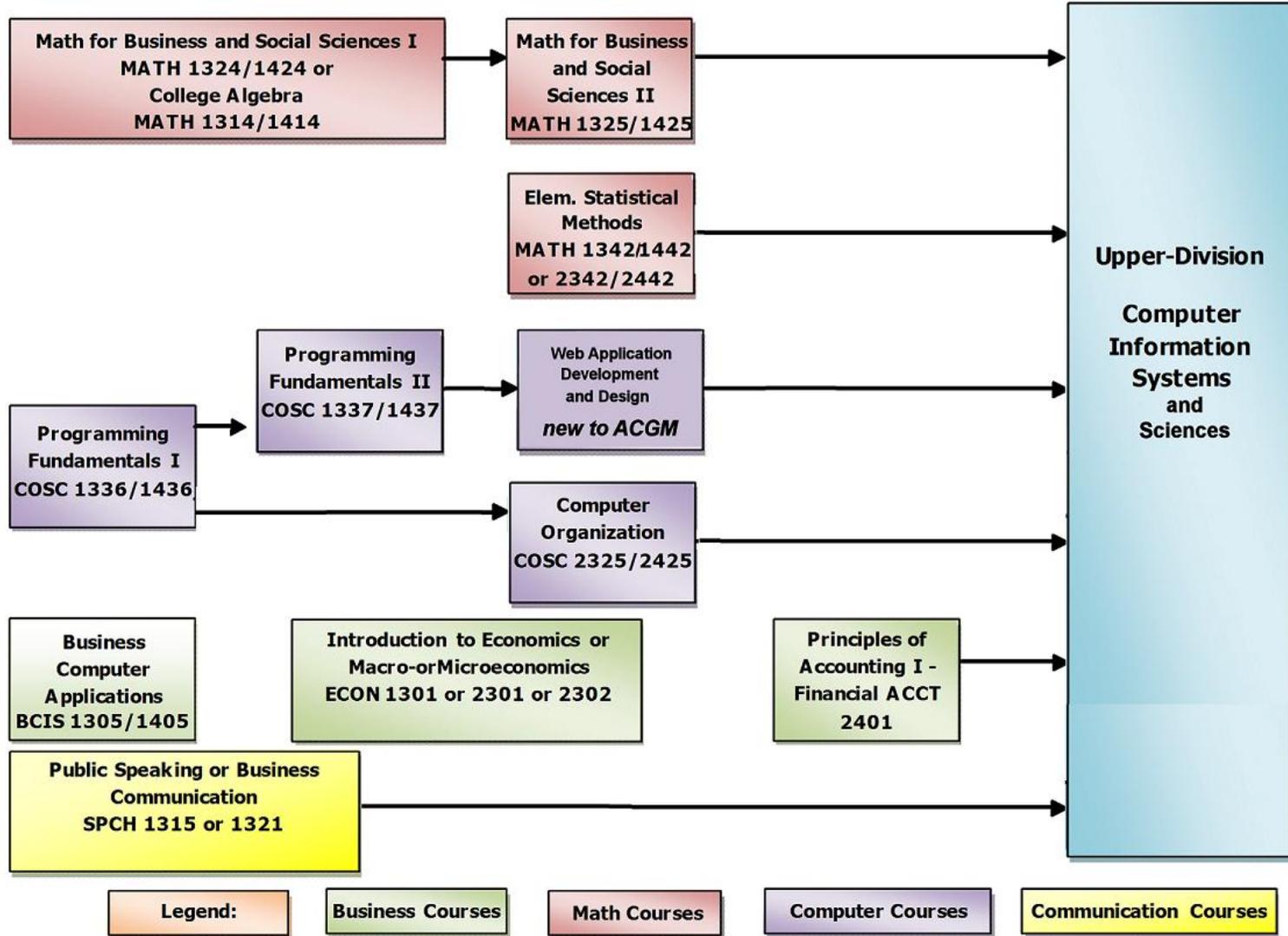
### SOPHOMORE YEAR - Recommended Scheduling Sequence\*

First Semester (Fall)	SCH	Second Semester (Spring)	SCH
MATH 2415 Calculus III**	4	MATH 2320/2420 Differential Equations**	3-4
MATH 2318 Linear Algebra**	3	Core Curriculum Course	3
Core Curriculum Course	3	Core Curriculum Course	3
Core Curriculum Course	3	Core Curriculum Course	3
Core Curriculum Course	3		
<b>TOTAL</b>	<b>16</b>	<b>TOTAL</b>	<b>13</b>

\* Prerequisite courses may be required before beginning Calculus sequence.

\*\* Students may need to complete additional advanced level mathematics courses to meet degree requirements.

## Mathematics Prerequisite Flowchart



## Community College Program of Study for Transfer to a Biology Program

FRESHMAN YEAR						
First Semester (Fall)			Second Semester (Spring)			
	Course	SCH		Course	SCH	
BIOL	1306 or 1311 1106 or 1111	Biology for Science Majors I or General Botany <sup>1</sup>	3	BIOL 1307 or 1313	Biology for Science Majors II or General Zoology <sup>1</sup>	3
BIOL	1106 or 1111	Biology for Science Majors I lab or General Botany lab <sup>1</sup>	1	BIOL 1107 or 1113	Biology for Science Majors II lab or General Zoology lab <sup>1</sup>	1
CHEM	1311	General Chemistry I	3	CHEM 1312	General Chemistry II	3
CHEM	1111	General Chemistry I lab	1	CHEM 1112	General Chemistry II lab	1
MATH	####	Mathematics Option <sup>2</sup>	3-5	MATH ####	Mathematics Option <sup>2</sup> or Texas Core Requirement (if math complete)	3
XXXX	####	Texas Core Curriculum Requirement	3	XXXX ####	Texas Core Curriculum Requirement	3
<b>Semester Credit Hours</b>			<b>14-16</b>	<b>Semester Credit Hours</b>		
				<b>14</b>		

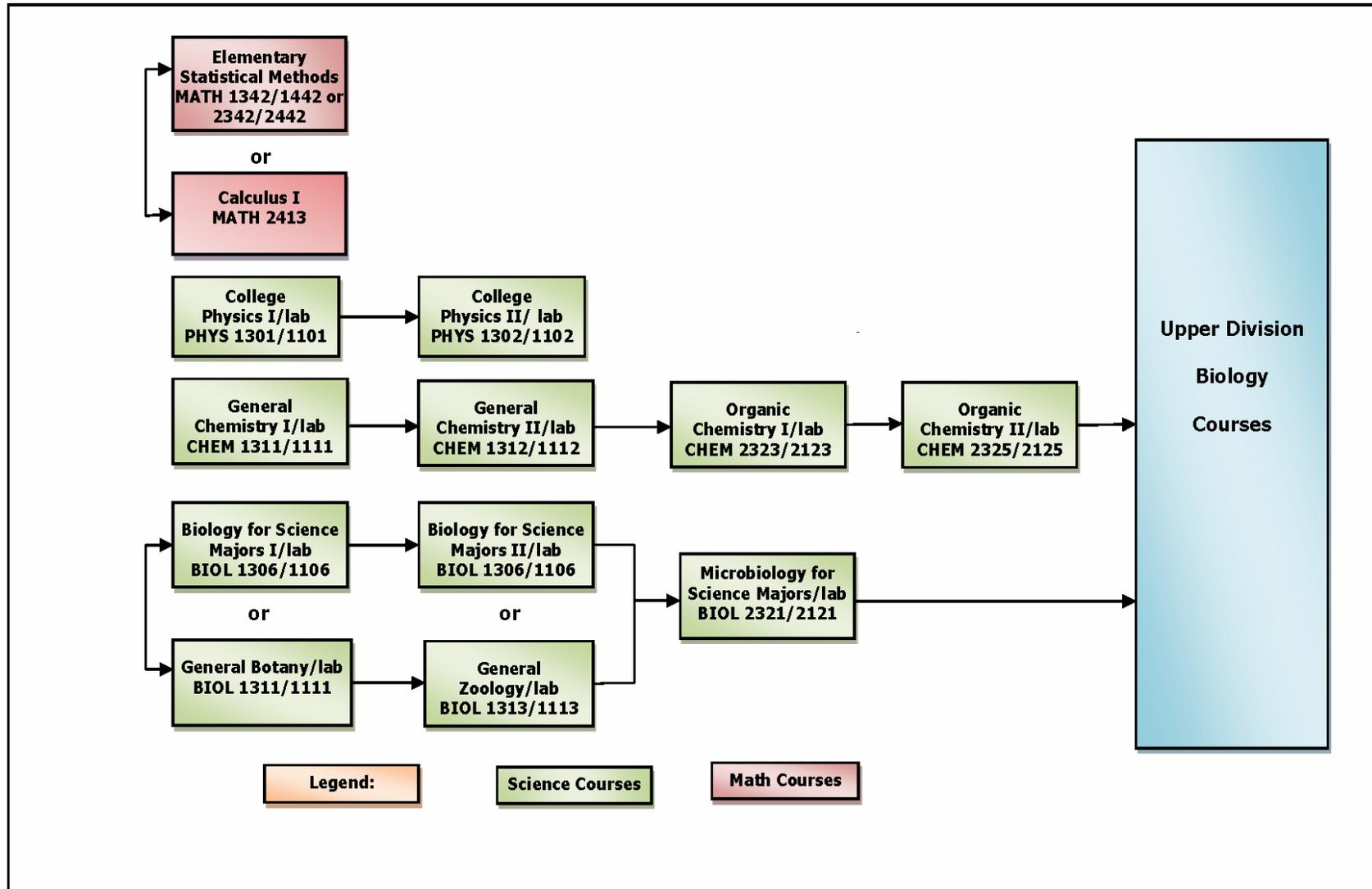
SOPHOMORE YEAR						
First Semester (Fall)			Second Semester (Spring)			
	Course	SCH		Course	SCH	
CHEM	2323	Organic Chemistry I	3	BIOL 2321	Microbiology for Science Majors	3
CHEM	2123	Organic Chemistry I lab	1	BIOL 2121	Microbiology for Science Majors lab	1
MATH	####	Mathematics Option <sup>2</sup> or Texas Core Requirement (if math complete)	3	CHEM 2325	Organic Chemistry II	3
XXXX	####	Texas Core Curriculum Requirement	3	CHEM 2125	Organic Chemistry II lab	1
PHYS	1301	College Physics I	3	PHYS 1302	College Physics II	3
PHYS	1101	College Physics I lab	1	PHYS 1102	College Physics II lab	1
<b>Semester Credit Hours</b>			<b>14</b>	<b>Semester Credit Hours</b>		
				<b>15</b>		

**NOTES:**

<sup>1</sup>Students must complete either the BIOL 1306/1106 and 1307/1107 sequence or the BIOL 1311/1111 and 1313/1113 sequences. Courses from these sequences may not be combined.

<sup>2</sup>Begin mathematics coursework according to placement by initial institution. Maintain continuous enrollment until final mathematics level is achieved. Complete through MATH 1342 or 1442 or 2342 or 2442 Elementary Statistical Methods, or MATH 2313 or 2413 or 2513 Calculus I as determined by four-year degree program. The student is advised to check with the school to which he or she intends to transfer for specific requirements and applicability of the mathematics course to the biology major at that institution.

## Biology Prerequisite Flowchart



## Community College Program of Study for Transfer to a Chemistry Program

### FRESHMAN YEAR

First Semester (Fall)		Second Semester (Spring)	
Course	SCH	Course	SCH
MATH 2413 Calculus I	4	MATH 2414 Calculus II	4
CHEM 1311 General Chemistry I	3	CHEM 1312 General Chemistry II	3
CHEM 1111 General Chemistry I lab	1	CHEM 1112 General Chemistry II lab	1
XXXX ##### Texas Core Curriculum Requirement	2	XXXX ##### Texas Core Curriculum Requirement	3
XXXX ##### Texas Core Curriculum Requirement	3	XXXX ##### Texas Core Curriculum Requirement	3
XXXX ##### Texas Core Curriculum Requirement	3	XXXX ##### Texas Core Curriculum Requirement	3
Semester Credit Hours		Semester Credit Hours	
16		17	

### SOPHOMORE YEAR

First Semester (Fall)		Second Semester (Spring)	
Course	SCH	Course	SCH
CHEM 2323 Organic Chemistry I	3	CHEM 2325 Organic Chemistry II	3
CHEM 2123 Organic Chemistry I lab	1	CHEM 2125 Organic Chemistry II lab	1
PHYS 2325 University Physics I	3	PHYS 2326 University Physics II	3
PHYS 2125 University Physics I lab	1	PHYS 2126 University Physics II lab	1
XXXX ##### Texas Core Curriculum Requirement	3	XXXX ##### Texas Core Curriculum Requirement	3
XXXX ##### Texas Core Curriculum Requirement	3	XXXX ##### Texas Core Curriculum Requirement	3
Semester Credit Hours		Semester Credit Hours	
14		14	

#### Notes:

- 1 Texas Common Course Numbers are used for all TCCN-numbered courses.
- 2 The student is encouraged to check with the institution to which he/she plans to attend for transferability conditions for CHEM 2325/2125 Organic Chemistry II and its accompanying lab.

## Chemistry Prerequisite Flowchart

