ASMSAS

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

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

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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:

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

Second SemesterCEM 122General Chemistry IIENG 111Composition IMTH 192Calculus IIPHY 122General Physics II

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(16 credits)

4

4 4

4

60

| Third Seme | ster | (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 Sem | ester | (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 | 2 |

Mathematics (MATH) (60 credits) **First Semester** (15 credits) Elective Nat. Sci. Elective(s) 3 MTH 191 Calculus I 5 Select one course from the following: CPS 120, CPS 141, CPS 161 or CPS 171 3 Elective ENG 111 Composition I 4 Second Semester (14 credits) Nat. Sci. Lab Elective(s) Elective 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 3 Elective(s) to reach minimum 60 credits 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 3 Elective Arts/Human. Elective(s) 1 Elective Arts/Human. Elective(s) 2 3 Elective(s) to reach a minimum of 60 credits. Elective 4 Minimum Credits Required for the Concentration or Option: 60 Pre-Actuarial Science (PPAS) (60 credits)

| (16 credit | ter | First Semest |
|------------|--|--------------|
| | Principles of Accounting I | ACC 111 |
| | An Introduction to Programming with Java | CPS 161 |
| | Composition I | ENG 111 |
| | Calculus I | MTH 191 |
| (16 credit | ester | Second Sem |
| | Principles of Accounting II | ACC 122 |
| | Principles of Economics I | ECO 211 |
| | Nat. Sci. Elective(s) | Elective |
| | Calculus II | MTH 192 |
| | Arts/Human. Elective(s) 1 | Elective |
| (13 credit | ter | Third Semes |
| | Principles of Economics II | ECO 222 |
| | Linear Algebra | MTH 197 |
| | Nat. Sci. Lab Elective(s) | Elective |
| | Soc. Sci. Elective(s) 2+ | Elective |

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| ester | (15 credits) |
|--|--|
| Calculus III | 4 |
| Arts/Human. Elective(s) 2++ | 3 |
| Speech/Comp. Elective(s) | |
| Elective(s) to reach minimum 60 credits | 5 |
| edits Required for the Concentration or Option: 60 | |
| icy (PPHA) | (60 credits) |
| | (16 credits) |
| | 4 |
| | 4 |
| | 5 |
| Arts/Human. Elective(s) | 3 |
| iester | (15 credits) |
| Restricted Biology Elective | 4 |
| General Chemistry II | 4 |
| Composition I | 4 |
| Elective(s) to reach minimum 60 credits | 3 |
| ster | (17 credits) |
| Organic Chemistry I | 4 |
| Speech/Comp. Elective(s) | 3 |
| General Physics I | 4 |
| Arts/Human. Elective(s) 2 | 3 |
| Soc. Sci. Elective(s) 1 | 3 |
| ester | (12 credits) |
| Organic Chemistry II | 4 |
| General Physics II | 4 |
| Elective(s) to reach minimum 60 credits | 1 |
| Soc. Sci. Elective(s) 2 | 3 |
| edits Required for the Concentration or Option: 60 | |
| | Calculus III: Arts/Human. Elective(s) 2++ Speech/Comp. Elective(s) Elective(s) to reach minimum 60 credits redits Required for the Concentration or Option: 60 (cy (PPHA)) ter Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) rester Restricted Biology Elective General Chemistry II Composition I Elective(s) to reach minimum 60 credits ster Organic Chemistry I Speech/Comp. Elective(s) General Physics I Arts/Human. Elective(s) 1 ester Organic Chemistry II Soc. Sci. Elective(s) 1 ester |

Minimum Credits Required for the Program:

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.

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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: AVS 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 | | Revised General Education Requirements 2018-2019 AA and AS | |
|---|------------------------------|--|---------------|
| Writing | 6 - 7 credits | English Composition | 3 - 4 credits |
| Speech Mathematics | 3 credits 3 - 4 credits | 2 nd Course in English Composition or one course in Communication | 3 - 4 credits |
| Natural Sciences | 3 - 4 credits | Mathematics | 3 - 4 credits |
| Social & Behavioral Sciences Arts & Humanities | 6 credits 6 credits | Natural Sciences from 2 disciplines including one lab course | 7 - 9 credits |
| Critical Thinking | 0 credits | Social & Behavioral Sciences from 2 disciplines | 6 credits |
| Computer & Information | ocicuits | Arts & Humanities from 2 disciplines | 6 credits |
| Literacy Total | 3 credits 30 - 33 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.

| a Veak | REQUESTED CHANGES |
|-----------------|--|
| Ge | neral Education Area |
| | glish Composition – The requirement for one writing/English composition course remains the same. No anges will be made unless specifically requested below. (Use Writing Elective or ENG 111) |
| Op | tional Change: |
| 2 nd | Course in English Composition or one course in Communication |
| W | CC previously required both a second composition/writing course and a communication course. Your tions are: |
| 5 | 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). |

Done 1/29/18

NWLB

Requested Change:

| Re | viewer Print Name Signature Date |
|--|--|
| | 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. |
| | Computer and Information Literacy The requirement for computer and information literacy has been removed. Your options are: 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. Remove the computer and information literacy course if the program will still meet the minimum of 60 credit hours. 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: |
| | 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: |
| | 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: |
| | Natural Sciences from 2 disciplines including one lab course WCC previously required one natural science course. Your options are: No change needed – a second natural science course is already included in my program. 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: |
| No. of Street, of Street, of Street, or Stre | 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: |
| | 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: Reduce the number of credit hours if the program total is over 60 (recommended). Replace the course with elective credits as needed to reach a minimum of 60 credit hours. Add a specific program-related course (please add the course in the semester it should be taken on the semester layout). |
| | |

| Reviewer | Print Name | Signature | Date |
|--------------------------------|------------|-----------|------|
| Initiator | | 0 | |
| Department Chair | 1 | emails | |
| Division Dean/ Administrator | Xill. | All | |
| Vice President for Instruction | | | |

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(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.

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,

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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

(61 credits)

Math and Science Concentrations

Biology/Pre-Medicine (BMED)

| biology/Pre-Me | | |
|---|---|-----------------------|
| BIO 162 CEM 111 MTH 176 or MTH 191 Elective | College Algebra Calculus I* | 4 4 4 3 |
| BIO 161 CEM 122 ENG 111 MTH 160 or MTH 192 | General Biology I Ecology and Evolution General Chemistry II Composition I Basic Statistics** | 4 4 4 4 |
| CEM 211 ENG 226 Elective Elective | Organic Chemistry I Composition II Soc. Sci. Elective(s) Select one course from the following: BIO 111, BIO 208***, BIO 215, BIO 227, BIO 228 or BIO 237 | 4 3 3 4 |
| CEM 222 COM 101 Elective Elective Elective | Organic Chemistry II Fundamentals of Speaking Arts/Human. Elective(s) Soc. Sci. Elective(s) Arts/Human. Elective(s) | 4 3 3 3 3 |
| Minimum Credit | ts Required for the Concentration or Option: 61 | |
| Chemistry/Pre- | Medicine (CMED) (62 credits | 5) |
| First Semester CEM 111 MTH 191 | General Chemistry I Calculus I | 4 5 |

| MTH 191 | Calculus I | 5 |
|---------------|---------------------------|--------|
| PHY 111 | General Physics I | 4 |
| Elective | Computer Lit. Elective(s) | 3 |
| | | |
| September | | 336.43 |
| CEM 122 | General Chemistry II | 4 |
| ENG 111 | Composition I | 4 |
| MTH 192 | Calculus II | 4 |
| PHY 122 | General Physics II | 4 |
| | , | |
| Third Semante | | (3) |
| CEM 211 | Organic Chemistry I | 4 |
| ENG 226 | Composition II | 3 |
| MTH 197 | Linear Algebra | 4 |
| Elective | Soc. Sci. Elective(s) | 3 |
| | | ***** |
| Fourth Sames | | th g |
| COM 101 | Fundamentals of Speaking | 3 |
| CEM 222 | Organic Chemistry II | 4 |
| | | |

| Elective Elective Elective | Arts/Human. Elective(s) Soc. Sci. Elective(s) Arts/Human. Elective(s) | 3 3 3 |
|----------------------------------|---|--|
| | edits 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 |
| Secondariem | | |
| BIO 161 or | General Biology I Ecology and Evolution | |
| CEM 122 or | General Chemistry II | 4 |
| PHY 122 MTH 160 | General Physics II Basic Statistics | 4 |
| MTH 192 | Calculus II | 4 |
| Elective | Soc. Sci. Elective(s) | 3 |
| | | |
| 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 Seme | | |
| MTH 295 | Differential Equations | 4 |
| Elective | Arts/Human. 2 Elective(s) | 3 |
| Elective | Arts/Human. Elective(s) Elective(s) to reach a minimum of 60 credits. | |
| Elective | | 23 |
| Minimum Cre | edits Required for the Concentration or Option: 60 | |
| Physics/Pre- | Engineering (PENG) | (68 credits) |
| First Sernesk | | |
| CEM 111 | General Chemistry I | 4 |
| MTH 191 | Calculus I | 5 |
| PHY 111 Elective | General Physics I Computer Lit. Elective(s) | 3 |
| Elective | | 2 19 19 19 19 19 19 19 19 19 19 19 19 19 |
| Second Servi | | 4 |
| ENG 111 MTH 192 | Composition I Calculus II | 4 |
| PHY 122 | General Physics II | 4 |
| Elective | Arts/Human. Elective(s) | 3 |
| | | |
| ENG 226 | Composition II | 3 |
| MTH 197 | Linear Algebra | 4 |
| PHY 211 | Analytical Physics I | 5 |
| Elective | Soc. Sci. Elective(s) | 3 |
| Fourth Seme | | |
| COM 101 | Fundamentals of Speaking | 3 |
| MTH 293 | Calculus III | 4 5 |
| PHY 222 Elective | Analytical Physics II Arts/Human. Elective(s) | 3 |
| LICCUVE | Araynanan Electro(a) | |
| | | Page 4 of 6 |

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| | | and the second secon |
|--|--|---|
| MTH 295 | Differential Equations | 4 |
| Elective | Soc. Sci. Elective(s) | 3 |
| Minimum Cro | edits Required for the Concentration or Option: 68 | |
| Pre-Actuaria | al Science (PPAS) | (60 credits) |
| | | |
| ACC 111 | Principles of Accounting I | 3 |
| CPS 161 | An Introduction to Programming with Java | 4 |
| ENG 111 | Composition I | 4 5 |
| MTH 191 | Calculus I | |
| Second Sem | | |
| ACC 122 ECO 211 | Principles of Accounting II Principles of Economics I | 3 |
| ENG 226 | Composition II | 3 |
| MTH 192 | Calculus II | 4 |
| Elective | Arts/Human. Elective(s) | 3 |
| MARIA | | |
| ECO 222 | Principles of Economics II | 3 |
| MTH 197 Elective | Linear Algebra Nat. Sci. Elective(s) | 4 |
| Elective | Soc. Sci. Elective(s)+ | 3 |
| Fourth Seme | | |
| MTH 293 | Calculus III | 4 |
| Elective | Arts/Human, Elective(s)++ | 3 |
| Elective | Nat. Sci. Elective(s)+++ | 4 |
| Elective | Speech Elective(s) | 5 |
| | | |
| Minimum Cro | edits Required for the Concentration or Option: 60 | |
| <i>Minimum Cro</i> Pre-Pharma | | (62 credits) |
| | icy (PPHA) | (62 credits) |
| Pre-Pharman Firststemen Elective | Biology Restricted Elective | 4 |
| Pre-Pharma Elective CEM 111 | Biology Restricted Elective General Chemistry I | 4 4 |
| Pre-Pharmac Elective CEM 111 MTH 191 | Biology Restricted Elective General Chemistry I Calculus I | 4 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) | 4 4 5 3 |
| Pre-Pharman Elective CEM 111 MTH 191 Elective Sacond Sem | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) | 4 4 5 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective Second Sem Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective | 4 4 5 3 |
| Pre-Pharman Elective CEM 111 MTH 191 Elective Sacond Sem | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) | 4 4 5 3 3 4 4 4 4 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 | Acy (PPHA) Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) | 4 4 5 3 3 4 4 4 |
| Pre-Pharmac Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) | 4 4 5 3 3 4 4 4 4 3 |
| Pre-Pharmac Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Calculus I Calculus I Composition I Speech Elective(s) Corganic Chemistry I | 4 4 5 3 3 4 4 4 3 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective CEM 122 ENG 111 Elective CEM 211 Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II | 4 4 5 3 4 4 4 4 3 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective CEM 211 Elective CEM 211 ENG 226 PHY 111 | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II General Physics I | 4 4 5 3 4 4 4 4 3 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective CEM 122 ENG 111 Elective CEM 211 Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II | 4 4 5 3 4 4 4 4 3 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective CEM 211 Elective CEM 211 ENG 226 PHY 111 Elective Elective Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II General Physics I Arts/Human. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 3 |
| Pre-Pharmac Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective CEM 211 ENG 226 PHY 111 Elective Elective Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 4 4 3 3 4 4 3 3 4 |
| Pre-Pharmac Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective CEM 211 Elective CEM 211 ENG 226 PHY 111 Elective Elective Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Composition I Speech Elective(s) Organic Chemistry I Composition II General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 3 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective CEM 122 ENG 111 Elective CEM 212 ENG 111 Elective CEM 211 ENG 226 PHY 111 Elective Elective Elective Elective Elective Elective | Icy (PPHA) Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) Organic Chemistry II General Physics I Arts/Human. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 4 4 3 3 4 4 3 3 4 |
| Pre-Pharmat Elective CEM 111 MTH 191 Elective CEM 122 ENG 111 Elective CEM 211 Elective CEM 211 Elective Elective Elective Elective Elective Elective Elective Elective Elective Elective | Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Composition I Speech Elective(s) Organic Chemistry II Composition II General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) Corganic Chemistry II General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) Soc. Sci. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 3 |
| Pre-Pharman Elective CEM 111 MTH 191 Elective Second Sem Elective CEM 122 ENG 111 Elective CEM 211 ENG 226 PHY 111 Elective Elective Elective Elective Elective Elective Elective Elective Elective Elective | Icy (PPHA) Biology Restricted Elective General Chemistry I Calculus I Arts/Human. Elective(s) Restricted Biology Elective General Chemistry II Composition I Speech Elective(s) Organic Chemistry I Composition II General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) Organic Chemistry II General Physics I Arts/Human. Elective(s) | 4 4 5 3 4 4 4 4 3 3 4 3 3 3 |

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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

• <u>2015 - 2016</u>

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 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 |
|------------------|--|---------|
| <u>BIO 162</u> | General Biology II Cells and Molecules | 4 |
| <u>CEM 111</u> | General Chemistry I | 4 |
| <u>MTH 176</u> o | r College Algebra | |
| <u>MTH 191</u> | Calculus I * | 4 |
| Elective(s) | Computer and Information Literacy | 3 |
| Total | | 15 |

Second Semester

| Class | Title | Credits |
|------------------|---|---------|
| <u>BIO 161</u> | General Biology I Ecology and Evolution | 4 |
| <u>CEM 122</u> | General Chemistry II | 4 |
| <u>ENG 111</u> | Composition I | 4 |
| <u>MTH 160</u> o | r Basic Statistics ** | |
| <u>MTH 192</u> | Calculus II | 4 |
| Total | | 16 |

Third Semester

| Class | Title | Credits |
|----------------|---|---------|
| <u>CEM 211</u> | 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 |

| Class | Title | Credits |
|----------------|-------------------------------|---------|
| <u>CEM 222</u> | Organic Chemistry II | 4 |
| <u>COM 101</u> | 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 Cred | ts Required | 61 |

Chemistry/Pre-Medicine (CMED)

First Semester

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

Second Semester

| Class | Title | Credits |
|----------------|----------------------|---------|
| <u>CEM 122</u> | General Chemistry II | 4 |
| <u>ENG 111</u> | Composition I | 4 |
| <u>MTH 192</u> | Calculus II | 4 |
| <u>PHY 122</u> | General Physics II | 4 |
| Total | | 16 |

Third Semester

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

| Class | Title | Credits |
|----------------|--------------------------|---------|
| <u>COM 101</u> | Fundamentals of Speaking | 3 |

| <u>CEM 222</u> | 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 Credi | ts Required | 62 | |

Mathematics (MATH)

First Semester

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

Second Semester

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

Third Semester

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

| Class | Title | Credits |
|------------------------|---|---------|
| <u>MTH 295</u> | 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 |
|----------------|-----------------------------------|---------|
| <u>CEM 111</u> | General Chemistry I | 4 |
| <u>MTH 191</u> | Calculus I | 5 |
| <u>PHY 111</u> | General Physics I | 4 |
| Elective(s) | Computer and Information Literacy | 3 |
| Total | | 16 |

Second Semester

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

Third Semester

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

| Class | Title | Credits |
|----------------|--------------------------|---------|
| <u>COM 101</u> | Fundamentals of Speaking | 3 |
| <u>MTH 293</u> | Calculus III | 4 |

| <u>PHY 222</u> | Analytical Physics II | 5 |
|----------------|-----------------------|----|
| Elective(s) | Arts and Humanities | 3 |
| Total | | 15 |

Fifth Semester

| Class | Title | Credits |
|----------------|-------------------------------|---------|
| <u>MTH 295</u> | Differential Equations | 4 |
| Elective(s) | Social and Behavioral Science | 3 |
| Total | | 7 |
| Total Cred | ts Required | 68 |

Pre-Actuarial Science (PPAS)

First Semester

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

Second Semester

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

Third Semester

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

Fourth Semester

| Class Ti | le 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 |
|---------------|-------------------|-----------------------------|---------|
| 1 | J <u>Elective</u> | Biology Restricted Elective | · · |
| , 3/22/15, | <u>CEM 111</u> | General Chemistry I | 4 |
| Per Joy | <u>(MTH 191</u>) | Calculus I | 5 / |
| this should | Elective(s) | Arts and Humanities | 3 |
| stay and | Total | | 16 |
| included o | n description. | | |
| Tricitat | Second Semester | | |

| Class | Title | Credits |
|------------------------------|-----------------------------|---------|
| ^J <u>Elective</u> | Biology Restricted Elective | 4 |
| <u>CEM 122</u> | General Chemistry II | 4 |
| <u>ENG 111</u> | Composition I | 4 |
| Elective(s) | Speech | 3 |
| Total | | 15 |

Third Semester

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

| Class | Title | Credits |
|----------------|-----------------------------------|---------|
| <u>CEM 222</u> | Organic Chemistry II | 4 |
| <u>PHY 122</u> | General Physics II | 4 |
| Elective(s) | Computer and Information Literacy | 3 |
| Elective(s) | Social and Behavioral Science | 3 |
| Total | | 14 |
| Total Cred | ts 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.

J+++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.

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.

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.

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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:

Math and Science Concentrations

Biology/Pre-Medicine (BMED)

Elective

Elective

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

Minimum Credits Required for the Concentration or Option: 61

Soc. Sci. Elective(s)

Arts/Human. Elective(s)

| Chemistry/P | Pre-Medicine (CMED) | (62 credits) |
|---|--|--|
| First Semest | iter | (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 Sem CEM 122 ENG 111 MTH 192 PHY 122 | nester General Chemistry II Composition I Calculus II General Physics II | (16 credits) 4 4 4 4 4 4 |
| Third Semes | ster | (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 Seme | ester | (16 credits) |
| COM 101 | Fundamentals of Speaking | 3 |

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(61 credits)

60

3 3

Program Information Report

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| CEM 222 Elective | Organic Chemistry II Arts/Human. Elective(s) | 4 |
|--|---|----------------------|
| Elective | Soc. Sci. Elective(s) | 3 3 |
| Elective | Arts/Human. Elective(s) | 3 |
| Minimum Cr | redits Required for the Concentration or Option: 62 | |
| Mathematic | s (MATH) (60 c | credits) |
| First Semes | | redits) |
| BIO 162 or | General Biology II Cells and Molecules | |
| CEM 111 or PHY 111 | General Chemistry I | |
| MTH 191 | General Physics I Calculus I | 4 |
| Elective | Computer Lit. Elective(s) | 5 3 |
| ENG 111 | Composition I | 4 |
| Second Sem | nester | redits) |
| BIO 161 or | General Biology I Ecology and Evolution | |
| CEM 122 or | General Chemistry II | |
| PHY 122 | General Physics II | 4 |
| MTH 160 MTH 192 | Basic Statistics Calculus II | 4 |
| Elective | Soc. Sci. Elective(s) | 4 3 |
| Third Semes | ttor | redits) |
| COM 101 | Fundamentals of Speaking | а сына) З |
| ENG 226 | Composition II | 3 |
| MTH 197 | Linear Algebra | 4 |
| MTH 293 | Calculus III | 4 |
| Elective | Soc. Sci. Elective(s) | 3 |
| Fourth Seme | ester | redits) |
| 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 Cro | redits Required for the Concentration or Option: 60 | |
| Physics/Pre | -Engineering (PENG) (68 c | redits) |
| First Semest | (16 c | redits) |
| CEM 111 | General Chemistry I | 4 |
| MTH 191 | Calculus I | 5 |
| PHY 111 | General Physics I | 4 |
| Elective | Computer Lit. Elective(s) | 3 |
| Second Sem | ester | redits) |
| ENG 111 | Composition I | 4 |
| MTH 192 | Calculus II | 4 |
| PHY 122 | General Physics II | 4 |
| Elective | Arts/Human. Elective(s) | 3 |
| C. C. S. G. S. C. S. | | redits) |
| ENG 226 MTH 197 | Composition II Linear Algebra | 3 4 |
| PHY 211 | Analytical Physics I | 4 5 |
| Elective | Soc. Sci. Elective(s) | 3 |
| | | |
| rourth Seme | ester (15ic | redits) |

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

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| MTH 295 Elective | ter Differential Equations Soc. Sci. Elective(s) | redits) 4 3 |
|---|---|---|
| Minimum Cr | redits Required for the Concentration or Option: 68 | |
| Pre-Actuaria | al Science (PPAS) (60 c | redits) |
| First Semes | | redits) |
| ACC 111 | Principles of Accounting I | 3 |
| CPS 161 | An Introduction to Programming with Java | 2 |
| ENG 111 | Composition I | 4 |
| MTH 191 | Calculus I | |
| Second Sem | ester | redits |
| ACC 122 | Principles of Accounting II | |
| ECO 211 | Principles of Economics I | 3 |
| ENG 226 | Composition II | |
| MTH 192 | Calculus II | 4 |
| Elective | Arts/Human. Elective(s) | 3 |
| Third Semes | ther the second se | redits |
| ECO 222 | Principles of Economics II | |
| MTH 197 | Linear Algebra | |
| Elective | Nat. Sci. Elective(s) | 4 |
| Elective | Soc. Sci. Elective(s)+ | 3 |
| Fourth Seme | | redits |
| MTH 293 | Calculus III | Guiro |
| Elective | Arts/Human. Elective(s)++ | |
| | Alls/numan, Elective(s)++ | |
| | | 4 |
| Elective Elective | Nat. Sci. Elective(s)+++ Speech Elective(s) | |
| Elective Elective Minimum Cr | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 | 3 |
| Elective Elective | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 | 4 3 redits) |
| Elective Elective Minimum Cr | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 Cy (PPHA) (62 C | redits |
| Elective Elective <i>Minimum Cr</i> Pre-Pharma | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 Cy (PPHA) (62 C) | : redits) redits) 2 |
| Elective Elective Minimum Cr Pre-Pharma First Semesi | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 Cy (PPHA) (62 C | a redits) redits) 2 2 |
| Elective Elective Minimum Cr Pre-Pharmar First Semest BIO 162 | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 Cy (PPHA) (62 C ter General Biology II Cells and Molecules | redits redits |
| Elective Elective Minimum Cr Pre-Pharmar First Semest BIO 162 CEM 111 MTH 191 | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c) (62 c) ter General Biology II Cells and Molecules General Chemistry I | redits redits |
| Elective Elective Minimum Cr Pre-Pharman First Semest BIO 162 CEM 111 MTH 191 Elective | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c) (99) (16 c) General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) | redits |
| Elective Elective Minimum Cro Pre-Pharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester (15 c | redits redits |
| Elective Elective Minimum Cr Pre-Pharmat First Semest BIO 162 CEM 111 MTH 191 Elective | Nat. Sci. Elective(s) edits Required for the Concentration or Option: 60 (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution | redits redits |
| Elective Elective Minimum Cro- Pre-Pharmar First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester (15 c | redits redits |
| Elective Elective Minimum Cro- Pre-Dharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 | Nat. Sci. Elective(s) edits Required for the Concentration or Option: 60 (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II | redits redits 2 2 3 |
| Elective Elective Minimum Cro Pre-Dharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective | Nat. Sci. Elective(s) edits Required for the Concentration or Option: 60 (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) | redits redits |
| Elective Elective Minimum Cro Pre-District BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (15 c (15 c) (15 | redits redits redits |
| Elective Elective Minimum Cro Pre-Pharmer First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (16 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (17 c (17 c | redits redits redits |
| Elective Elective Minimum Cr Pre-Pharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 ENG 226 | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 cf (7) (9) (15 cf General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (15 cf | redits redits redits |
| Elective Elective Minimum Cr Pre-Pharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 ENG 226 PHY 111 | Nat. Sci. Elective(s) edits Required for the Concentration or Option: 60 (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (15 c (15 | redits redits |
| Elective Elective Minimum Cr Pre-Pharman First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 ENG 226 PHY 111 Elective | Nat. Sci. Elective(s)+++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 cf (7) (9) (15 cf General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (15 cf | redits redits redits 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 |
| Elective Elective Minimum Cr Pre-Dharmer First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 ENG 226 PHY 111 Elective Elective Elective | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 cy (PPHA) (62 c (15 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester (15 c General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) ster (17 c Organic Chemistry I Composition I Speech Elective(s) soc. Sci. Elective(s) | redits redits |
| Elective Elective Minimum Cr Pre-District First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 Elective ENG 226 PHY 111 Elective Elective Elective | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (16 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology 1 Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (17 c Organic Chemistry I Composition I General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) (14 c | redits redits redits |
| Elective Elective Elective Minimum Cro Pre-Distance BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 Elective Elective Elective Elective Fourth Seme | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (16 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester (15 c General Biology I Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (17 c Organic Chemistry I Composition II General Physics I Arts/Human. Elective(s) soc. Sci. Elective(s) (14 c Organic Chemistry II | redits redits redits |
| Elective Elective Minimum Cr Pre-Dharmer First Semest BIO 162 CEM 111 MTH 191 Elective Second Sem BIO 161 CEM 122 ENG 111 Elective Third Semes CEM 211 ENG 226 PHY 111 Elective Elective Elective | Nat. Sci. Elective(s) +++ Speech Elective(s) edits Required for the Concentration or Option: 60 (62 c (16 c General Biology II Cells and Molecules General Chemistry I Calculus I Arts/Human. Elective(s) ester General Biology 1 Ecology and Evolution General Chemistry II Composition I Speech Elective(s) (17 c Organic Chemistry I Composition I General Physics I Arts/Human. Elective(s) Soc. Sci. Elective(s) (14 c | redits redits redits |

Minimum Credits Required for the Concentration or Option: 62

Minimum Credits Required for the Program:

Thursday, March 5, 2015 9:29:14 a.m.

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.

+++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.

PROGRAM CHANGE OF DISCONTINUATION FORM

| | 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 prog | gram listing from the WCC catalog or W | eb site and indicate any changes to be made. | | | |
| 2. Draw lines through any a separate sheet. | text that should be deleted and write in | additions. Extensive narrative changes can be included on | | | |
| new courses as part of t | | l. Changes to courses, discontinuing a course, or adding approved separately using a Master Syllabus form, but rm. | | | |
| Requested Changes: | | | | | |
| Add course(s): <u>See</u> Program title (title was Description Type of award Advisors | Review Program admission requirements Add course(s): See concentration information attached Program title (title was) Program outcomes Description Advisors Advisors Other Add concentrations for Pre-Pharmacy and Pre-Actuarial Science - Persone Come Science | | | | |
| 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/equ | ipment/space implications: | | | | |
| | rograms already exist and are used in other p n existing resource for these students. | programs. The advisor for Math and Science and the advisor for | | | |

List departments that have been consulted regarding their use of this program. Pharmacy Technology, Math and Science

Signatures:

| Signatures: | | | |
|--------------------------------|---------------------|---------------------|--------|
| Reviewer | Print Name | Signature | Date |
| Department Chair | Lisa Rombes | ana kont | 2-4-15 |
| Division Dean/Administrator | Kristin Brandemuehl | - Htiste Brandenuch | 2.4.45 |
| Vice President for Instruction | William Abernethy | 545-4 | 2-9-15 |
| President | | | |

Do not write in shaded area. Entered in: Banner 24me C&A Database 2/11 5 We og File 215 mo Board Approval AP

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.



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

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 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.

MTH 197 MTH 293

MTH

ECO 211

ECO 222

MTH 191

192

Au-Pharmacy (PPHA) BIO 161 BIO 162 (EM 211 CEM 222 PHY III PHY 122 MTH 191

Pre-Actuarial Science (PAS)

Ø

Recommended Course Sequences Ru-Pharmacy (PPHA)

. .

| | Semester | _x_Fall | Winter | Spring/Summer | Any | |
|-----|-------------|--|-------------------|---------------|-------------|--------------|
| | Course # | Course Title | | | | Credit Hours |
| -27 | MTH 191 | Calculus 1 | | | 사람은 다양 | 5 |
| 1 | CEM 111 | General Chemistry 1 | | | | 4 |
| ١ | BIO 162 | General Biology Il Cells and Molecules o | r BIO 111, BIO 20 | 8, or BIO 237 | | 4 |
| 4 | Elective(s) | Arts and Humanities l | | | | 3 |
| , | | | | Total Semes | ter Credits | 16 |

| | Semester 2 | 2 Fall | _x | Winter | Spring/Summer | Any | |
|---|--------------|---------------------------|---------------------|-------------------|-----------------|--------------|--------------|
| | Course # | Course Title | | | | | Credit Hours |
| 2 | CEM 122 | General Chemistry II | | | | | 4 |
| ١ | BIO 161 | General Biology 1 Ecology | and Evolution or BI | O 111, BIO 2 | 208, or BIO 237 | | 4 |
| 3 | ENG 111 | Composition 1 | | | | | 4 |
| ú | Elective (s) | Speech | | | | | 3 |
| | | | 明治法院にあるが | 14-22-04-04-04-33 | Total Seme | ster Credits | . 15 |

| | Semester 3 | x_Fall | Winter | Spring/Summer | Any | |
|----|-------------|---------------------------------|---|---------------|---------------|--------------|
| | Course # | Course Title | | | | Credit Hours |
| 1 | CEM 211 | Organic Chemistry 1 | | | | 4 |
| 7, | PHY 111 | General Physics 1 (or PHY 211) | | | | 4 |
| r | ENG 266 224 | Composition ll | | | | 3 |
| υ | Elective(s) | Arts and Humanities 2 | | | | 3 |
| Ś | Elective(s) | Social and Behavioral Science 1 | a de la compañía de l | | | 3 |
| | | | | Total Sem | ester Credits | 17 |

| | Semester 4 | Fall | _x_Winter | Spring/Summer | Any | |
|----|---|---------------------------------|-----------|---------------|----------------|--------------|
| | Course # | Course Title | | | | Credit Hours |
| ١ | CEM 222 | Organic Chemistry ll | | | | 4 |
| 7. | PHY 122 | General Physics Il (or PHY 222) | | | | 4 |
| 1 | Elective(s) | Social and Behavioral Science 2 | | | | 3 |
| z, | Elective(s) | Computer and Information | | | | 3 |
| ¢. | | | | Total Ser | nester Credits | 14 Jul - 20 |
| | and an an an and a second s | | | | | |
| | | | 法中非合作的规则 | Total Pre | ogram Credits | 62 |

Optional Transfer Courses

| [| Course # | Course Title | Credit Hours |
|-----|----------|--|--------------|
| 4 | MTH 192 | Calculus 2 11 | 4 |
| 1 | BIO 111 | Anatomy and Physiology – Normal Structure and Function | 5 |
| 2 | BIO 208 | Genetics | 4 |
| - 3 | BIO 237 | Microbiology | 4 |
| | | Total Semester Credits | 17 |

Optional Transfer Courses Credit Hours Course # Course Title BIO 215 Cell and Molecular Biology 4 ł BIO 227 Zoology Binlony of Annhalt r or BIO 228 Bidation of Flinks 4 Botany 4 MTH 160 3 3 Elective đ 15 **Total Semester Credits** Total Transferrable Credits 94 1. 1. 1. 1. A. A.

Biochemistry (400 level course at U of M) Physiology

Section IX. Recommended Course Sequences



First Semester

| Class | Title | Credits |
|------------------|--|---------|
| ACC 111 | Principles of Accounting I | 3 |
| MTH 191 | Calculus I | 5 |
| ENG 111 | Composition I | 4 |
| د <u>CPS 161</u> | An Introduction to Programming with Java | 4 |
| Total | | 16 |

Second Semester

| Class | Title | Credits |
|----------------------|-----------------------------|---------|
| ю <u>Elective(s)</u> | Arts and Humanities | 3 |
| <u>з ENG 226</u> | Composition II | 3 |
| ۵ <u>MTH 192</u> | Calculus II | 4 |
| ∲ <u>ECO 211</u> | Principles of Economics I | 3 |
| ACC 122 | Principles of Accounting II | 3 |
| Total | | 16 |

Third Semester

| Class | Title | Credits |
|---------------------------|-----------------------------------|---------|
| • <u>ECO 222</u> | Principles of Economics II | 3 |
| ۶ <u>MTH 197</u> | Linear Algebra | 4 |
| ⁷ /Elective(s) | Natural Sciences* | 4 |
| λ Elective(s) | Social and Behavioral Science** + | 3 |
| Total | | 14 |

Fourth Semester

| Class | Title | Credits |
|--------------------------|-----------------------------|---------|
| ۵ <u>Elective(s)</u> | Speech | 3 |
| <u>MTH 293</u> | Calculus III | 4 |
| 3 Elective(s) | Natural Sciences**** +# | 4 |
| ¹ Elective(s) | Arts and Humanities 2*** ++ | 3 |
| Total | | 14 |
| Total Credits | s Required | 60 |

*Students transferring to a four-year institution should choose a lab-based, MTA-approved science course.

***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 ++1 number of credits back up to 60 if necessary.



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.

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 II 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:

Math and Science Concentrations

| Biology/Pre- | Medicine (BMED) | 1 credits) |
|---|--|--|
| First Semest | er | 5 credits) |
| BIO 162 | General Biology II Cells and Molecules | |
| CEM 111 | General Chemistry I | 4 |
| MTH 176 or | College Algebra | |
| MTH 191 | Calculus I* | 4 |
| Elective | Computer Lit. Elective(s) | 3 |
| Second Seme | ester (1 | 6 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 Semest | ter | 4 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 Seme | ster Community Full-an | 6icredits |
| CEM 222 | Organic Chemistry II | 4 |
| COM 101 | Fundamentals of Speaking | 3 |
| Elective | Arts/Human. Elective(s) | |
| Elective | Soc. Sci. Elective(s) | 3 |
| Elective | Arts/Human, Elective(s) | 3 |
| Minimum Cre | edits Required for the Concentration or Option: 61 | |
| | | 6 credits) |
| Chemistry/P | re-Medicine (CMED) | |
| Chemistry/P | re-Medicine (CMED) [6 | 6 cradits) 4 |
| Chemistry/P First Semeste CEM 111 | re-Medicine (CMED) (6 | 6 cradits) 4 |
| Chemistry/P First Semeste CEM 111 MTH 191 | re-Medicine (CMED) (6 er General Chemistry I Calculus I | 6 cradits) 4 5 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 | re-Medicine (CMED) [6 er General Chemistry I | 6 cradits) 4 5 4 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) | 6 cradits 4 5 4 3 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester | 6 cradits 4 3 6 credits |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II | 6 credits |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester | 6 credits |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I | Gicredits |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II | Scredits 2 3 6 credits 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II Ker | Sicredits 2 3 6 credits 2 4 credits |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II | Scredits 4 3 6 credits 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II | 5 credits) 4 5 4 3 6 credits) 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I | 6 credits) 4 5 4 3 6 credits) 4 4 4 4 4 4 4 3 4 3 4 3 3 4 3 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ster General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) | 6 credits 4 5 4 3 6 credits 4 4 4 4 3 3 4 3 4 3 4 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 |
| Chemistry/P First Semestr CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective Fourth Seme | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ster General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) | Gioredits 4 3 6 credits 4 4 4 4 5 5 5 6 credits 3 4 credits 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |
| Chemistry/P First Semestr CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective Fourth Seme COM 101 | re-Medicine (CMED) (G er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II :er Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) | 6 credits 4 3 6 credits 4 4 4 4 5 6 credits 3 4 5 6 credits 3 4 5 6 credits 4 5 6 6 credits 4 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective Fourth Seme COM 101 CEM 222 | re-Medicine (CMED) (G er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) ster Fundamentals of Speaking | 6 credits 4 3 6 credits 4 4 credits 3 4 credits 3 4 credits 3 4 |
| Chemistry/P First Semestr CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective | re-Medicine (CMED) (G er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II Corganic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) ster Fundamentals of Speaking Organic Chemistry II | Scredits) 4 5 4 3 Gcredits) 4 4 4 4 4 3 4 3 3 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective Fourth Seme COM 101 CEM 222 MTH 293 Elective | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ester General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) ster Fundamentals of Speaking Organic Chemistry II Calculus III Calculus Calculus III Calculus Calculus Ca | Scredits) 4 5 4 3 6icredits) 4 4 4 4 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 4 3 3 4 3 3 4 3 3 4 3 3 4 3 3 4 4 3 3 4 4 3 3 3 4 4 3 3 4 3 3 4 3 3 4 3 3 4 4 3 3 3 4 4 4 3 3 3 3 4 4 4 3 3 3 4 |
| Chemistry/P First Semeste CEM 111 MTH 191 PHY 111 Elective Second Seme CEM 122 ENG 111 MTH 192 PHY 122 Third Semest CEM 211 ENG 226 MTH 197 Elective Fourth Seme COM 101 CEM 222 MTH 293 Elective | re-Medicine (CMED) (6 er General Chemistry I Calculus I General Physics I Computer Lit. Elective(s) ster General Chemistry II Composition I Calculus II General Physics II ter Organic Chemistry I Composition II Linear Algebra Soc. Sci. Elective(s) ster Fundamentals of Speaking Organic Chemistry II Calculus III Arts/Human. Elective(s) | Scredits) 4 5 4 3 6icredits) 4 4 4 4 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 4 3 3 4 3 3 4 3 3 4 3 3 4 3 3 4 4 3 3 4 4 3 3 3 4 4 3 3 4 3 3 4 3 3 4 3 3 4 4 3 3 3 4 4 4 3 3 3 3 4 4 4 3 3 3 4 |

Minimum Credits Required for the Concentration or Option: 66

🗱 Washtenaw Community College

Program Information Report

| Computer Science (COMS) (68 credits) | | | | |
|---|--|--------------------------------|--|--|
| First Semester MTH 191 PHY 111 Elective | Calculus I General Physics I Computer Lit. Elective(s) | 5 4 3 | | |
| Second Semes CPS 171 ENG 111 MTH 192 PHY 122 | ter Introduction to Programming with C++ Composition I Calculus II General Physics II | 5) 4 4 4 4 | | |
| Third Semeste CPS 271 ENG 226 MTH 197 PSY 100 | r Object Features of C++ Composition II Linear Algebra Introduction to Psychology | 4 3 4 3 | | |
| Fourth Semest CPS 272 MTH 293 Elective Elective | Data Structures with C++ Calculus III Arts/Human. Elective(s) Take an additional three credits in the CPS discipline | 5) 4 3 3 | | |
| Fifth Semester COM 101 PLS 112 Elective Elective | Fundamentals of Speaking Introduction to American Government Arts/Human. Elective(s) Take an additional three credits in the CPS discipline | 3 3 3 3 | | |
| Minimum Cred | its Required for the Concentration or Option: 68 | | | |
| Mathematics (| MATH) (61 credit | 5) | | |
| First Semester BIO 162 or CEM 111 or PHY 111 MTH 191 Elective ENG 111 | General Biology II Cells and Molecules General Chemistry I General Physics I Calculus I Computer Lit. Elective(s) Composition I | \$) 4 5 3 4 | | |
| Second Semes BIO 161 or CEM 122 or PHY 122 MTH 160 MTH 192 Elective | ter General Biology I Ecology and Evolution General Chemistry II General Physics II Basic Statistics Calculus II Soc. Sci. Elective(s) | 4 4 4 3 | | |
| Third Semeste COM 101 ENG 226 MTH 197 MTH 293 Elective Fourth Semest MTH 295 | Fundamentals of Speaking Composition II Linear Algebra Calculus III Soc. Sci. Elective(s) | 3 3 4 3 3 | | |
| Elective Elective Elective | Arts/Human. Elective(s) Arts/Human. Elective(s) Take an additional three credits in the MTH discipline | 3 3 3 | | |

Minimum Credits Required for the Concentration or Option: 61

Program Information Report

| Physics/Pre-Er | ngineering (PENG) (68 credi | ts) |
|--|---|----------------------|
| First Semester CEM 111 MTH 191 PHY 111 Elective | General Chemistry I Calculus I General Physics I Computer Lit, Elective(s) | 4 5 4 3 |
| Second Semest ENG 111 MTH 192 PHY 122 Elective | ter Composition I Calculus II General Physics II Arts/Human, Elective(s) | 4 4 4 3 |
| Third Semester ENG 226 MTH 197 PHY 211 Elective | Composition II Linear Algebra Analytical Physics I Soc. Sci. Elective(s) | 3 4 5 3 |
| Fourth Semest COM 101 MTH 293 PHY 222 Elective | er Fundamentals of Speaking Calculus III Analytical Physics II Arts/Human. Elective(s) | 3 4 5 3 |
| Fifth Semester MTH 295 Elective | Differential Equations Soc. Sci. Elective(s) | ts) 4 3 |
| Minimum Credi | its Required for the Concentration or Option: 68 | |
| Minimum Credi <i>Notes:</i> | its Required for the Program: | 61 |
| *Students transf | ferring 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 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 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.

PROGRAM CHANGE OR DISCONTINUATION FORM

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fr

| Program Code: AS NS AS | Program Name: | MATH and Sc | IENCE | Effective | Term: | | |
|--|--|--|-------------------------|-----------|---------|--|--|
| Division Code: M 5 N | Department: L i | fe Science | BNED | concentra | tion | | |
| Directions: Attach the current program listing from the WCC catalog or Web site and indicate any changes to be made. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet. 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 CPS 171, PSY 100 PLS BOOLEDENEESCO new electives, Social Science electives, Computer literacy elective entret entert. Add course(s): BIO 161, BIO 162, Math electives, Social Science electives, Computer literacy elective entert entert. Description Program tile (title was) Description Type of award Advisors | | | | | | | |
| Articulation information Show all changes on the <u>attac</u> | | ılog. | | | | | |
| Rationale for proposed c Replace existing introduct requirement; create flexibi program so it can be used | hanges or disconti ory Biology sequenc lity in program so it | nuation: e with new majors-le can be adapted for t | ransfer to various 4-ye | | | | |
| Financial/staffing/equip | oment/space impli | cations: | | | | | |
| List departments that ha Biology, Chemistry | ve been consulted | regarding their use | e of this program. | | | | |
| Signatures: | | | | | | | |
| Reviewer | F | rint Name | Signat | ure | Date | | |
| Initiator | Ani | re Heise | and the | use | 2/14/13 | | |
| Department Chair | Ani | re Heise | ane | Herse | 2/14/13 | | |
| Division Dean/Administrate | or $M.S.$ | howalter | 71 Show | 6 | 2/14/13 | | |

| ,,, _, | | | - | |
|--|-------------------------|------------------------|-------------------|--------------------------|
| Vice President for Instruction | Bin Abeneth | | > | 3/22/13 |
| President | VIA | | 3 | , , , |
| Do not write in shaded area. Entered i | in: Banner C&A Database | 3413 Log File -19013 B | oard Approval | <u>an</u> sa kata kata k |
| logged 2/15/13 5/1 Office of Curriculum & Assessm | 1 | for the | | |
| Office of Curriculum & Assessm | ient | http://www.w | /ccnet.edu/depart | ments/curriculum |

PROGRAM CHANGE OR DISCONTINUATION FORM

· /

| Program Code: | Program Name: Math and Science | Effective Term: F' 2013 | | | | | | | |
|---|--|--|---------|--|--|--|--|--|--|
| ASMSAS | MATH & SEIBNCE | | | | | | | | |
| Division Code: MSH | Department: Math and Science MATH concentratio | m for (MATH) | | | | | | | |
| Directions: | | 0 | | | | | | | |
| 1. Attach the current prog | ram listing from the WCC catalog or Web | o site and indicate any changes to be ma | de. | | | | | | |
| 2. Draw lines through any text that should be deleted and write in additions. Extensive narrative changes can be included on a separate sheet. | | | | | | | | | |
| new courses as part of t | 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: | | | | | | | | | |
| Requested changes: Review X Remove course(s): CPS 171, six additional elective credits in the MTH discipline Add course(s): Add course(s): Program title (title was) Description Type of award Advisors Advisors Articulation information Show all changes on the attached page from the catalog. | | | | | | | | | |
| | | | | | | | | | |
| This change applies to the CPS 171 is not needed. It | 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/equi | pment/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 | Justa Mord | 2/14/13 | | | | | | |
| Department Chair | Kristin Good | Mar grand | 2/14/13 | | | | | | |
| Division Dean/Administrat | or M. Showalter | M. Shoual | 2/14/13 | | | | | | |
| Vice President for Instructi | on STUBIT BLACKLOW | E melet | 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 fo | | | | | | | | | |

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

logged 2/15/13 % Office of Curriculum & Assessment

WASHTENAW COMMUNITY COLLEGE

| PROGRAM CHANGE OR DISCONTINUATION FORM | | | | | | | | | |
|---|-------------------------|-------------|---------|--|---------------|------|--|--|--|
| Program Code: ASMSAS Division Code: MSH | Program Name: | Math & Sc | ener | Effective 7 | Term: F | 2013 | | | |
| Division Code: MSH | Department: Ph | secal Scien | er for | PENG 1 (concentre | MED ations | | | | |
| 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. | | | | | | | | | |
| 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: | | 2 | +ot | ······································ | | | | | |
| Requested Changes: C++ Review Program admission requirements Remove course(s): Continuing eligibility requirements Add course(s): Program outcomes Program title (title was) Accreditation information Description Discontinuation (attach program discontinuation for phasing out courses) Advisors Information Articulation information Other | | | | | | | | | |
| Show all changes on the atta | ched page from the cata | log. | | | | | | | |
| Rationale for proposed changes or discontinuation: This change appleis to the Concentration for both Chemistry and Physics Pre engineering. After researching comparable degrees in pre-med W/ Chem of 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: | | No. No. | | 1 | T Dec | | | | |
| Reviewer | | rint Name | 1/ | Bignature | Date | | | | |
| Initiator | TATKLE | en Butchen | Kathlee | - Butcher | 1/3//2 | 2013 | | | |
| Department Chair | | | | | | | | | |
| Division Dean/Administra | tor M. S. | howalter | m So | upl | 2/14/ | 13 | | | |
| Vice President for Instruct | ion Strert | · Bleckhan | SE | n lil | 2/26/ | 13 | | | |

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

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

Mone Office of Curriculum & Assessment M logged 2/15/13 y

http://www.wccnet.edu/departments/curriculum

dad salakense (A. Méne)

Associate in Science Degree

2010 - 2011 2011 - 2012 2012 - 2013

Description

-06

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 source 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 II CEM 222 Organic Chemistry II BIO 227 Biology of Animale

BID III or 208 or 215 or 227 or 228 or 237 Altorganic Biochemistry of BIO 208 Genetics

BIO 228 Biology of Plants U Elective: BJO 402, BIO 411, 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 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 Elective: Take an additional Me 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 employer science concentrations requires one semester of high school physics (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

| First Semester Class BIO 162 CEM 111 MTH 191 ¹ or MTH 176 Elective(s) Elective(s) | Title New Name General Chemistry I Calculus I College Algebra Computer and Information Literacy | Credits 4 3 15 |
|---|---|-------------------------|
| BIO 162 <u>CEM 111</u> <u>MTH 191¹</u> or <u>MTH 176</u> Elective(s) | New Name General Chemistry I Calculus I College Algebra | |
| <u>CEM 111</u> <u>MTH 191¹</u> or <u>MTH 176</u> Elective(s) | General Chemistry I Calculus I College Algebra | |
| <u>MTH 191¹</u> or MTH 176 Elective(<u>s)</u> | Calculus I College Algebra | |
| <u>MTH 176</u> Elective(s) | College Algebra | |
| Elective(s) | | |
| | Computer and Information Literacy | |
| C-4-1 | | . 1 |
| fotal | | |
| Second Semester | | |
| Class | Title | Credits |
| 310 161 | New Name | |
| CEM 122 | General Chemistry II | |
| ENG 111 | Composition I | |
| <u>MTH 192²</u> or | Calculus II | |
| <u>MTH 160</u> | Basic Statistics | |
| Fotal | | . 1 |
| Third Semester | | |
| Class | Title | Credits |
| CEM 211 | Organic Chemistry I | |
| ENG 226 | Composition II | |
| Social Science | Elective | |
| Biology Elective ³ | Select one course from the following: BIO 111, BIO 208, BIO 215, BIO 227, BIO 228 or BIO 237 | |
| Total | | 14 |
| ourth Semester | | |
| Class | Title | Credits |
| <u>CEM 222</u> | Organic Chemistry II | |
| COM 101 | Fundamentals of Speaking | |
| Elective(s) | Arts and Humanities | |
| locial Science | Elective | |
| Elective(s) | Arts and Humanities | |
| otal | | 10 |
| | | |
| otal Credits Required | | 6 |
| | ¹ Students transferring to EMU as a biology major may substitute MTH 176 or any higher 4-credit hour math c | ourse for MTH 19 |
| | 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 t | o transfer |

| Chemistry/Pre-Medi | cine (CMED) | | | |
|------------------------|-------------------------------------|---------|------------------------------------|-------------|
| First Semester | | | | |
| Class | Title | Credits | Notes | New credits |
| <u>CEM 111</u> | General Chemistry I | 4 | | 4 |
| <u>MTH 191</u> | Calculus I | 5 | | 5 |
| <u>PHY 111</u> | General Physics 1 | 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 | | |
| <u>CEM 211</u> | 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 | | |
| <u>COM 101</u> | Fundamentals of Speaking | 3 | | 3 |
| <u>CEM 222</u> | Organic Chemistry II | 4 | | 4 |
| <u>MTH 293</u> | Calculus III | 4 | | 4 |
| Elective(s) | Arts and Humanities | 3 | | 3 |
| Total | | 14 | | 14 |
| Fifth Semester | | | | |
| Class | Title | Credits | | |
| GPS 171 | | | remove | 2 |
| PLS 112 | Introduction to American Government | | Change to social science elsective | 3 |
| Elective(s) | Arts and Humanities | 3 | | 3 |
| Total | | 10 | | 6 |
| Total Credits Required | d | 70 | | 66 |

| Mathematics | | | | |
|-------------------------------------|--|------------------|---------------|--|
| (MATH) | | | | |
| First Semester | | | | |
| | | ~ | . | New |
| Class | General Title | Credits | Notes | Credits |
| BIO HOT NEZ or | Concepts of Biology II Cells and A | lolecules | | |
| <u>CEM 111</u> or | General Chemistry I | | | |
| <u>PHY 111</u> | General Physics I | 4 keep | | 4 |
| <u>MTH 191</u> | Calculus I | 5 keep | | 5 3 |
| Elective(s) | Computer and Information Literacy Take an additional three credits in the | 3 keep |) | 3 |
| | MTH discipline | ³ rem | ove | |
| ENG 111 | Composition I | 4 keep |)) | 4 moved from semester 2 |
| Total | composition | 19 | | 16 |
| Second Semester | | | | |
| Class | Title | Credits | | |
| BIO 103 16 or | General Biology I Ecology and General Chemistry II | Evolutio | ¥7 | |
| <u>CEM 122</u> or <u>PHY 122</u> | General Physics II | 4 keep |) | 4 |
| CPS 171 | Introduction to Programming with C++ | 4 rem | | |
| MTH 192 | Calculus II | 4 keep |) | 4 |
| | Introduction to American Government | ₃ Cha | nge to social | |
| <u>PLS 112</u> | | scie | nce elsective | 3 moved from semester 5 |
| <u>MTH 160</u> | Basic Statistics | 4 keej | 0 | 4 moved from semester 3 |
| Total | | 19 | | 15 |
| Third Semester | | | | |
| Class | Title | Credits | | |
| <u>ENG 226</u> | Composition II | 3 kee | 0 | 3 |
| MTH 197 | Linear Algebra | 4 kee | þ | 4 |
| PSY 100 | Introduction to Psychology | | nge to social | |
| | | | nce elsective | 3 |
| <u>COM 101</u> | Fundamentals of Speaking | 3 keep | | 3 moved from semester 4 4 moved from semester 4 |
| <u>MTH 293</u> Total | Calculus III | 4 keej 17 | 5 | 17 |
| | | 17 | | |
| Fourth Semester | | | | |
| Class | Title | Credits | | |
| Elective(s) | Arts and Humanities | 3 kee | p | 3 |
| | Take an additional three credits in the | 3 | | |
| | MTH discipline | Tem | | 4 moved from semester 5 |
| MTH 295 | Differential Equations Arts and Humanities | 4 kee 3 kee | | 3 moved from semester 3 |
| Elective(s) | Arts and Humanifies Take an additional three credits in the | | | s morea nom semester e |
| | MTH discipline | ³ kee | р | 3 moved from semester 5 |
| Total | | 16 | | 13 |
| Fifth Semester - no | longer needed | | | |
| Total Credits | | | | |
| Required | | 71 | | 61 |

| Physics/Pre-Eng | gineering (PENG) | ······ | <u>.</u> | |
|-----------------------------|---|---|-----------------|-----------------------|
| First Semester | | | | |
| Class | Title | Credits Notes | New Credits | |
| CEM 111 | General Chemistry I | 4 keep | 4 | |
| MTH 191 | Calculus I | 5 keep | 5 | |
| <u>PHY 111</u> | General Physics I | 4 keep | 4 | |
| Elective(s) | Computer and Information Literacy | ³ keep | 3 | |
| Total | | 16 | 16 | |
| Second Semester | | | | |
| Class | Title | Credits | | |
| C PS 171 | | ⁴ remove | | |
| ENG 111 | Composition I | 4 keep | 4 | |
| MTH 192 | Calculus II | 4 keep | 4 | |
| PHY 122 | General Physics II | 4 keep | 4 | |
| <u>Elective(s)</u> Total | Arts and Humanities | 3 keep 19 | 3 Note: N 15 | Moved from semester 5 |
| Third Semester | | | | |
| Class | Title | Credits | | |
| ENG 226 | Composition II | 3 keep | 3 | |
| <u>MTH 197</u> | Linear Algebra | 4 keep | 4 | |
| <u>PHY 211</u> | Analytical Physics I | 5 keep Change to social | 5 | |
| <u>PSY 100</u> | Introduction to Psychology | $\frac{3}{3}$ science elsective | 3 | |
| Total | | 15 | 15 | |
| Fourth Semester | | | | |
| Semester | | | | |
| Class | Title | Credits | | |
| <u>COM 101</u> | Fundamentals of Speaking | 3 keep | 3 | |
| MTH 293 | Calculus III | 4 keep | 4 5 | |
| PHY 222 | Analytical Physics II <u>Arts and Humanities</u> | 5 keep 3 keep | 3 | |
| <u>Elective(s)</u> Total | Arts and numanities | 15 | 15 | |
| Fifth Semester | | | | |
| Class | Title | Credits | | |
| MTH 295 | Differential Equations | 4 keen | 4 | |
| PLS 112 | Introduction to American | ³ Change to social science elsective | 3 | |
| | Government | | 5 | |
| Total | | 7 | 1 | |
| Total Credits | | 70 | 68 | |
| Required | | 72 | 08 | |

PROGRAM CHANGE OR DISCONTINUATION FORM

| Program Code: ASMSAS | Program Name: Associates of Science Math and Science | Effective Term: W' 12 |
|-------------------------|--|-----------------------|
| Division Code: MらH | 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. <i>Mathematics</i> 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 <u>attached page from the catalog</u> . | |
| 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 | Red Shul | 11.4.11 |
| | Butcher | Happle Butche | 11-7-11 |
| Department Chair | Kristin Chatas | Vust Shal tother. | 11.4.11 11-7-1 |
| Division Dean/Administrator | Martha Showalter | m Horin But | te 11/10/11 |
| Vice President for Instruction | Stuart Blacklaw | Secula - | 12-6-11 |
| President | N/A | | |
| Do not write in shaded area. Entered i | in: Banner C&A Database | Log File <u>114/115</u> Board Approval | |

fn 12/19/11

Office of Curriculum & Assessment

MATH AND SCIENCE

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

mathematics

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71

Math and Science (ASMSAS)

| General Educati | on 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 OE 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) |

Core Courses

| CPS 171 | Introduction to Programming with C++ |
|------------|--------------------------------------|
| MTH 192 | Calculus II |
| BIO 103 or | General Biology II |
| PHY 122 | General Physics II Or CEM 122 |
| | |

Complete the requirements for the following concentration.

Math Concentration

Mathematics (MATH)

(25 credits)

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

Minimum Credits Required for the Program:

Associate in Science Deg

| TI a ba sc st St ar | ath and Science (ASMSAS) is program prepares students to transf four-year college or university to compl chelor's degree in biology, chemistry, com ence, math, or physics. The program will idents a solid foundation in math and sc udents should obtain program requiren d transfer equivalencies from the colle ich they are transferring. |
|---------------------------------------|--|
| re pl st ar tri | ticulation: This program will fulfill MAG quirements if, in addition to the courses eted to meet General Education requirem idents complete one additional course in a d Behavioral Science, Students must have anscripts certified for MACRAO complete e WCC Student Records Office. |
| Pi | ogram Admission Requirements: |
| | Students must have an Academic Math of 7 to begin the math sequence. Two ye nigh school algebra and one year of high pre-calculus are recommended to prepa chis program. |
| | |
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| | |
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| | |

Program Information Report

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22

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 |
| | | 595. |
| 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

Minimum Concentration Credits Required for the Program:

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

| CEM 111 CEM 122 CEM 211 CEM 222 | Medicine (BMED) General Chemistry I General Chemistry II Organic Chemistry I Organic Chemistry I Organic Chemistry II | (24 credits) 4 4 4 4 |
|---|---|--|
| BIO 227 or BIO 228 Elective | Biology of Animals Biology of Plants BIO 102, BIO 111, BIO 208, BIO 215, BIO 227, BIO 228, or BIO 237 | 4 4-5 |
| Chemistry/P CEM 111 CEM 122 CEM 211 CEM 222 MTH 197 MTH 293 | Te-Medicine (CMED) General Chemistry I General Chemistry II Organic Chemistry I Organic Chemistry I Linear Algebra Calculus III | (24.credits) 4 4 4 4 4 4 4 4 |
| CPS 271 CPS 272 | COMS) Object Features of C++ Data Structures with C++ | (22 credits) 4 4 Page 2 of 9 |

Program Information Report

| MTH 197 MTH 293 Elective | Linear Algebra Calculus III Take an additional six credits | 4 4 6 |
|--------------------------------|--|--------------|
| Mathematics | | (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 Cre | dits 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.

Monday, December 19, 2011 3:53:7 p.m.

| Program Code: ASMSAS | Program Nar | ne: Math and Science A | 5 program | Effective Term: f07 |
|--|---------------------|--|--|--|
| Division Code: MNB | Department: | Math & Natural Sciences | | |
| Directions: | <u></u> | | | |
| 1. Attach the current pro | ogram listing from | the WCC catalog or Web | site and indicate any o | changes to be made. |
| 2. Draw lines through an a separate sheet. | ny text that should | l be deleted and write in ac | ditions. Extensive na | rrative changes can be included on |
| new courses as part o | f the proposed pro | f change being proposed. ogram change, must be app s the program change form | proved separately using | iscontinuing a course, or adding g a Master Syllabus form, but |
| Requested Changes: | | | | |
| Review Remove course(s): Add course(s): Program title (title w Description Type of award Advisors Articulation informa Show all changes on the a | as tion |) | plan that includes for phasing out co Other remove cho | lity requirements es ormation attach program discontinuation transition of students and timetabl |
| Rationale for propose Transfer implications & | | | | |
| Financial/staffing/eq | luipment/space | implications: | | |
| 1 | | ulted regarding their use | of this program. | |
| List departments that | t have been const | uncu regularing their acc | | |
| List departments that Signatures: | t have been const | uncu regurung men uce | | ure Date |

| Kevlewer | Filit Ivanic | orginature | - Dute |
|--------------------------------------|-------------------------|-----------------------------------|---------|
| Initiator | L. Nelson | | |
| Department Chair | R. Hagood | -lot 7030 | 3/24/07 |
| Division Dean/Administrator | M. Showalter | Mr. Januar 1 | 3/29/07 |
| Vice President for Instruction | | Moner M. Joley. | 4/5/07 |
| President | | | |
| Do not write in shaded area. Entered | in: Banner C&A Database | Log File 7/29/075 Board Approval_ | |

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

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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 Educa | tion 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 con | centration 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 Coureas CPS 171 | Introduction to Programming with C++ | 4 |
|-------------------------|--------------------------------------|------------|
| MTH 192 | Calculus II | 4 |
| BIO 103 or | General Biology II | 889 200 |
| PHY 122 | General Physics II | 4 |

Minimum Concentration Credits Required for the Program:

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

| | (CORRESS) |
|---|--|
| CEM 111 | General Chemistry I 4 |
| CEM 122 | General Chemistry II 4 |
| CEM 211 | Organic Chemistry I |
| 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 |
| *************************************** | |
| CEM 111 | General Chemistry I |
| | • |
| CEM 122 | General Chemistry II |
| CEM 211 | Organic Chemistry I 9 |

Thursday , April 05, 2007 01:04:58 p.m.

Page 1 of 2

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Program Information Report

| CEM 222 | Organic Chemistry II |
|-------------|------------------------------------|
| MTH 197 | Linear Algebra 4 |
| MTH 293 | Calculus III 4 |
| Computer Se | ence (COBS) |
| 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 |
| | (ALANDER) |
| 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 |
| | Engineering (PENG) |
| 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 Cre | edits Required for the Program: 65 |

WASHTENAW COMMUNITY COLLEGE

PROGRAM CHANGE FORM

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| Program Code: | Program Name: Math and Science Associate in Science | | tive Term: | | |
|---|---|--|----------------------------|--|--|
| ASMSAS | Math and Science Associate in Science | <u>105</u> | | | |
| Directions: | | | | | |
| | ram listing from the WCC catalog and indicat | | | | |
| 2. Draw lines through any a separate sheet. | text that should be deleted and write in addit | ions. Extensive narrative changes can | be included on | | |
| new courses as part of t | for each type of change being proposed. Change proposed program change, must be appro- the same time as the program change form. | inges to courses, discontinuing a cour ved separately using a Master Syllabus | se, or adding form, but | | |
| Requested Changes: | | | | | |
| Remove course(s) Advisors Add course(s) Articulation information Total program credits: Current credits After changes) Program admission requirements Program Title (title was) Continuing eligibility requirements Description Program outcomes Type of award Other readability/format Show all changes on the attached page from the catalog. Rationale for proposed changes: standardize to present calalog format 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 | | |
| | | | | | |

| Keviewei | 1 mit i vanie | | |
|-------------------------------|-----------------------------|-------------------|---------|
| Program Change Initiator | | | |
| Department Chair | | | |
| Division Dean/Administrator | M. Showalter | m Shawat | 4/14/05 |
| Vice President of Instruction | ¥5 | Roger M. Palacy | 1/25/05 |
| Please submit completed form | to the Office of Curriculum | n and Assessment. | // |

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

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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.

(12 credits)

| General E | 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 | | | |

'The Chemistry/Pre-Medicine and Physics concentrations require ENG 107; al 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 9/15/05 make convection on Web fr concentrations require PHY 241 & 222:

111+122

Core Courses

| | 41363 | (12 0104100) |
|------------|--------------------------------------|--------------|
| 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:

.

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 |
|---------|---------|----------|---------|---------|
|---------|---------|----------|---------|---------|

Math and Science Concentrations

| | re-Medicine (BMED) (24 Credits) es Department |
|---------------------------------------|---|
| CEM 111 | General Chemistry I |
| CEM 122 | General Chemistry II |
| CEM 211 | Organic Chemistry I |
| CEM 222 | Organic Chemistry II |
| Choose: | BIO 227 Biology of Animals or |
| | BIO 228 Biology of Plants |
| Elective | BIO 102, BIO 111, BIO 208, BIO 215, BIO 216, BIO 227, BIO 228, BIO 237 |
| · · · · · · · · · · · · · · · · · · · | /Pre-Medicine (CMED) (24 Credits) |
| Physical Sci Advisor: | iences Department |
| 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 |
| | Science (COMS) (25 Credits) |
| CIS 238 | PC Assembly Language |
| 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 |
| | ics (MATH) (25 Credits) |
| Mathematic Advisor: | s Department |
| MTH 160 | Basic Statistics |
| MTH 197 | Linear Algebra |
| MTH 293 | Calculus III |
| MTH 295 | Differential Equations |
| Elective | take an additional nine credits |

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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

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WASHTENAW COMMUNITY COLLEGE PROGRAM AUTHORIZATION FORM

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Date

| 1. | Program Title: Science And | Math Associate In Scie | nce Degree | Program Code: MSAS |
|----|--------------------------------|--|---|--|
| 2. | Division: MNS | 3. Department: | | CIP Code: |
| 4. | Type of Program: A.A | A. 🔀 A.S. | 🗌 A.A.S. | A.T.S. |
| | Advanced Certificate | Mastery Certificate | Achievement Cer | |
| 5. | Will this program be Perkins f | unded? 🗌 yes | 🗌 no | 6. Effective Year: Fall 1999 |
| 7. | (BS) degree program in the | transfer to a four-year co e sciences. Four-year li udies emphasize commu aduates become teache | iberal arts graduate inication, analytica ers, scientists, chen | to complete a bachelor of science es prepare for a wide variety of jobs I, computational, scientific, and critical nists, biologists, doctors, laboratory |

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

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| 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: G. Analysis of Affected Instructional Units D. Enrollment Projections A. Program Description H. Articulations E. Program Cost Analysis B. Program Goals I. Licensure/Accreditation F. Course Descriptions C. Needs Assessment /Signature Print Name Approval Recommended: 11

| | | 5/11/59 |
|--|-----------------|---------|
| Program initiator: K. Butcher, J. Egan, D. Shier | James y | |
| | Jame C.S | Stulse |
| Dept. Chain/Dir.: same as above | | |
| Tuten (m Denk) | Jame CE | 5/11/59 |
| Dean/Admin .: Goorge Griewold James Egan | - Aller | PLITES |
| | The Aller | 5/4/17 |
| VP, Instr/Stud Ser: <u>Guy Altieri</u> | - All And All | 1/2:00 |
| President: Larry Whitworth | Trated & maunta | Q13197 |
| | | |
| Date of Board Approval: May 25,1999 | | |
| Date of Board Approval: 11100 2011999 | — () | |
| Available on disk | • | |
| 4. A. | | |

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 | | |

Document Code: Science & Math Approval

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

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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

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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

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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 | nts (33-34 credits)* ENG 111&122 Composition I&II |
|-------------------------------|--|
| 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) |
| Mathematics | MTH 191 Calculus I |
| Behavioral/ Social/Science | PLS 112 Introduction to American Government |
| Science | Choose either: BIO 101 Concepts of Biology or Physics 211 Analytical Physics I |
| Concentration | Frank Requirements (29-33 Credits) |

Select a concentration in Biology and General Science 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 |
|------------------------------|--|
| 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 |
| Physics: | The following courses are required: CEM 111, 122, 211 and 222; MTH 197, 293 and 295; and PHY 222 |
| 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 |
| Minimum Credits | |

SCIENCE and MATH

to transfer to a This of 1 or university to 晋 eductor of science (BS) in the sciences. Foura graduates prepare for ny of jobs and ir studies emphasize mitytical, fic and critical nee graduates mists, chemists, laboratory ICIALS. inne

*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 fouryear institutions. See p. 230 in the WCC Catalog and a counselor for additional information.

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.