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WCC General Education Requirements
Effective Fall 2018

Associate degree programs were updated to meet the revised WCC general education requirements below.

Course Distribution Requirements

Associate degree students must complete courses from each of six General Education content areas. The requirements vary, depending on which degree is being earned. The number of general education credit hours required for each degree is as follows.

	AA	AS	AAS
Writing/Composition	3-4 credits	3-4 credits	3-4 credits
2nd Writing/Composition or Communication	3-4 credits	3 credits	3 credits
Mathematics	3-4 credits	3-4 credits	3-4 credits
Natural Sciences [1]	7-8 credits	7-8 credits	3-4 credits
Social & Behavioral Science [2]	6 credits	6 credits	3 credits
Arts and Humanities [3]	6 credits	6 credits	3 credits
General Education Electives to reach 30 credits	0-2 credits	0-2 credits	N/A
Minimum	30 credits	30 credits	18 credits

[1] Two courses in Natural Science including one with laboratory experience (from two disciplines)
[2] From two disciplines
[3] From two disciplines

Program Information Report

Transfer and University Parallel Programs

If your goal is to continue your education toward a baccalaureate degree, then transfer and university parallel programs is the track for you. Complete the first two years of study in a supportive environment with small classes and personal attention.

Before beginning any transfer program, a student should consult with an academic advisor or counselor to obtain a program articulation agreement or a transfer guide. Early in the program, the student should contact an undergraduate advisor at the transfer college for specific admission and curriculum requirements and, if available, an unofficial transfer-credit evaluation.

Copies of articulation agreements and transfer guides are available in the Counseling Office on the second floor of the Student Center Building. Computers with access to the Internet Web sites of four-year colleges and universities are also available there.

Math and Science

Learn more about math or science through this associate degree program.

Math and Science (ASMSAS)

Associate in Science Degree

Program Effective Term: Fall 2018

High Demand Occupation High Skill Occupation High Wage Occupation

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in actuarial science, biology, chemistry, math, or pharmacy. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations. These concentrations may also list courses used to meet General Education requirements.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228 or BIO 237

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 191 Calculus I
MTH 192 Calculus II
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations

Pre-Actuarial Science (PPAS)
ECO 211 Principles of Economics I
ECO 222 Principles of Economics II
MTH 191 Calculus I
MTH 192 Calculus II
MTH 197 Linear Algebra
MTH 293 Calculus III

Pre-Pharmacy (PPHA)
Two Restricted Electives in Biology (see below)
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
PHY 111 General Physics I
PHY 122 General Physics II

Program Information Report

Biology Restricted Electives for Pre-Pharmacy (PPHA): BIO 111, BIO 161, BIO 162, BIO 208, BIO 237, BIO 215, BIO 227 or BIO 228
Optional Transfer Courses for Pre-Pharmacy (PPHA): MTH 160, MTH 192, along with other Biology restricted electives. See a program advisor to select appropriate Biology courses.

Articulation:
This program will fulfill the Michigan Transfer Agreement (MTA) requirements provided the student takes two science courses from two different disciplines. One course must have a lab component. Students must have MTA posted on their transcripts by the WCC Student Records Office.

This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have MACRAO posted on their transcripts by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The biology and chemistry concentrations require one year of high school chemistry or CEM 101 with a "C" or better to enroll in CEM 111.

Minimum Concentration Credits Required for the Program: **60**
Select a concentration for requirements and total credits required for program.

Math and Science Concentrations

Biology/Pre-Medicine (BMED)		(60 credits)
First Semester		**(17 credits)**
BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 176 or	College Algebra	
MTH 191	Calculus I*	4
Elective	Elective(s) to reach minimum 60 credits	5
Second Semester		**(16 credits)**
BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 160 or	Basic Statistics**	
MTH 192	Calculus II	4
Third Semester		**(14 credits)**
CEM 211	Organic Chemistry I	4
Elective	Speech/Comp. Elective(s)	3
Elective	Soc. Sci. Elective(s) 1	3
Elective	Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237	4
Fourth Semester		**(13 credits)**
CEM 222	Organic Chemistry II	4
Elective	Arts/Human. Elective(s) 1	3
Elective	Soc. Sci. Elective(s) 2	3
Elective	Arts/Human. Elective(s) 2	3

Minimum Credits Required for the Concentration or Option: 60

Chemistry/Pre-Medicine (CMED)		(60 credits)
First Semester		**(16 credits)**
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Elective(s) to reach minimum 60 credits	3
Second Semester		**(16 credits)**
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4

Program Information Report

Third Semester		(14 credits)
CEM 211	Organic Chemistry I	4
Elective	Speech/Comp. Elective(s)	3
MTH 197	Linear Algebra	4
Elective	Soc. Sci. Elective(s) 1	3

Fourth Semester		(14 credits)
Elective	Elective(s) to reach minimum 60 credits	1
CEM 222	Organic Chemistry II	4
Elective	Arts/Human. Elective(s) 1	3
Elective	Soc. Sci. Elective(s) 2	3
Elective	Arts/Human. Elective(s) 2	3

Minimum Credits Required for the Concentration or Option: 60

Mathematics (MATH) (60 credits)

First Semester		(15 credits)
Elective	Nat. Sci. Elective(s)	3
MTH 191	Calculus I	5
Elective	Select one course from the following: CPS 120, CPS 141, CPS 161 or CPS 171	3
ENG 111	Composition I	4

Second Semester		(14 credits)
Elective	Nat. Sci. Lab Elective(s)	3
MTH 160	Basic Statistics	4
MTH 192	Calculus II	4
Elective	Soc. Sci. Elective(s) 1	3

Third Semester		(17 credits)
Elective	Speech/Comp. Elective(s)	3
Elective	Elective(s) to reach minimum 60 credits	3
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Soc. Sci. Elective(s) 2	3

Fourth Semester		(14 credits)
MTH 295	Differential Equations	4
Elective	Arts/Human. Elective(s) 1	3
Elective	Arts/Human. Elective(s) 2	3
Elective	Elective(s) to reach a minimum of 60 credits.	4

Minimum Credits Required for the Concentration or Option: 60

Pre-Actuarial Science (PPAS) (60 credits)

First Semester		(16 credits)
ACC 111	Principles of Accounting I	3
CPS 161	An Introduction to Programming with Java	4
ENG 111	Composition I	4
MTH 191	Calculus I	5

Second Semester		(16 credits)
ACC 122	Principles of Accounting II	3
ECO 211	Principles of Economics I	3
Elective	Nat. Sci. Elective(s)	3
MTH 192	Calculus II	4
Elective	Arts/Human. Elective(s) 1	3

Third Semester		(13 credits)
ECO 222	Principles of Economics II	3
MTH 197	Linear Algebra	4
Elective	Nat. Sci. Lab Elective(s)	3
Elective	Soc. Sci. Elective(s) 2+	3

Program Information Report

Fourth Semester		(15 credits)
MTH 293	Calculus III	4
Elective	Arts/Human. Elective(s) 2++	3
Elective	Speech/Comp. Elective(s)	3
Elective	Elective(s) to reach minimum 60 credits	5

Minimum Credits Required for the Concentration or Option: 60

Pre-Pharmacy (PPHA) (60 credits)

First Semester		(16 credits)
Elective	Biology Restricted Elective	4
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
Elective	Arts/Human. Elective(s)	3

Second Semester		(15 credits)
Elective	Restricted Biology Elective	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
Elective	Elective(s) to reach minimum 60 credits	3

Third Semester		(17 credits)
CEM 211	Organic Chemistry I	4
Elective	Speech/Comp. Elective(s)	3
PHY 111	General Physics I	4
Elective	Arts/Human. Elective(s) 2	3
Elective	Soc. Sci. Elective(s) 1	3

Fourth Semester		(12 credits)
CEM 222	Organic Chemistry II	4
PHY 122	General Physics II	4
Elective	Elective(s) to reach minimum 60 credits	1
Elective	Soc. Sci. Elective(s) 2	3

Minimum Credits Required for the Concentration or Option: 60

Minimum Credits Required for the Program: 60

Notes:

**Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191.*
***Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192.*
****Students transferring to EMU as a biology major may consider completing BIO 208 at WCC prior to transfer.*
+See the MTA list to make course selections from any discipline except ECO.
++Transfer students should consider a course from the the EMU Diverse Word Requirements list.

Done 1/29/18 NWLB

WASHTENAW COMMUNITY COLLEGE
GENERAL EDUCATION REVISION PROGRAM CHANGE FORM
FOR AA AND AS PROGRAMS 2018-2019

Program Code: ASMSAS	**Program Name:** Math & Science
Division Code: A&S MSE	**Department:**

This form is to be used only for General Education Revision Program Changes for Associate in Arts (AA) and Associate in Science (AS) programs. Any other program changes should be submitted separately using a standard Program Change Form.

Directions:

1. Review each general education area under **Requested Changes** below and respond as needed.
2. Attach the semester program layout showing the current program listing from the WCC catalog.
   a. Indicate any changes to be made on the semester layout.
   b. Draw a line through any courses that should be removed on the semester layout.
   c. Write in any courses that need to be added on the semester layout.
3. Submit this form and semester program layout to the Office of Curriculum and Assessment (SC 257).

Current General Education Requirements AA and AS	
Writing	6 - 7 credits
Speech	3 credits
Mathematics	3 - 4 credits
Natural Sciences	3 - 4 credits
Social & Behavioral Sciences	6 credits
Arts & Humanities	6 credits
Critical Thinking	0 credits
Computer & Information Literacy	3 credits
Total	30 - 33 credits

Revised General Education Requirements 2018-2019 AA and AS	
English Composition	3 - 4 credits
2nd Course in English Composition or one course in Communication	3 - 4 credits
Mathematics	3 - 4 credits
Natural Sciences from 2 disciplines including one lab course	7 - 9 credits
Social & Behavioral Sciences from 2 disciplines	6 credits
Arts & Humanities from 2 disciplines	6 credits
Elective Credits to reach a minimum of 30 credit hours	0 - 3 credits
Total	30 credits

Please review each General Education Area in the chart below, and record the needed changes in the chart and on the attached semester layout.

REQUESTED CHANGES	
	General Education Area
	English Composition – The requirement for one writing/English composition course remains the same. No changes will be made unless specifically requested below. (Use Writing Elective or ENG 111) Optional Change:
	2nd Course in English Composition or one course in Communication WCC previously required both a second composition/writing course and a communication course. Your options are: 1. Allow students to select any course that meets composition/writing or communication (*recommended*). 2. Require students to take a specific composition course (identify course below and on semester layout). 3. Require students to take a specific communication course (identify course below and on semester layout).

	Requested Change:
	2nd Course in English Composition or one course in Communication Credit Hours Because of this change, an extra 3 – 4 credit hours may be available in the program. Please specify how you would like to use those credit hours. Your options are: 1. Reduce the number of credit hours if the program total is over 60 *(recommended).* 2. Replace the course with elective credits as needed to reach a minimum of 60 credit hours. 3. Add a specific program-related course *(please add the course in the semester it should be taken on the semester layout).* Requested Change:
	Mathematics – The requirement for one mathematics course remains the same. However, the courses that meet the MTA requirement have changed slightly. MTH 148, 149 and 167 do not meet the general education requirement for AA or AS degrees. Please identify an alternate course or list "Math elective". Optional Change:
	Natural Sciences from 2 disciplines including one lab course WCC previously required one natural science course. Your options are: 1. No change needed – a second natural science course is already included in my program. 2. Add a second natural science course in the semester shown on the semester layout attached. Unless specific courses are required, include one course identified as a lab science course. Requested Change:
	Social & Behavioral Sciences from 2 disciplines – The requirement for two social and behavioral science courses remains the same. No changes will be made unless specifically requested below. Optional Change:
	Arts & Humanities from 2 disciplines – The requirement for two arts and humanities courses remains the same. No changes will be made unless specifically requested below. (Note: A department can designate a COM course as a requirement here. The same course cannot be counted in two areas.) Optional Change:
	Computer and Information Literacy The requirement for computer and information literacy has been removed. Your options are: 1. Continue to require a specific computer course. If a specific course is required in your program, we will leave it there. If you previously used "Computer and Information Literacy Course," you will need to specify either a specific course or a list of courses from which to choose. 2. Remove the computer and information literacy course if the program will still meet the minimum of 60 credit hours. 3. Remove the computer and information literacy course and replace the course with elective or other credits as needed to meet the minimum of 60 credit hours. Required Change:
	Elective Credits to reach a minimum of 30 credit hours – A course titled "General Education Credit(s) to Reach a Minimum of 30 Credit Hours" will be created and then added as needed to the program.

Reviewer	Print Name	Signature	Date
Initiator			
Department Chair	See emails		
Division Dean/ Administrator			
Vice President for Instruction			

Program Information Report

(ASMSAS)

Transfer and University Parallel Programs

If your goal is to continue your education toward a baccalaureate degree, then transfer and university parallel programs is the track for you. Complete the first two years of study in a supportive environment with small classes and personal attention.

Business (AABAS)
Computer Science: Programming in Java (ASCSPJ) See School of Information Technology
Criminal Justice (AACJ)
Education, Early Childhood (AAECE)
Education, Elementary (AAELEM)
Education, Secondary (AASECO)
Environmental Science (ASENVS)
1. Environmental Science (ENV1)
2. Environmental Science and Society (ENV2)

Exercise Science (ASESCI)
General Studies in Math and Natural Sciences (ASGSMS)
Honors in the Liberal Arts (AAHLA)
Human Services (AAHUST)
Information Systems: Programming in C++ (ASISPC) See School of Information Technology
Liberal Arts Transfer (AALAT)
Math and Science (ASMSAS)
1. Pre-Medicine Concentration (BMED or CMED)
2. Mathematics Concentration (MATH)
3. Physics/Pre-Engineering Concentration (PHYS)
4. Pre-Actuarial Science Concentration (PPAS)
5. Pre-Pharmacy Concentration (PPHA)

Before beginning any transfer program, a student should consult with an academic advisor or counselor to obtain a program articulation agreement, or a transfer guide. Early in the program, the student should contact an undergraduate advisor at the transfer college for specific admission and curriculum requirements and, if available, an unofficial transfer-credit evaluation.

Copies of articulation agreements and transfer guides are available in the Counseling Office on the second floor of the Student Center Building. Computers with access to the Internet Web sites of four-year colleges and universities are also available there.

Math and Science

Learn more about math or science through this associate degree program.

Program Information Report

Math and Science (ASMSAS)

Associate in Science Degree

Program Effective Term: Fall 2015

High Demand Occupation High Skill Occupation High Wage Occupation

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in actuarial science, biology, chemistry, math, pharmacy, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228 or BIO 237

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
Elective: Take an additional three credits in the MTH discipline

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Pre-Actuarial Science (PPAS)
ECO 211 Principles of Economics I
ECO 222 Principles of Economics II
MTH 191 Calculus I
MTH 192 Calculus II
MTH 197 Linear Algebra
MTH 293 Calculus III

Pre-Pharmacy (PPHA)
Two Restricted Electives in Biology (see below)
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
PHY 111 General Physics I
PHY 122 General Physics II
Biology Restricted Electives for Pre-Pharmacy (PPHA): BIO 111, BIO 161, BIO 162, BIO 208, BIO 237, BIO 215, BIO 227 or BIO 228
Optional Transfer Courses for Pre-Pharmacy (PPHA): MTH 160, MTH 192, along with other Biology restricted electives. See a program advisor to select appropriate Biology courses.

Articulation:
This program will fulfill the Michigan Transfer Agreement (MTA) requirements provided the student takes two science courses from two different disciplines. One course must have a lab component. Students must have MTA posted on their transcripts by the WCC Student Records Office.

This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements,

students complete one additional course in Social and Behavioral Science. Students must have MACRAO posted on their transcripts by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The physics concentration requires one semester of high school physics or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 101 with a "C" or better to enroll in CEM 111.

Minimum Concentration Credits Required for the Program: **60**

Math and Science Concentrations

Biology/Pre-Medicine (BMED) **(61 credits)**

First Semester **(15 credits)**

BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 176 or	College Algebra	
MTH 191	Calculus I*	4
Elective	Computer Lit. Elective(s)	3

Second Semester **(15 credits)**

BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 160 or	Basic Statistics**	
MTH 192	Calculus II	4

Third Semester **(15 credits)**

CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
Elective	Soc. Sci. Elective(s)	3
Elective	Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237	4

Fourth Semester **(16 credits)**

CEM 222	Organic Chemistry II	4
COM 101	Fundamentals of Speaking	3
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 61

Chemistry/Pre-Medicine (CMED) **(62 credits)**

First Semester **(16 credits)**

CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3

Second Semester **(15 credits)**

CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4

Third Semester **(17 credits)**

CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
Elective	Soc. Sci. Elective(s)	3

Fourth Semester **(14 credits)**

COM 101	Fundamentals of Speaking	3
CEM 222	Organic Chemistry II	4

Program Information Report

Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 62

Mathematics (MATH) (60 credits)

BIO 162 or	General Biology II Cells and Molecules	
CEM 111 or	General Chemistry I	
PHY 111	General Physics I	4
MTH 191	Calculus I	5
Elective	Computer Lit. Elective(s)	3
ENG 111	Composition I	4

Second Semester

BIO 161 or	General Biology I Ecology and Evolution	
CEM 122 or	General Chemistry II	
PHY 122	General Physics II	4
MTH 160	Basic Statistics	4
MTH 192	Calculus II	4
Elective	Soc. Sci. Elective(s)	3

Third Semester

COM 101	Fundamentals of Speaking	3
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Soc. Sci. Elective(s)	3

Fourth Semester

MTH 295	Differential Equations	4
Elective	Arts/Human. 2 Elective(s)	3
Elective	Arts/Human. Elective(s)	3
Elective	Elective(s) to reach a minimum of 60 credits.	2-3

Minimum Credits Required for the Concentration or Option: 60

Physics/Pre-Engineering (PENG) (68 credits)

First Semester

CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3

Second Semester

ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Elective	Arts/Human. Elective(s)	3

Third Semester

ENG 226	Composition II	3
MTH 197	Linear Algebra	4
PHY 211	Analytical Physics I	5
Elective	Soc. Sci. Elective(s)	3

Fourth Semester

COM 101	Fundamentals of Speaking	3
MTH 293	Calculus III	4
PHY 222	Analytical Physics II	5
Elective	Arts/Human. Elective(s)	3

Program Information Report

Fifth Semester		
MTH 295	Differential Equations	4
Elective	Soc. Sci. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 68

Pre-Actuarial Science (PPAS) (60 credits)

First Semester		
ACC 111	Principles of Accounting I	3
CPS 161	An Introduction to Programming with Java	4
ENG 111	Composition I	4
MTH 191	Calculus I	5
Second Semester		
ACC 122	Principles of Accounting II	3
ECO 211	Principles of Economics I	3
ENG 226	Composition II	3
MTH 192	Calculus II	4
Elective	Arts/Human. Elective(s)	3
Third Semester		
ECO 222	Principles of Economics II	3
MTH 197	Linear Algebra	4
Elective	Nat. Sci. Elective(s)	4
Elective	Soc. Sci. Elective(s)+	3
Fourth Semester		
MTH 293	Calculus III	4
Elective	Arts/Human. Elective(s)++	3
Elective	Nat. Sci. Elective(s)+++	4
Elective	Speech Elective(s)	3

Minimum Credits Required for the Concentration or Option: 60

Pre-Pharmacy (PPHA) (62 credits)

First Semester		
Elective	Biology Restricted Elective	4
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
Elective	Arts/Human. Elective(s)	3
Second Semester		
Elective	Restricted Biology Elective	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
Elective	Speech Elective(s)	3
Third Semester		
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
PHY 111	General Physics I	4
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Fourth Semester		
CEM 222	Organic Chemistry II	4
PHY 122	General Physics II	4
Elective	Computer Lit. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 62

Minimum Credits Required for the Program: 60

Program Information Report

Notes:

**Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191.*
***Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192.*
****Students transferring to EMU as a biology major may consider completing BIO 208 at WCC prior to transfer.*
+See the MTA list to make course selections from any discipline except ECO.
++Transfer students should consider a course from the the EMU Diverse Word Requirements list.
+++Students may take 3 credits of a MTA approved natural science course as the second Natural Science elective but may need an elective to bring the total number of credits back up to 60 if necessary.

Math and Science (ASMSAS) Associate in Science Degree

- 2015 - 2016

Description

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in actuarial science, biology, chemistry, math, pharmacy, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
Elective: Take an additional three credits in the MTH discipline

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Pre-Actuarial Science (PPAS)
ECO 211 Principles of Economics I
ECO 222 Principles of Economics II
MTH 191 Calculus I

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MTH 192 Calculus II
MTH 197 Linear Algebra
MTH 293 Calculus III

Pre-Pharmacy (PPHA)
~~BIO 161 General Biology I Ecology and Evolution~~
~~BIO 162 General Biology II Cells and Molecules~~
2 Restricted Electives in Biology below
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
PHY 111 General Physics I
PHY 122 General Physics II
~~MTH 191 Calculus I~~
Biology Restricted Electives: BIO 111, BIO 161, BIO 162, BIO 208, BIO 237, BIO 215, BIO 227 or BIO 228

Optional Transfer Courses for Pre-Pharmacy (PPHA): MTH 192 Calculus II, MTH 160 Basic Statistics along with other Biology restricted electives. See a program advisor to select appropriate Biology courses.

Articulation

This program will fulfill the Michigan Transfer Agreement (MTA) requirements provided the student takes two science courses from two different disciplines. One course must have a lab component. Students must have MTA posted on their transcripts by the WCC Student Records Office.

This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have MACRAO posted on their transcripts by the WCC Student Records Office.

Admissions Requirements

- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The physics concentration requires one semester of high school physics or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 101 with a "C" or better to enroll in CEM 111.

Contact Information

Division
Math, Science & Health

Department

Physical Sciences Dept

Advisors

Jerrell McCowin

Requirements

Select a concentration for requirements and total credits required for program.

Biology/Pre-Medicine (BMED)

First Semester

Class	Title	Credits
BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 176	or College Algebra	
MTH 191	Calculus I *	4
Elective(s)	Computer and Information Literacy	3
Total		15

Second Semester

Class	Title	Credits
BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 160	or Basic Statistics **	
MTH 192	Calculus II	4
Total		16

Third Semester

Class	Title	Credits
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
Elective(s)	Social and Behavioral Science	3
	Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237	4
Total		14

Fourth Semester

Class	Title	Credits
CEM 222	Organic Chemistry II	4
COM 101	Fundamentals of Speaking	3
Elective(s)	Arts and Humanities	3
Elective(s)	Social and Behavioral Science	3
Elective(s)	Arts and Humanities	3
Total		16
Total Credits Required		61

Chemistry/Pre-Medicine (CMED)

First Semester

Class	Title	Credits
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective(s)	Computer and Information Literacy	3
Total		16

Second Semester

Class	Title	Credits
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Total		16

Third Semester

Class	Title	Credits
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
Elective(s)	Social and Behavioral Science	3
Total		14

Fourth Semester

Class	Title	Credits
COM 101	Fundamentals of Speaking	3

CEM 222	Organic Chemistry II	4
Elective(s)	Arts and Humanities	3
Elective(s)	Social and Behavioral Science	3
Elective(s)	Arts and Humanities	3
Total		16
Total Credits Required		62

Mathematics (MATH)

First Semester

Class	Title	Credits
BIO 162	or General Biology II Cells and Molecules	
CEM 111	or General Chemistry I	
PHY 111	General Physics I	4
MTH 191	Calculus I	5
Elective(s)	Computer and Information Literacy	3
ENG 111	Composition I	4
Total		16

Second Semester

Class	Title	Credits
BIO 161	or General Biology I Ecology and Evolution	
CEM 122	or General Chemistry II	
PHY 122	General Physics II	4
MTH 160	Basic Statistics	4
MTH 192	Calculus II	4
Elective(s)	Social and Behavioral Science	3
Total		15

Third Semester

Class	Title	Credits
COM 101	Fundamentals of Speaking	3
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective(s)	Social and Behavioral Science	3
Total		17

Fourth Semester

Class	Title	Credits
MTH 295	Differential Equations	4
Elective(s)	Arts and Humanities 2	3
Elective(s)	Arts and Humanities	3
	Elective(s) to reach a minimum of 60 credits.	2 - 3
Total		12 - 13
Total Credits Required		60 - 61

Physics/Pre-Engineering (PENG)

First Semester

Class	Title	Credits
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective(s)	Computer and Information Literacy	3
Total		16

Second Semester

Class	Title	Credits
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Elective(s)	Arts and Humanities	3
Total		15

Third Semester

Class	Title	Credits
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
PHY 211	Analytical Physics I	5
Elective(s)	Social and Behavioral Science	3
Total		15

Fourth Semester

Class	Title	Credits
COM 101	Fundamentals of Speaking	3
MTH 293	Calculus III	4

PHY 222	Analytical Physics II	5
Elective(s)	Arts and Humanities	3
Total		15

Fifth Semester

Class	Title	Credits
MTH 295	Differential Equations	4
Elective(s)	Social and Behavioral Science	3
Total		7
Total Credits Required		68

Pre-Actuarial Science (PPAS)

First Semester

Class	Title	Credits
ACC 111	Principles of Accounting I	3
CPS 161	An Introduction to Programming with Java	4
ENG 111	Composition I	4
MTH 191	Calculus I	5
Total		16

Second Semester

Class	Title	Credits
ACC 122	Principles of Accounting II	3
ECO 211	Principles of Economics I	3
ENG 226	Composition II	3
MTH 192	Calculus II	4
Elective(s)	Arts and Humanities	3
Total		16

Third Semester

Class	Title	Credits
ECO 222	Principles of Economics II	3
MTH 197	Linear Algebra	4
Elective(s)	Natural Sciences	4
Elective(s)	Social and Behavioral Science +	3
Total		14

Fourth Semester

Class	Title	Credits
MTH 293	Calculus III	4
Elective(s)	Arts and Humanities ++	3
Elective(s)	Natural Sciences +++	4
Elective(s)	Speech	3
Total		14

Total Credits Required
60

Pre-Pharmacy (PPHA)

First Semester

Class	Title	Credits
Elective	Biology Restricted Elective	
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
Elective(s)	Arts and Humanities	3
Total		16

3/23/15, per Joy this should stay and not be included on description.

Second Semester

Class	Title	Credits
Elective	Biology Restricted Elective	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
Elective(s)	Speech	3
Total		15

Third Semester

Class	Title	Credits
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
PHY 111	General Physics I	4
Elective(s)	Arts and Humanities	3
Elective(s)	Social and Behavioral Science	3
Total		17

Fourth Semester

Class	Title	Credits
CEM 222	Organic Chemistry II	4
PHY 122	General Physics II	4
Elective(s)	Computer and Information Literacy	3
Elective(s)	Social and Behavioral Science	3
Total		14
Total Credits Required		62

Footnotes

*Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191.
**Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192.
***Students transferring to EMU as a biology major may consider completing BIO 208 at WCC prior to transfer.
+See the MTA list to make course selections from any discipline except ECO.
++Transfer students should consider a course from the EMU Diverse Word Requirements list.
+++Students may take ~~a~~ 3 credits of a MTA approved natural science course as the second Natural Science elective but may need an elective to bring the total number of credits back up to 60 if necessary.

Program Information Report

Transfer and University Parallel Programs

If your goal is to continue your education toward a baccalaureate degree, then transfer and university parallel programs is the track for you. Complete the first two years of study in a supportive environment with small classes and personal attention.

Business (AABAS)
Computer Science: Programming in Java (ASCSPJ) See School of Information Technology
Criminal Justice (AACJ)
Education, Early Childhood (AAECE)
Education, Elementary (AAELEM)
Education, Secondary (AASECO)
Environmental Science (ASENVS)
1. Environmental Science (ENV1)
2. Environmental Science and Society (ENV2)

Exercise Science (ASESCI)
General Studies in Math and Natural Sciences (ASGSMS)
Honors in the Liberal Arts (AAHLA)
Human Services (AAHUST)
Information Systems: Programming in C++ (ASISPC) See School of Information Technology
Liberal Arts Transfer (AALAT)
Math and Science (ASMSAS)
1. Pre-Medicine Concentration (BMED or CMED)
2. Mathematics Concentration (MATH)
3. Physics/Pre-Engineering Concentration (PHYS)
4. Pre-Actuarial Science Concentration (PPAS)
5. Pre-Pharmacy Concentration (PPHA)

Before beginning any transfer program, a student should consult with an academic advisor or counselor to obtain a program articulation agreement, or a transfer guide. Early in the program, the student should contact an undergraduate advisor at the transfer college for specific admission and curriculum requirements and, if available, an unofficial transfer-credit evaluation.

Copies of articulation agreements and transfer guides are available in the Counseling Office on the second floor of the Student Center Building. Computers with access to the Internet Web sites of four-year colleges and universities are also available there.

Math and Science

Learn more about math or science through this associate degree program.

Program Information Report

Math and Science (ASMSAS)

Associate in Science Degree

Program Effective Term: Fall 2015

High Demand Occupation High Skill Occupation High Wage Occupation

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in actuarial science, biology, chemistry, math, pharmacy, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
Elective: Take an additional three credits in the MTH discipline

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Pre-Actuarial Science (PPAS)
ECO 211 Principles of Economics I
ECO 222 Principles of Economics II
MTH 191 Calculus I
MTH 192 Calculus II
MTH 197 Linear Algebra
MTH 293 Calculus III

Pre-Pharmacy (PPHA)
BIO 161 General Biology I Ecology and Evolution
BIO 162 General Biology II Cells and Molecules
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
PHY 111 General Physics I
PHY 122 General Physics II
MTH 191 Calculus I
Optional Transfer Courses for Pre-Pharmacy (PPHA): MTH 192 Calculus II, BIO 111 Anatomy and Physiology - Normal structure and Function, BIO 208 Genetics, BIO 237 Microbiology, BIO 215 Cell and Molecular Biology, BIO 227 Biology of Animals or BIO 228 Biology of Plants, MTH 160 Basic Statistics

Articulation:
This program will fulfill the Michigan Transfer Agreement (MTA) requirements provided the student takes two science courses from two different disciplines. One course must have a lab component. Students must have MTA posted on their transcripts by the WCC Student Records Office.

Program Information Report

This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have MACRAO posted on their transcripts by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The physics concentration requires one semester of high school physics or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 101 with a "C" or better to enroll in CEM 111.

Minimum Concentration Credits Required for the Program: 60

Math and Science Concentrations

Biology/Pre-Medicine (BMED) (61 credits)

First Semester		**(15 credits)**
BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 176 or	College Algebra	
MTH 191	Calculus I*	4
Elective	Computer Lit. Elective(s)	3
Second Semester		**(16 credits)**
BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 160 or	Basic Statistics**	
MTH 192	Calculus II	4
Third Semester		**(14 credits)**
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
Elective	Soc. Sci. Elective(s)	3
Elective	Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237	4
Fourth Semester		**(16 credits)**
CEM 222	Organic Chemistry II	4
COM 101	Fundamentals of Speaking	3
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 61

Chemistry/Pre-Medicine (CMED) (62 credits)

First Semester		**(16 credits)**
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3
Second Semester		**(16 credits)**
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Third Semester		**(14 credits)**
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
Elective	Soc. Sci. Elective(s)	3
Fourth Semester		**(16 credits)**
COM 101	Fundamentals of Speaking	3

CEM 222	Organic Chemistry II	4
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 62

Mathematics (MATH) (60 credits)

First Semester (16 credits)

BIO 162 or	General Biology II Cells and Molecules	
CEM 111 or	General Chemistry I	
PHY 111	General Physics I	4
MTH 191	Calculus I	5
Elective	Computer Lit. Elective(s)	3
ENG 111	Composition I	4

Second Semester (15 credits)

BIO 161 or	General Biology I Ecology and Evolution	
CEM 122 or	General Chemistry II	
PHY 122	General Physics II	4
MTH 160	Basic Statistics	4
MTH 192	Calculus II	4
Elective	Soc. Sci. Elective(s)	3

Third Semester (17 credits)

COM 101	Fundamentals of Speaking	3
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Soc. Sci. Elective(s)	3

Fourth Semester (12 credits)

MTH 295	Differential Equations	4
Elective	Arts/Human. 2 Elective(s)	3
Elective	Arts/Human. Elective(s)	3
Elective	Elective(s) to reach a minimum of 60 credits.	2-3

Minimum Credits Required for the Concentration or Option: 60

Physics/Pre-Engineering (PENG) (68 credits)

First Semester (16 credits)

CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3

Second Semester (15 credits)

ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Elective	Arts/Human. Elective(s)	3

Third Semester (15 credits)

ENG 226	Composition II	3
MTH 197	Linear Algebra	4
PHY 211	Analytical Physics I	5
Elective	Soc. Sci. Elective(s)	3

Fourth Semester (15 credits)

COM 101	Fundamentals of Speaking	3
MTH 293	Calculus III	4
PHY 222	Analytical Physics II	5
Elective	Arts/Human. Elective(s)	3

Program Information Report

Fifth Semester		(7 credits)
MTH 295	Differential Equations	4
Elective	Soc. Sci. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 68

Pre-Actuarial Science (PPAS) (60 credits)

First Semester		(16 credits)
ACC 111	Principles of Accounting I	3
CPS 161	An Introduction to Programming with Java	4
ENG 111	Composition I	4
MTH 191	Calculus I	5

Second Semester		(16 credits)
ACC 122	Principles of Accounting II	3
ECO 211	Principles of Economics I	3
ENG 226	Composition II	3
MTH 192	Calculus II	4
Elective	Arts/Human. Elective(s)	3

Third Semester		(14 credits)
ECO 222	Principles of Economics II	3
MTH 197	Linear Algebra	4
Elective	Nat. Sci. Elective(s)	4
Elective	Soc. Sci. Elective(s)+	3

Fourth Semester		(14 credits)
MTH 293	Calculus III	4
Elective	Arts/Human. Elective(s)++	3
Elective	Nat. Sci. Elective(s)+++	4
Elective	Speech Elective(s)	3

Minimum Credits Required for the Concentration or Option: 60

Pre-Pharmacy (PPHA) (62 credits)

First Semester		(16 credits)
BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
Elective	Arts/Human. Elective(s)	3

Second Semester		(15 credits)
BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
Elective	Speech Elective(s)	3

Third Semester		(17 credits)
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
PHY 111	General Physics I	4
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3

Fourth Semester		(14 credits)
CEM 222	Organic Chemistry II	4
PHY 122	General Physics II	4
Elective	Computer Lit. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 62

Minimum Credits Required for the Program: 60

Program Information Report

Notes:

**Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191.*
***Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192.*
****Students transferring to EMU as a biology major may consider completing BIO 208 at WCC prior to transfer.*
+See the MTA list to make course selections from any discipline except ECO.
++Transfer students should consider a course from the the EMU Diverse Word Requirements list.
+++Students may take a 3 credit natural science course as the second Natural Science elective but may need an elective to bring the total number of credits back up to 60 if necessary.

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: ASMSAS **Program Name: Math and Science** **Effective Term: Fall 2015**

Division Code: MSN **Department:** Math/Allied Health

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- ☒ Remove ~~course(s)~~: Comp. Sci. concentration
- ☒ Add course(s): See concentration information attached
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☒ Other Add concentrations for Pre-Pharmacy and Pre-Actuarial Science → Remove Comp Science Concentration

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

Pre-Pharmacy: The current ASMSAS at WCC has biology, chemistry and physics concentrations but none require all 3 disciplines with math. Advanced studies in pharmacy, beyond the associate level, require that a rigorous foundation be built in these disciplines. Offering a comprehensive interdisciplinary degree will benefit our students transferring into pharmacy and /or other pre-med programs.

Pre-Actuarial Science: Actuarial Science is a growing field of study. The Occupational Outlook handbook predicts a 26% increase in employment in this area between 2012 and 2022. The 2012 median salary for an actuary was $93,680 or $45.04 per hour. This new concentration will guide students to complete the required combination of mathematics and economics needed in this field of study.

Financial/staffing/equipment/space implications:

The courses used in these programs already exist and are used in other programs. The advisor for Math and Science and the advisor for Pharmacy Technology are an existing resource for these students.

List departments that have been consulted regarding their use of this program.

Pharmacy Technology, Math and Science

Signatures:

Reviewer	Print Name	Signature	Date
Department Chair	Lisa Rombes	Lisa Rombes	2-4-15
Division Dean/Administrator	Kristin Brandemuehl	Kristin Brandemuehl	2.4.15
Vice President for Instruction	William Abernethy		2-9-15
President			

Do not write in shaded area. **Entered in: Banner** 2/4 mo **C&A Database** 2/11/15 mo **Log File** 2/15 mo **Board Approval** n/a

Please submit completed form to the Office of Curriculum and Assessment and email an electronic copy to sjohn@wccnet.edu for posting on the website.

mo logged 1/30/15 sj

Math and Science (ASMSAS) Associate in Science Degree

High Demand Occupation **High Skill Occupation** **High Wage Occupation**

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237

Pre-Pharmacy (PPHA)
BIO 161
BIO 162
CEM 211
CEM 222
PHY 111
PHY 122
MTH 191

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra
MTH 293 Calculus III

Computer Science (COMS)
CPS 171 Introduction to Programming with C++
CPS 271 Object Features of C++
CPS 272 Data Structures with C++
MTH 197 Linear Algebra
MTH 293 Calculus III
Elective: Take an additional six credits in the CPS discipline

Pre-Actuarial Science (PAS)

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
Elective: Take an additional three credits in the MTH discipline

ECO 211
ECO 222
MTH 191
MTH 192
MTH 197
MTH 293

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Articulation:
This program will fulfill the Michigan Transfer Agreement (MTA) requirements provided the student takes two science courses from two different disciplines. One course must have a lab component. Students must have MTA posted on their transcripts by the WCC Student Records Office.
This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have MACRAO posted on their transcripts by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The physics concentration requires one semester of high school physics or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 090 with a "C" or better to enroll in CEM 111.

Recommended Course Sequences Pre-Pharmacy (PPHA)

Semester 1 x Fall ___Winter ___Spring/Summer ___Any

Course #	Course Title	Credit Hours
MTH 191	Calculus I	5
CEM 111	General Chemistry I	4
BIO 162	General Biology II Cells and Molecules or BIO 111, BIO 208, or BIO 237	4
Elective(s)	Arts and Humanities I	3
	Total Semester Credits	16

Semester 2 ___Fall x Winter ___Spring/Summer ___Any

Course #	Course Title	Credit Hours
CEM 122	General Chemistry II	4
BIO 161	General Biology I Ecology and Evolution or BIO 111, BIO 208, or BIO 237	4
ENG 111	Composition I	4
Elective (s)	Speech	3
	Total Semester Credits	15

Semester 3 x Fall ___Winter ___Spring/Summer ___Any

Course #	Course Title	Credit Hours
CEM 211	Organic Chemistry I	4
PHY 111	General Physics I (or PHY 211)	4
ENG 266 224	Composition II	3
Elective(s)	Arts and Humanities 2	3
Elective(s)	Social and Behavioral Science 1	3
	Total Semester Credits	17

Semester 4 ___Fall x Winter ___Spring/Summer ___Any

Course #	Course Title	Credit Hours
CEM 222	Organic Chemistry II	4
PHY 122	General Physics II (or PHY 222)	4
Elective(s)	Social and Behavioral Science 2	3
Elective(s)	Computer and Information	3
	Total Semester Credits	14
	Total Program Credits	62

Optional Transfer Courses

Course #	Course Title	Credit Hours
MTH 192	Calculus II	4
BIO 111	Anatomy and Physiology – Normal Structure and Function	5
BIO 208	Genetics	4
BIO 237	Microbiology	4
	Total Semester Credits	17

Optional Transfer Courses

Course #	Course Title	Credit Hours
BIO 215	Cell and Molecular Biology	4
BIO 227	~~Zoology~~ Biology of Animals	
or BIO 228	Botany Biology of Plants	4
MTH 160		4
Elective		3
	Total Semester Credits	15
	Total Transferrable Credits	94

Biochemistry (400 level course at U of M) Physiology

Section IX. Recommended Course Sequences Pre-Actuarial Science (PPAS / PAS)

First Semester

Class	Title	Credits
ACC 111	Principles of Accounting I	3
MTH 191	Calculus I	5
ENG 111	Composition I	4
CPS 161	An Introduction to Programming with Java	4
Total		16

Second Semester

Class	Title	Credits
Elective(s)	Arts and Humanities	3
ENG 226	Composition II	3
MTH 192	Calculus II	4
ECO 211	Principles of Economics I	3
ACC 122	Principles of Accounting II	3
Total		16

Third Semester

Class	Title	Credits
ECO 222	Principles of Economics II	3
MTH 197	Linear Algebra	4
Elective(s)	Natural Sciences*	4
Elective(s)	Social and Behavioral Science** +	3
Total		14

Fourth Semester

Class	Title	Credits
Elective(s)	Speech	3
MTH 293	Calculus III	4
Elective(s)	Natural Sciences**** +++	4
Elective(s)	Arts and Humanities 2*** ++	3
Total		14
Total Credits Required		60

Footnotes

*Students transferring to a four-year institution should choose a lab-based, MTA-approved science course. — taken care of in Articulation? Science

\+ **See the MTA list to make course selections from any discipline except ECO.

++ ***See the EMU Diverse World Requirement list

+++ **** Can take a 3 credit hour science course as the second Natural Science elective, but may need an elective to bring the total number of credits back up to 60 if necessary.

Program Information Report

MATH & SCIENCE (ASMSAS)

Transfer and University Parallel Programs

If your goal is to continue your education toward a baccalaureate degree, then transfer and university parallel programs is the track for you. Complete the first two years of study in a supportive environment with small classes and personal attention.

Business (AABAS)
Computer Science: Programming in Java (ASCSPJ) See School of Information Technology
Criminal Justice (AACJ)
Education, Early Childhood (AAECE)
Education, Elementary (AAELEM)
Education, Secondary (AASECO)
Environmental Science (ASENVS)
Exercise Science (ASESCI)
General Studies in Math and Natural Sciences (ASGSMS)
Human Services (AAHUST)
Information Systems: Programming in C++ (ASISPC) See School of Information Technology
Liberal Arts Transfer (AALAT)
Math and Science (ASMSAS)

1. Pre-Medicine Concentration (BMED or CMED)
2. Computer Science Concentration (COMS)
3. Mathematics Concentration (MATH)
4. Physics/Pre-Engineering Concentration (PHYS)

Before beginning any transfer program, a student should consult with an academic advisor or counselor to obtain a program articulation agreement, or a transfer guide. Early in the program, the student should contact an undergraduate advisor at the transfer college for specific admission and curriculum requirements and, if available, an unofficial transfer-credit evaluation.

Copies of articulation agreements and transfer guides are available in the Counseling Office on the second floor of the Student Center Building. Computers with access to the Internet Web sites of four-year colleges and universities are also available there.

Computer Science and Information Systems

Interested in a bachelor's degree in computer science or (business) information systems? This area provides the foundation you need to be successful.

Program Information Report

Math and Science (ASMSAS)
Associate in Science Degree
Program Effective Term: Fall 2013

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations.

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
Elective: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra
MTH 293 Calculus III

Computer Science (COMS)
CPS 171 Introduction to Programming with C++
CPS 271 Object Features of C++
CPS 272 Data Structures with C++
MTH 197 Linear Algebra
MTH 293 Calculus III
Elective: Take an additional six credits in the CPS discipline

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
Elective: Take an additional three credits in the MTH discipline

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Articulation:
This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have their transcripts certified for MACRAO completion by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The physics concentration requires one semester of high school physics or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 090 with a "C" or better to enroll in CEM 111.

Minimum Concentration Credits Required for the Program: **61**

Math and Science Concentrations

Program Information Report

Biology/Pre-Medicine (BMED) (61 credits)

First Semester		(15 credits)
BIO 162	General Biology II Cells and Molecules	4
CEM 111	General Chemistry I	4
MTH 176 or	College Algebra	
MTH 191	Calculus I*	4
Elective	Computer Lit. Elective(s)	3

Second Semester		(16 credits)
BIO 161	General Biology I Ecology and Evolution	4
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 160 or	Basic Statistics**	
MTH 192	Calculus II	4

Third Semester		(14 credits)
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
Elective	Soc. Sci. Elective(s)	3
Elective	Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237	4

Fourth Semester		(16 credits)
CEM 222	Organic Chemistry II	4
COM 101	Fundamentals of Speaking	3
Elective	Arts/Human. Elective(s)	3
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 61

Chemistry/Pre-Medicine (CMED) (66 credits)

First Semester		(16 credits)
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3

Second Semester		(16 credits)
CEM 122	General Chemistry II	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4

Third Semester		(14 credits)
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
Elective	Soc. Sci. Elective(s)	3

Fourth Semester		(14 credits)
COM 101	Fundamentals of Speaking	3
CEM 222	Organic Chemistry II	4
MTH 293	Calculus III	4
Elective	Arts/Human. Elective(s)	3

Fifth Semester		(6 credits)
Elective	Soc. Sci. Elective(s)	3
Elective	Arts/Human. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 66

Program Information Report

Computer Science (COMS) (68 credits)

First Semester		(12 credits)
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3

Second Semester		(16 credits)
CPS 171	Introduction to Programming with C++	4
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4

Third Semester		(14 credits)
CPS 271	Object Features of C++	4
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
PSY 100	Introduction to Psychology	3

Fourth Semester		(14 credits)
CPS 272	Data Structures with C++	4
MTH 293	Calculus III	4
Elective	Arts/Human. Elective(s)	3
Elective	Take an additional three credits in the CPS discipline	3

Fifth Semester		(12 credits)
COM 101	Fundamentals of Speaking	3
PLS 112	Introduction to American Government	3
Elective	Arts/Human. Elective(s)	3
Elective	Take an additional three credits in the CPS discipline	3

Minimum Credits Required for the Concentration or Option: 68

Mathematics (MATH) (61 credits)

First Semester		(16 credits)
BIO 162 or	General Biology II Cells and Molecules	
CEM 111 or	General Chemistry I	
PHY 111	General Physics I	4
MTH 191	Calculus I	5
Elective	Computer Lit. Elective(s)	3
ENG 111	Composition I	4

Second Semester		(15 credits)
BIO 161 or	General Biology I Ecology and Evolution	
CEM 122 or	General Chemistry II	
PHY 122	General Physics II	4
MTH 160	Basic Statistics	4
MTH 192	Calculus II	4
Elective	Soc. Sci. Elective(s)	3

Third Semester		(17 credits)
COM 101	Fundamentals of Speaking	3
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Soc. Sci. Elective(s)	3

Fourth Semester		(13 credits)
MTH 295	Differential Equations	4
Elective	Arts/Human. Elective(s)	3
Elective	Arts/Human. Elective(s)	3
Elective	Take an additional three credits in the MTH discipline	3

Minimum Credits Required for the Concentration or Option: 61

Program Information Report

Physics/Pre-Engineering (PENG) (68 credits)

First Semester		**(16 credits)**
CEM 111	General Chemistry I	4
MTH 191	Calculus I	5
PHY 111	General Physics I	4
Elective	Computer Lit. Elective(s)	3
Second Semester		**(15 credits)**
ENG 111	Composition I	4
MTH 192	Calculus II	4
PHY 122	General Physics II	4
Elective	Arts/Human. Elective(s)	3
Third Semester		**(15 credits)**
ENG 226	Composition II	3
MTH 197	Linear Algebra	4
PHY 211	Analytical Physics I	5
Elective	Soc. Sci. Elective(s)	3
Fourth Semester		**(15 credits)**
COM 101	Fundamentals of Speaking	3
MTH 293	Calculus III	4
PHY 222	Analytical Physics II	5
Elective	Arts/Human. Elective(s)	3
Fifth Semester		**(7 credits)**
MTH 295	Differential Equations	4
Elective	Soc. Sci. Elective(s)	3

Minimum Credits Required for the Concentration or Option: 68

Minimum Credits Required for the Program: 61

Notes:

**Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191.*
***Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192.*
****Students transferring to EMU as a biology major may consider completing BIO 208 at WCC prior to transfer.*

Math and Science

Learn more about math or science through this associate degree program.

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: AS MS AS **Program Name:** MATH and SCIENCE **Effective Term:**

Division Code: MSN **Department:** Life Science BMED concentration

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- X☐ Remove course(s): BIO 101, BIO 103, ~~MTH 191~~, ~~MTH 192~~; CPS 171, PSY 100,PLS ~~BIO ELECTIVES~~ 112 become Social Science electives
- X☐ Add course(s): _BIO 161, BIO 162, ~~Math electives~~, Social Science electives, Computer literacy elective ~~or test out~~ CEM 140 or BIO 208
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☒ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☐ Other _____

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

Replace existing introductory Biology sequence with new majors-level courses; adjust program to reflect computer literacy requirement; create flexibility in program so it can be adapted for transfer to various 4-year institutions; create flexibility in program so it can be used by Biology majors as well as Pre-med majors.

Financial/staffing/equipment/space implications:

List departments that have been consulted regarding their use of this program.

Biology, Chemistry

Signatures:

Reviewer	Print Name	Signature	Date
Initiator	Anne Heise	Anne Heise	2/14/13
Department Chair	Anne Heise	Anne Heise	2/14/13
Division Dean/Administrator	M. Showalter	M Showalter	2/14/13
Vice President for Instruction	Brian Abernethy		3/22/13
President	V/A		

Do not write in shaded area. Entered in: Banner_____ C&A Database 3/30/13 gr Log File 3/30/13 gr Board Approval _____

gr logged 2/15/13 sf

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: ASMSAS
Division Code: MSH
Program Name: Math and Science
MATH & SCIENCE
Department: Math and Science
MATH concentration for (MATH)
Effective Term: F' 2013

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- X☐ Remove course(s): CPS 171, six additional elective credits in the MTH discipline
- ☐ Add course(s): _____
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☐ Other _____

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

This change applies to the concentration in Mathematics. After researching comparable degrees in mathematics, requiring CPS 171 is not needed. In addition, the program does not require nine additional MTH credits as originally listed. Beyond MTH 295, it is very difficult for students to find courses that would meet this requirement.

Financial/staffing/equipment/space implications:

NA

List departments that have been consulted regarding their use of this program.

Mathematics, Science

Signatures:

Reviewer	Print Name	Signature	Date
Initiator	Kristin Good	Kristin Good	2/14/13
Department Chair	Kristin Good	Kristin Good	2/14/13
Division Dean/Administrator	M. Showalter	M. Showalter	2/14/13
Vice President for Instruction	STUART BLACKLOW		2/26/13
President			

Do not write in shaded area. Entered in: Banner_____ C&A Database_____ Log File _____ Board Approval _____

Please submit completed form to the Office of Curriculum and Assessment and email an electronic copy to sjohn@wccnet.edu for posting on the website.

logged 2/15/13

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: ASMSAS **Program Name:** Math & Science **Effective Term:** F 2013

Division Code: MSH **Department:** Physical Science for PENG & CMED concentrations

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- ☒ Remove course(s): CPS 171 Intro to Programming C++
- ☐ Add course(s): _____
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☐ Other _____

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

This change applies to the Concentration for both Chemistry and Physics | Pre engineering. After researching comparable degrees in pre-med w/ Chem & Physics, requiring CPS 171 is not needed.

Financial/staffing/equipment/space implications:

List departments that have been consulted regarding their use of this program.

Signatures:

Reviewer	Print Name	Signature	Date
Initiator	Kathleen Butcher	Kathleen Butcher	1/31/2013
Department Chair			
Division Dean/Administrator	M. Shoemaker	M. Shoemaker	2/14/13
Vice President for Instruction	Stuart Bleckman		2/26/13
President			

Do not write in shaded area. Entered in: Banner_____ C&A Database 3/14/13 Log File 3/14/13 Board Approval _____

Please submit completed form to the Office of Curriculum and Assessment and email an electronic copy to sjohn@wccnet.edu for posting on the website.

done
logged 2/15/13

Associate in Science Degree 2010 - 2011 2011 - 2012 2012 - 2013

Description

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Complete the requirements for one of the following concentrations. ~~The same course may not be used to meet both a concentration requirement and other program requirements above. Please consult an advisor to select appropriate electives (22-26 credits).~~

Biology/Pre-Medicine (BMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
~~BIO 227 Biology of Animals~~
~~or~~
~~BIO 228 Biology of Plants~~
~~Elective: BIO 102, BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237~~

BIO 111 or 208 or 215 or 227 or 228 or 237
CEM 142 ~~Organic Biochemistry or BIO 208 Genetics~~

Chemistry/Pre-Medicine (CMED)
CEM 111 General Chemistry I
CEM 122 General Chemistry II
CEM 211 Organic Chemistry I
CEM 222 Organic Chemistry II
MTH 197 Linear Algebra
MTH 293 Calculus III

Computer Science (COMS)
CPS 171 Intro to Programming with C++
CPS 271 Object Features of C++
CPS 272 Data Structures with C++
MTH 197 Linear Algebra
MTH 293 Calculus III
Elective: Take an additional six credits in the CPS discipline

Mathematics (MATH)
MTH 160 Basic Statistics
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations 3
Elective: Take an additional nine credits in the MTH discipline

Physics/Pre-Engineering (PENG)
CEM 111 General Chemistry I
MTH 197 Linear Algebra
MTH 293 Calculus III
MTH 295 Differential Equations
PHY 211 Analytical Physics I
PHY 222 Analytical Physics II

Articulation

This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have their transcripts certified for MACRAO completion by the WCC Student Records Office.

Admissions Requirements

- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The ~~chemistry~~, physics, ~~and computer science~~ concentrations require one semester of high school physics ~~or PHY 105~~ or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 090 to enroll in CEM 111.

with a "C" or better

Biology/Pre-Medicine (BMED)

First Semester

Class		Title	Credits
BIO 162		New Name	4
CEM 111		General Chemistry I	4
MTH 191[1]	or	Calculus I	
MTH 176		College Algebra	4
Elective(s)		Computer and Information Literacy	3
Total			15

Second Semester

Class		Title	Credits
BIO 161		New Name	4
CEM 122		General Chemistry II	4
ENG 111		Composition I	4
MTH 192[2]	or	Calculus II	
MTH 160		Basic Statistics	4
Total			16

Third Semester

Class	Title	Credits
CEM 211	Organic Chemistry I	4
ENG 226	Composition II	3
Social Science	Elective	3
Biology Elective[3]	Select one course from the following: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228 or BIO 237	4
Total		14

Fourth Semester

Class	Title	Credits
CEM 222	Organic Chemistry II	4
COM 101	Fundamentals of Speaking	3
Elective(s)	Arts and Humanities	3
Social Science	Elective	3
Elective(s)	Arts and Humanities	3
Total		16

Total Credits Required	61

[1]Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math course for MTH 191

[2] Students transferring to EMU as a biology major may substitute MTH 160 or higher for MTH 192

[3]Students transferring to EMU as a biology major may consider completing BIO 208 Genetics at WCC prior to transfer

Chemistry/Pre-Medicine (CMED)

First Semester

Class	Title	Credits	Notes	New credits
CEM 111	General Chemistry I	4		4
MTH 191	Calculus I	5		5
PHY 111	General Physics I	4		4
Elective(s)	Computer and Information Literacy	3		3
Total		16		16

Second Semester

Class	Title	Credits		
CEM 122	General Chemistry II	4		4
ENG 111	Composition I	4		4
MTH 192	Calculus II	4		4
PHY 122	General Physics II	4		4
Total		16		16

Third Semester

Class	Title	Credits		
CEM 211	Organic Chemistry I	4		4
ENG 226	Composition II	3		3
MTH 197	Linear Algebra	4		4
PSY 100	Introduction to Psychology	3	Change to social science elsective	3
Total		14		14

Fourth Semester

Class	Title	Credits		
COM 101	Fundamentals of Speaking	3		3
CEM 222	Organic Chemistry II	4		4
MTH 293	Calculus III	4		4
Elective(s)	Arts and Humanities	3		3
Total		14		14

Fifth Semester

Class	Title	Credits		
~~CPS 171~~	~~Introduction to Programming with C++~~	~~4~~ remove		
PLS 112	Introduction to American Government	3	Change to social science elsective	3
Elective(s)	Arts and Humanities	3		3
Total		10		6
Total Credits Required		70		66

Mathematics (MATH)

First Semester

Class		Title	Credits	Notes	New Credits	
BIO ~~101~~ 162	or	~~Concepts of~~ General Biology II Cells and Molecules				
CEM 111	or	General Chemistry I				
PHY 111		General Physics I	4	keep	4	
MTH 191		Calculus I	5	keep	5	
Elective(s)		Computer and Information Literacy	3	keep	3	
		Take an additional three credits in the MTH discipline	3	remove		
ENG 111		Composition I	4	keep	4	moved from semester 2
Total			19		16	

Second Semester

Class		Title	Credits			
BIO ~~103~~ 161	or	General Biology I Ecology and Evolution				
CEM 122	or	General Chemistry II				
PHY 122		General Physics II	4	keep	4	
CPS 171		Introduction to Programming with C++	4	remove		
MTH 192		Calculus II	4	keep	4	
PLS 112		Introduction to American Government	3	Change to social science elsective	3	moved from semester 5
MTH 160		Basic Statistics	4	keep	4	moved from semester 3
Total			19		15	

Third Semester

Class	Title	Credits			
ENG 226	Composition II	3	keep	3	
MTH 197	Linear Algebra	4	keep	4	
PSY 100	Introduction to Psychology	3	Change to social science elsective	3	
COM 101	Fundamentals of Speaking	3	keep	3	moved from semester 4
MTH 293	Calculus III	4	keep	4	moved from semester 4
Total		17		17	

Fourth Semester

Class	Title	Credits			
Elective(s)	Arts and Humanities	3	keep	3	
	Take an additional three credits in the MTH discipline	3	remove		
MTH 295	Differential Equations	4	keep	4	moved from semester 5
Elective(s)	Arts and Humanities	3	keep	3	moved from semester 5
	Take an additional three credits in the MTH discipline	3	keep	3	moved from semester 5
Total		16		13	

Fifth Semester - no longer needed

Total Credits Required	71		61

Physics/Pre-Engineering (PENG)

First Semester

Class	Title	Credits	Notes	New Credits	
CEM 111	General Chemistry I	4	keep	4	
MTH 191	Calculus I	5	keep	5	
PHY 111	General Physics I	4	keep	4	
Elective(s)	Computer and Information Literacy	3	keep	3	
Total		16		16	

Second Semester

Class	Title	Credits			
~~CPS 171~~	~~Introduction to Programming with C++~~	4	remove		
ENG 111	Composition I	4	keep	4	
MTH 192	Calculus II	4	keep	4	
PHY 122	General Physics II	4	keep	4	
Elective(s)	Arts and Humanities	3	keep	3	Note: Moved from semester 5
Total		19		15	

Third Semester

Class	Title	Credits			
ENG 226	Composition II	3	keep	3	
MTH 197	Linear Algebra	4	keep	4	
PHY 211	Analytical Physics I	5	keep	5	
PSY 100	Introduction to Psychology	3	Change to social science elsective	3	
Total		15		15	

Fourth Semester

Class	Title	Credits			
COM 101	Fundamentals of Speaking	3	keep	3	
MTH 293	Calculus III	4	keep	4	
PHY 222	Analytical Physics II	5	keep	5	
Elective(s)	Arts and Humanities	3	keep	3	
Total		15		15	

Fifth Semester

Class	Title	Credits			
MTH 295	Differential Equations	4	keep	4	
PLS 112	Introduction to American Government	3	Change to social science elsective	3	
Total		7		7	
Total Credits Required		72		68	

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: ASMSAS
Program Name: ~~Associates of Science~~ Math and Science
Effective Term: W' 12

Division Code: MSH
Department: Math + Science

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- ☐ Remove course(s): _____
- X☐ Add course(s): ____CEM 111 and CEM 122 to the possible general education and core course options for the ASMAS degree. in Mathematics
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☐ Other _____

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

Students should have the option to use the Chemistry courses as possible general education and core course options for the ASMSAS degree in addition to the choices of Biology and Physics.

Financial/staffing/equipment/space implications:

List departments that have been consulted regarding their use of this program.

Mathematics and Natural Science

Signatures:

Reviewer	Print Name	Signature	Date
Initiator	Kristin Chatas/Kathy Butcher	Kristin Chatas / Kathleen Butcher	11.4.11 / 11-7-11
Department Chair	Kristin Chatas	Kristin Chatas / Kathleen Butcher	11.4.11 11-7-11
Division Dean/Administrator	Martha Showalter	M. Showalter	11/10/11
Vice President for Instruction	Stuart Blacklaw		12-6-11
President	N/A		

Do not write in shaded area. **Entered in: Banner**_____ **C&A Database**_____ **Log File** 11/14/11sf **Board Approval** _____

jn 12/19/11 done

Students utilize this program in preparation for a degree in ~~engineering or physics~~. mathematics

Math and Science (ASMSAS) — Associate in Science Deg

General Education Requirements		(34 credits)
ENG 111	Composition I	4
ENG 226	Composition II	3
COM 101	Fundamentals of Speaking	3
MTH 191	Calculus I	5
BIO 101 or	Concepts of Biology	
PHY 111	General Physics I OR CEM 111	4
PSY 100	Introduction to Psychology	3
PLS 112	Introduction to American Government	3
Arts/Human.	Elective(s)	6
Computer Lit.	Elective(s)	3
Core Courses		**(12 credits)**
CPS 171	Introduction to Programming with C++	4
MTH 192	Calculus II	4
BIO 103 or	General Biology II	
PHY 122	General Physics II OR CEM 122	4

Complete the requirements for the following concentration.

Math Concentration

Mathematics (MATH)		(25 credits)
MTH 160	Basic Statistics	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
Elective	Take an additional nine credits	9

Minimum Credits Required for the Program: **71**

Math and Science (ASMSAS)

This program prepares students to transf a four-year college or university to compl bachelor's degree in biology, chemistry, com science, math, or physics. The program will students a solid foundation in math and sc Students should obtain program requirem and transfer equivalencies from the colle which they are transferring.

Articulation: This program will fulfill MAC requirements if, in addition to the courses pleted to meet General Education requirem students complete one additional course in and Behavioral Science. Students must have transcripts certified for MACRAO completi the WCC Student Records Office.

Program Admission Requirements:

- Students must have an Academic Math of 7 to begin the math sequence. Two ye high school algebra and one year of high pre-calculus are recommended to prepa this program.

Program Information Report

Math and Science (ASMSAS)

Associate in Science Degree

Program Effective Term: Fall 2012

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Articulation:
This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. Students must have their transcripts certified for MACRAO completion by the WCC Student Records Office.

Program Admission Requirements:
- Students must have an Academic Math Level of 7 to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The chemistry, physics, and computer science concentrations require one semester of high school physics or PHY 105 or PHY 111 with a "C" or better to enroll in PHY 211.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 090 to enroll in CEM 111.

ENG 111	Composition I	4
ENG 226	Composition II	3
COM 101	Fundamentals of Speaking	3
MTH 191	Calculus I	5
BIO 101 or	Concepts of Biology*	
CEM 111 or	General Chemistry I	
PHY 111	General Physics I	4
PSY 100	Introduction to Psychology	3
PLS 112	Introduction to American Government	3
Arts/Human.	Elective(s)	6
Computer Lit.	Elective(s)	3

CPS 171	Introduction to Programming with C++	4
MTH 192	Calculus II	4
BIO 103 or	General Biology II*	
CEM 122 or	General Chemistry II	
PHY 122	General Physics II	4

Minimum Concentration Credits Required for the Program: **22**
Complete the requirements for one of the following concentrations. The same course may not be used to meet both a concentration requirement and other program requirements above. Please consult an advisor to select appropriate electives.

Math and Science Concentrations

Biology/Pre-Medicine (BMED)		(24 credits)
CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4
CEM 222	Organic Chemistry II	4
BIO 227 or	Biology of Animals	
BIO 228	Biology of Plants	4
Elective	BIO 102, BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237	4-5

Chemistry/Pre-Medicine (CMED)		(24 credits)
CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4
CEM 222	Organic Chemistry II	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4

Computer Science (COMS)		(22 credits)
CPS 271	Object Features of C++	4
CPS 272	Data Structures with C++	4

MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Take an additional six credits	6

Mathematics (MATH)		(25 credits)
MTH 160	Basic Statistics	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
Elective	Take an additional nine credits	9

Physics/Pre-Engineering (PENG)		(26 credits)
CEM 111	General Chemistry I	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
PHY 211	Analytical Physics I	5
PHY 222	Analytical Physics II	5

Minimum Credits Required for the Program: **68**

Notes:

**The BMED concentration requires BIO 101 & BIO 103. The CMED, COMS, and PENG concentrations require PHY 111 & PHY 122. The MATH concentration may choose the BIO, CEM or PHY sequence.*

Math and Science

Learn more about math or science through this associate degree program.

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE OR DISCONTINUATION FORM

Program Code: ASMSAS

Program Name: Math and Science AS program

Effective Term: f07

Division Code: MNB

Department: Math & Natural Sciences

Directions:

1. Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Review
- ☐ Remove course(s): _____
- ☐ Add course(s): _____
- ☐ Program title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- ☐ Accreditation information
- ☐ Discontinuation (attach program discontinuation plan that includes transition of students and timetable for phasing out courses)
- ☒ Other remove choice of ENG 107 restrict to ENG 226 _____

Show all changes on the attached page from the catalog.

Rationale for proposed changes or discontinuation:

Transfer implications & MACRAO guidelines

Financial/staffing/equipment/space implications:

List departments that have been consulted regarding their use of this program.

Signatures:

Reviewer	Print Name	Signature	Date
Initiator	L. Nelson		
Department Chair	R. Hagood		3/29/07
Division Dean/Administrator	M. Showalter		3/29/07
Vice President for Instruction			4/5/07
President			

Do not write in shaded area. **Entered in: Banner**_____ **C&A Database**_____ **Log File** 3/29/07 **Board Approval** _____

Please submit completed form to the Office of Curriculum and Assessment and email an electronic copy to sjohn@wccnet.edu for posting on the website.

Program Information Report

University Transfer Programs

Math and Science (ASMSAS)

Associate in Science Degree

Program Effective Term: **Fall 2007**

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Articulation:
This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. To use MACRAO, students must have their transcripts certified for MACRAO completion by the WCC Student Records Office.

Program Admission Requirements:
- Students must have a minimum COMPASS Trigonometry score of 46 or complete (MTH 176 and MTH 178) or MTH 180 with a grade of "C" or better to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The chemistry, physics, and computer science concentrations require one semester of high school physics or PHY 105 or PHY 111 with a "C" or better to enroll in PHY 211.
- A high school computer course or CIS 100 is required to enroll in CIS 110.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 090 to enroll in CEM 111.

Continuing Eligibility Requirements:
Students must demonstrate basic computer literacy skills by successfully passing the Computer and Information Literacy Test. The test may be taken at any point during the program, but must be completed before graduating.

General Education Requirements		**(31 credits)**
ENG 111	Composition I	4
ENG 226	Composition II	3
COM 101	Fundamentals of Speaking	3
MTH 191	Calculus I	5
BIO 101 or	Concepts Of Biology*	
PHY 111	General Physics I	4
PSY 100	Introductory Psychology	3
PLS 112	Introduction to American Government	3
Arts/Human.	Elective(s)	6

**The BMED concentration requires BIO 101 & BIO 103. The CMED, COMS, and PENG concentrations require PHY 111 & PHY 122. The MATH concentration may choose either the BIO or PHY sequence.*

Core Courses		**(12 credits)**
CPS 171	Introduction to Programming with C++	4
MTH 192	Calculus II	4
BIO 103 or	General Biology II	
PHY 122	General Physics II	4

Minimum Concentration Credits Required for the Program: **22**
Complete the requirements for one of the following concentrations. The same course may not be used to meet both a concentration requirement and other program requirements above. Please consult an advisor to select appropriate electives.

Math and Science Concentrations

Biology/Pre-Medicine (BMED)		(24 credits)
CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4
CEM 222	Organic Chemistry II	4
BIO 227 or	Biology of Animals	
BIO 228	Biology of Plants	4
Elective	BIO 102, BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237	4-5

Chemistry/Pre-Medicine (CMED)		(24 credits)
CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4

Program Information Report

CEM 222	Organic Chemistry II	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4

Computer Science (CPS) (12 credits)

CPS 271	Object Features of C++	4
CPS 272	Data Structures with C++	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	Take an additional six credits	6

Mathematics (MATH) (25 credits)

MTH 160	Basic Statistics	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
Elective	Take an additional nine credits	9

Physics/Pre-Engineering (PENG) (26 credits)

CEM 111	General Chemistry I	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
PHY 211	Analytical Physics I	5
PHY 222	Analytical Physics II	5

Minimum Credits Required for the Program: **65**

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE FORM

Program Code:	Program Name:	Effective Term:
ASMSAS	Math and Science Associate in Science	f05

Directions:

1. Attach the current program listing from the WCC catalog and indicate any changes to be made.
2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet.
3. Check the boxes below for each type of change being proposed. Changes to courses, discontinuing a course, or adding new courses as part of the proposed program change, must be approved separately using a Master Syllabus form, but should be submitted at the same time as the program change form.

Requested Changes:

- ☐ Remove _____ course(s)
- ☐ Add _____ course(s)
- ☐ Total program credits: Current credits_____ After changes _____
- ☐ Program Title (title was _____)
- ☐ Description
- ☐ Type of award
- ☐ Advisors
- ☐ Articulation information
- ☐ Program admission requirements
- ☐ Continuing eligibility requirements
- ☐ Program outcomes
- Other readability/format

Show all changes on the attached page from the catalog.

Rationale for proposed changes:

standardize to present calalog format

Financial/staffing/equipment/space implications:

List departments that have been consulted regarding their use of this program.

Signatures:

Reviewer	Print Name	Signature	Date
Program Change Initiator			
Department Chair			
Division Dean/Administrator	M. Showalter	M. Showalter	4/14/05
Vice President of Instruction		Roger M. Poisson	4/25/05

Please submit completed form to the Office of Curriculum and Assessment.

Access Program File 4/25 Log 4/25 Copied and Returned _____

University Transfer Programs

Math and Science (ASMSAS)
Associate in Science Degree

Program Effective Term: Fall 2005

This program prepares students to transfer to a four-year college or university to complete a bachelor's degree in biology, chemistry, computer science, math, or physics. The program will give students a solid foundation in math and science. Students should obtain program requirements and transfer equivalencies from the college to which they are transferring.

Articulation:
This program will fulfill MACRAO requirements if, in addition to the courses completed to meet General Education requirements, students complete one additional course in Social and Behavioral Science. To use MACRAO, students must have their transcripts certified for MACRAO completion by the WCC Student Records Office.

Program Admission Requirements:
- Students must have a minimum COMPASS Trigonometry score of 46 or complete (MTH 176 and MTH 178) or MTH 180 with a grade of "C" or better to begin the math sequence. Two years of high school algebra and one year of high school pre-calculus are recommended to prepare for this program.
- The chemistry, physics, and computer science concentrations require one semester of high school physics or PHY 105 or PHY 111 with a "C" or better to enroll in PHY 211.
- A high school computer course or CIS 100 is required to enroll in CIS 110.
- The biology, chemistry, and physics concentrations require one year of high school chemistry or CEM 057 to enroll in CEM 111.

Continuing Eligibility Requirements:
Students must demonstrate basic computer literacy skills by successfully passing the Computer and Information Literacy Test. The test may be taken at any point during the program, but must be completed before graduating.

General Education Requirements		(31 credits)
ENG 111	Composition I	4
ENG 107* or	Technical Writing	
ENG 226	Composition II	3
COM 101	Fundamentals of Speaking	3
MTH 191	Calculus I	5
BIO 101** or	Concepts Of Biology	
PHY 111	General Physics I	4
PSY 100	Introductory Psychology	3
PLS 112	Introduction to American Government	3
Arts/Human.	Elective(s)	6

**The Chemistry/Pre-Medicine and Physics concentrations require ENG 107; all other concentrations require ENG 226.*

***The Biology/Pre-Medicine concentration requires BIO 101 & 103; the Mathematics concentration can use either the BIO or PHY sequence; all other concentrations require PHY ~~211~~ & ~~222~~.* 111 + 122 9/15/05 make correction on Web pr

Core Courses		(12 credits)
CPS 171	Introduction to Programming with C++	4
MTH 192	Calculus II	4
BIO 103 or	General Biology II	
PHY 122	General Physics II	4

Minimum Concentration/Option Credits Required for the Program: 24

Complete the requirements for one of the following concentrations. The same course may not be used to meet both a concentration requirement and other program requirements above. Please consult an advisor to select appropriate electives.

Minimum Credits Required for the Program 67

Math and Science Concentrations

Biology/Pre-Medicine (BMED) (24 Credits)

Life Sciences Department
Advisor:

CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4
CEM 222	Organic Chemistry II	4
Choose:	BIO 227 Biology of Animals or BIO 228 Biology of Plants	4
Elective	BIO 102, BIO 111, BIO 208, BIO 215, BIO 216, BIO 227, BIO 228, BIO 237	4

Chemistry/Pre-Medicine (CMED) (24 Credits)

Physical Sciences Department
Advisor:

CEM 111	General Chemistry I	4
CEM 122	General Chemistry II	4
CEM 211	Organic Chemistry I	4
CEM 222	Organic Chemistry II	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4

Computer Science (COMS) (25 Credits)

Computer Instruction Department
Advisor:

CIS 238	PC Assembly Language	3
CPS 271	Object Features of C++	4
CPS 272	Data Structures with C++	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
Elective	take an additional six credits	6

Mathematics (MATH) (25 Credits)

Mathematics Department
Advisor:

MTH 160	Basic Statistics	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
Elective	take an additional nine credits	9

Physics/Pre-Engineering (PENG) (26 Credits)

Department Advisor:

CEM 111	General Chemistry I	4
MTH 197	Linear Algebra	4
MTH 293	Calculus III	4
MTH 295	Differential Equations	4
PHY 211	Analytical Physics I	5
PHY 222	Analytical Physics II	5

Program Approval Document

Associate In Science
In

MATH AND SCIENCE

Prepared by

Kathy Butcher, James Egan and David Shier
Math and Natural Sciences Division
Washtenaw Community College

April 21, 1999

WASHTENAW COMMUNITY COLLEGE
PROGRAM AUTHORIZATION FORM

1. Program Title: Science And Math Associate In Science Degree **Program Code:** MSAS

2. Division: MNS **3. Department:** ______ **CIP Code:** ______

4. Type of Program: ☐ **A.A.** ☒ A.S. ☐ A.A.S. ☐ A.T.S.

☐ Advanced Certificate ☐ Mastery Certificate ☐ Achievement Certificate ☐ Certificate of Completion

5. Will this program be Perkins funded? ☐ **yes** ☐ **no** **6. Effective Year:** Fall 1999

7. Program Description (for Catalog, brochures, etc.:
This program prepares to transfer to a four-year college or university to complete a bachelor of science (BS) degree program in the sciences. Four-year liberal arts graduates prepare for a wide variety of jobs and professions. Their studies emphasize communication, analytical, computational, scientific, and critical thinking skills. Science graduates become teachers, scientists, chemists, biologists, doctors, laboratory researchers, nurses, pharmacists, among other possible professions.

8. Advisors: Kathy Butcher, James Egan, Judith Fish, David Shier

9. Admissions Criteria:	10. Criteria for Continuing Program Eligibility:
The following high school courses or WCC equivalents must be completed with a grade of "C" or better: -Two years of high school algebra and one year of high school analysis and trigonometry or MTH 178 and 179. -One year of high school chemistry -Passing scores on the College's entering student placement tests in reading, writing, and math.	

11. Attach a Program Approval Document [PAD], which includes the following:

A. Program Description
B. Program Goals
C. Needs Assessment
D. Enrollment Projections
E. Program Cost Analysis
F. Course Descriptions
G. Analysis of Affected Instructional Units
H. Articulations
I. Licensure/Accreditation

Approval Recommended:	**Print Name**	**Signature**	**Date**
Program Initiator:	K. Butcher, J. Egan, D. Shier	[signature]	5/11/99
Dept. Chair/Dir.:	same as above	[signature]	5/11/99
Dean/Admin.:	~~George Griswold~~ Interim Dean, James Egan	[signature]	5/11/99
VP, Instr/Stud Ser:	Guy Altieri	[signature]	5/6/99
President:	Larry Whitworth	[signature]	6/3/99

Date of Board Approval: May 25, 1999

Available on disk

[illegible] File ______ Curriculum File ______ Catalog ______
[illegible] Chair, Dean, Admissions, Counseling, [illegible]
[illegible]

COURSE REQUIREMENTS FOR PROGRAM

Course	Title	Credit	Pre-requisites/Co-requisites
BIO 101	Concepts of Biology	4	BIO 101L (co-req)
COM 101	Fundamentals of Speaking	3	None
CPS 171	Introduction to Programming with C++	4	MTH 169 or two years HS algebra; CIS 100 or CIS 110 or HS computer class
ENG 111	Composition I	4	ENG 000
ENG 122	Composition II	3	ENG 111
MTH 191	Calculus I	5	MTH 178 and MTH 179
MTH 192	Calculus II	4	MTH 191
PLS 112	Introduction to American Government	3	None
PSY 100 (optional)	Introductory Psychology	3	None
Select courses based on major:			
Biology & General Science:			
BIO 103	General Biology II	4	BIO 101; CEM 111; or Consent
BIO 215	Introduction to Cell Physiology	3	CEM 111; BIO 101; or Consent
BIO 216	Cell Physiology Lab	1	BIO 215 (co-req)
BIO 227	Zoology	4	BIO 101 or Consent
BIO 228	Botany	4	BIO 101 or Consent
CEM 111	General Chemistry I	1	CEM 057, or HS chemistry; HS algebra
CEM 122	General Chemistry II	4	CEM 111; MTH 169
CEM 211	Organic Chemistry I	4	CEM 111
CEM 222	Organic Chemistry II	4	CEM 122; CEM 211
Chemistry & Pre-Medicine			
CEM 111	see above		

CEM 122	see above		
CEM 211	see above		
CEM 222	see above		
PHY 211	Analytical Physics I	5	MTH 191; PHY 105 or PHY 111 or HS Physics
PHY 222	Analytical Physics II	5	PHY 211; PHY 222L (co-req)
Physics:			
CEM 111	see above		
CEM 122	see above		
CEM 211	see above		
CEM 222	see above		
Computer Science			
CPS 171	Introduction to Programming with C++	4	MTH 169 or two years HS algebra; CIS 100 or CIS 110 or HS computer class
CPS 271	Object Features of C++	4	CPS 171 or consent
CPS 272	Data Structures with C++	4	CPS 171, or CPS 290, or consent
CIS 238	PC Assembly Language	3	1 semester computer program language
MTH 197	Linear Algebra	4	MTH 191
MTH 293	Calculus III	4	MTH 192; MTH 197 (co-req)
PHY 211	see above		
PHY 222	see above		
Math:			
MTH 160	Basic Statistics	4	MTH 097
MTH 197	see above		
MTH 293	see above		
MTH 295	Differential Equations	4	MTH 197; MTH 293
	Minimum Credits Required:	**60**	

A. PROGRAM DESCRIPTION

This program prepares to transfer to a four-year college or university to complete a bachelor of science (BS) degree program in the sciences. Four-year liberal arts graduates prepare for a wide variety of jobs and professions. Their studies emphasize communication, analytical, computational, scientific, and critical thinking skills. Science graduates become teachers, scientists, chemists, biologists, doctors, laboratory researchers, nurses, pharmacists, among other possible professions.

B. PROGRAM GOALS

To prepare students for a successful transfer to a four-year institution in a science or math field.

C. NEEDS ASSESSMENT

Employment Outlook

Information about employment trends indicate that the professions of biological, medical and physical scientists and chemists will grow faster than average from 1998-2006. Nationally, from 1998 through 2006, there will be a 20% increase in the openings for chemists and a 25% increase for scientists.

In the Ann Arbor area, it is expected that there will be 28% increase in openings for medicine and health science managers and a 35% increase in math and natural science managers.

Expected Earnings/Wages

Nationally, average salaries for biologists with bachelor's degrees were approximately $25,868 and for chemists, the average salary was $49,400. In Michigan, the annual salary range for biologists was between $27,800-$58,400 and for chemists $29,114-$50,998. (Michigan Occupational Information System, 1998).

D. ENROLLMENT PROJECTIONS

Estimated Number of Students per Year

We expect to enroll between 40-50 students the first semester and expect increased enrollments once this program becomes established.

Longevity of Program

E. PROGRAM COST ANALYSIS

Start-up Costs

There are no additional costs for this program.

F. COURSE DESCRIPTIONS

1. **BIO 101: Concepts of Biology**
   Basic principles and concepts of biology are surveyed in lecture and laboratory with emphasis on biological processes as well as practical applications. if followed by BIO 103, this course provides a comprehensive year sequence for biology majors. Taken alone, it serves as a good introduction to biology for non-science students.

2. **BIO 103: General Biology II**
   The emphasis in this course is on analyzing the processes and mechanisms involved in biological systems including the cell, genetics, organisms and ecology/evolution. Topics are covered from an experimental point of view. This course, with BIO 101, provides a

comprehensive survey of biological concepts and shows the interrelationship of topics covered from the molecular to the population level. This course is required for the Biology/Pre-medicine Program.

3. **BIO 215: Introduction to Cell Physiology**
   Introduction to the chemistry and physiology of living cells, including cell metabolism, membrane permeability and excitability, movement and contractile elements, gene expression and protein synthesis. Properties common to all living things will be emphasized, as well as the importance of those properties in the human organism.

4. **BIO 216: Cell Physiology Lab**
   This is a lab course designed to be taken concurrently with BIO 215, Introduction to Cell Physiology.

5. **BIO 227: Zoology**
   Lecture, field, and laboratory investigation provide an intensive study of the classification, evolutionary relationship, structure, and function of the major animal groups. Included are the sponges, jellyfish, worms, mollusks, insects, arthropods, starfish and other echinoderms, fish, amphibians, reptiles, birds and mammals.

6. **BIO 228: Botany**
   In this class, field and laboratory investigations provide detailed study of plant structure and function. It is for students with a general interest in plants or to provide a basis for further work in botany or other programs.

7. **CEM 111: General Chemistry I**
   This course covers the major topics in chemistry. Laws of chemical combination, states of matter, atomic and molecular structure, bonding, and other basic principles are covered. It is for students in a professional or preprofessional curriculum.

8. **CEM 122: General Chemistry II**
   This course covers four major topics in chemistry: kinetics, chemical thermodynamics, chemical equilibria, and electrochemistry. Laboratory work includes qualitative and quantitative analysis.

9. **CEM 211: Organic Chemistry I**
   This course provides students with the background in nomenclature of organic chemistry, stereochemistry, the preparation and reactions of aliphatic and aromatic compounds. Students also practice the preparation and handling of organic compounds in the laboratory. This is the first course in a two-semester sequence.

10. **CEM 222: Organic Chemistry II**
    This course provides a continued exploration of nomenclature, stereochemistry, preparations and reactions of organic compounds including spectroscopic analysis in the laboratory. Students apply the techniques used in CEM 211 to the synthesis and analysis of complex organic compounds. Laboratory work includes hands-on spectroscopic analysis (IR, GC, and NMR) of products and unknowns. This is the second course in a two semester sequence of organic chemistry.

11. **CIS 238: PC Assembly Language**
This is a first course in the PC assembly language. The organization of the 80x86 microprocessor is examined to aid in the study of the instruction set. Topics include various character/numeric conversions, twos and tens complement arithmetic. string and bit manipulation, the calling of assembly language routines from other assembly programs as well as from high level language programs, and the use and modification of DOS and BIOS interrupt routines.

12. **COM 101: Fundamentals of Speaking**
Instruction is provided in essential speaking and listening skills. Through the use of practical experience, students receive help in organization and delivery. The course attempts to relieve the stress the average person encounters when speaking in public. Students gain a heightened awareness of the relationship between speaker and audience.

13. **CPS 171: Introduction to Programming with C++**
This course is an introduction to programming with C++ language. Students should have basic experience using a computer but no prior programming is required. (Experienced programmers should consider CPS 290). Students learn about problem solving strategies, top-down program development and programming style. Topics include sequential, decision and iterative control structures, functions, basic data structures, and an introduction to classes. Students write and execute approximately eight C++ programs.

14. **CPS 271: Object Features of C++**
This course continues the study of C++ begun in CPS 171. (Experienced programmers should consider CPS 290.) Students learn the object-oriented features of the language. Topics include classes, constructors and destructors, operator overloading, pointers, dynamic allocation of memory, inheritance, polymorphism, file manipulation, templates, and exceptions.

15. **CPS 272: Data Structures with C++**
This is the third of a sequence of C++ courses, following CPS 171 and CPS 271. The course covers more advanced computer science features as implemented in C++. Topics include testing, verification and complexity of algorithms, recursion, advanced data structures, class libraries, and techniques for team design of large programs.

16. **ENG 111: Composition I**
This course focuses on developing skills in critical reading, logical thinking, and written composition (from paragraphs to expository essays and documented papers). Reading materials serve as a basis for papers and classroom discussions. Students write both in-class and outside themes frequently. Methods of organization and development are emphasized.

17. **ENG 122: Composition II**
This course is a continuation of ENG 111 and further develops critical reading and logical thinking skills. Students will write argumentative essays using a variety of formats. The research paper is emphasized.

18. MTH 160: Basic Statistics

This course provides students with a general understanding of statistical concepts dealing with the processing and interpretation of numerical information. Topics covered include describing a numerical data set, central tendency, variability, probability distributions, inference, and hypothesis testing. This course transfers to many four-year institutions. A graphing calculator is required for this course. Consult the time schedule for current brand and model.

19. MTH 191: Calculus I

This is first-semester college calculus of one variable. Topics include limits, continuity, derivatives, applications of derivatives, elementary integration, and applications of integration. This course transfers to four-year institutions. A graphing calculator is required for this course. Consult the time schedule for current brand and model.

20. MTH 192: Calculus II

This is second-semester college calculus of one variable. Topics include the calculus of transcendental functions, techniques of integration, indeterminate forms and improper integrals, sequences and series, parametric equations and polar coordinates. This course transfers to four-year institutions. A graphing calculator is required for this course.

21. MTH 197: Linear Algebra

This is an introductory college course in linear algebra. Topics include linear systems of equations, properties of vectors and matrices, determinants, vector spaces, linear transformations, eigenvalues, and applications. This course transfers to four-year institutions. A graphing calculator is required for this course. Consult the time schedule for current brand and model.

22. MTH 293: Calculus III

This is the third-semester college calculus of more than one variable. Topics include geometry in the plane and in space, vector-valued functions, partial derivatives, multiple integrals, and an introduction to vector calculus. This course transfers to four-year institutions.

23. MTH 295: Differential Equations

This is a first college course in elementary differential equations. Topics include techniques for solving ordinary differential equations of order one, techniques for solving linear equations, applications, the Laplace transform, and solving linear systems of equations using eigenvalues. This course transfers to four-year institutions. A graphing calculator is required for this course. Consult the time schedule for current brand and model.

24. PHY 211: Analytical Physics I

The first of a two-course sequence in calculus-based physics for students intending to major in science or engineering, PHY 211 develops the concepts of mechanics, heat, and wave motion. Laboratory exercises are included to assist students' understanding of these topics.

25. **PHY 222: Analytical Physics II**
This second part of a two-course sequence in calculus-based physics covers the concepts of electromagnetism, light, and modern physics extending the student's knowledge of physics learned in PHY 211.

27. **PLS 112: Introduction to American Government**
This class studies the forms and functions of American government with emphasis on national government. The decision-making process in Congress, the Presidency and the federal court system are studied. The course also examines the relationship of political parties and public opinion to the electoral process. This course is also taught as a television course.

G. ANALYSIS OF AFFECTED INSTRUCTIONAL UNITS AND CORE CURRICULUM

All of the affected instructional units are in support of this program.

H. ARTICULATIONS

This program is considered a university parallel program and all the courses transfer to the four-year institutions. Students still need to consult with a transfer counselor or academic advisor to select elective courses for their program that are equivalent to the courses required by the college and major to which they will transfer. Transfer guides with specific course requirements and WCC equivalencies are available for most Michigan colleges and universities in the Transfer and Placement Center.

I. LICENSURE/ACCREDITATION (IF APPLICABLE)

ASSOCIATE IN SCIENCE DEGREE: Science and Math

General Requirements (33-34 credits)*		
Communication	ENG 111&122 Composition I&II	7
Computers	CPS 171 Introduction to Programming with C++	4
Humanities[UM1]	Select one courses in arts and humanities (choose from the list on p. 60 in the WCC Catalog)	3
Mathematics	MTH 191 Calculus I	5
	MTH 192 Calculus II	4
Behavioral/ Social Science	PLS 112 Introduction to American Government	3
	PSY 100 Introductory Psychology	3
Science	Choose either: BIO 101 Concepts of Biology or Physics 211 Analytical Physics I *(Consider future course implications and prerequisites when making this selection.)*	4-5

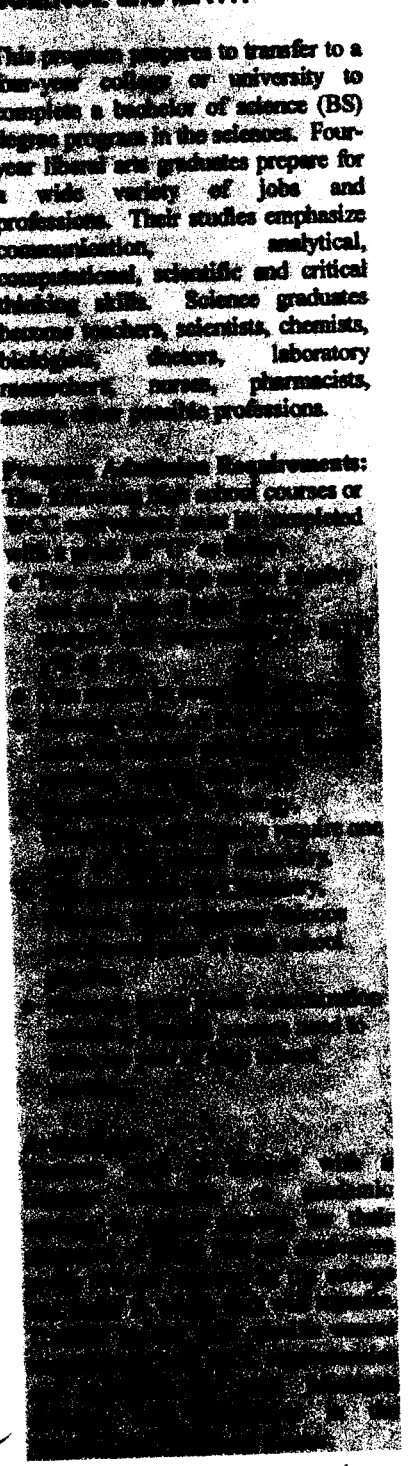
Concentration:

~~Science/Math Program Requirements~~ ***(29-33 Credits)***

Select a concentration in Biology and General Science, Chemistry and Physics, Computer Science or Math. Please consult with an advisor prior to beginning these concentrations.

Biology & Pre-Medicine:	The following courses are required: BIO 103, 215, 216, 227,and 228; CEM 111, 122, 211 and 222 (32 credits)	32
Chemistry & Pre-Medicine:	The following courses are required: CEM 111, 122, 211 and 222; MTH 197 and 293; and PHY 222. Students must select additional 4 hours in chemistry (33 credits)	33
Physics:	The following courses are required: CEM 111, 122, 211 and 222; MTH 197, 293 and 295; and PHY 222. (29 credits)	29
Computer Science:	The following courses are required: CPS 271, 272; CIS 238; MTH 197, 293; and PHY 222. Select an additional 6-8 credit hours in the humanities, social, and/or behavioral sciences (30-32)	
Math:	The following courses are required: MTH 160, 197, 293, and 295; Choose either BIO 103 or PHY 222. Select an additional 12 credit hours in the humanities, social, and/or behavioral sciences (30-33 credits)	32-33

Minimum Credits Required: **60** 62



**If students are transferring to EMU or other Michigan universities, one option is to follow the MACRAO agreement. This agreement outlines a series of liberal arts courses that meet the general education requirements at various four-year institutions. See p. 230 in the WCC Catalog and a counselor for additional information.*

University of Michigan Notes:
[1]Except for the BGS degree, UM requires a minimum of 16 credit hours of one foreign language or fourth semester proficiency. Foreign language courses usually transfer in full year sequences only.