

Bay College  
Course Cover Sheet



**M-CAM Training Area:**

CNC/Machining **Multi-Skilled/Mechatronics** Production Operation Welding/Fabrications

**Program(s):** Mechatronics and Robotics Systems, AAS

Mechatronics, Certificate

**Course:** ELEC 285 Fluid Power

**Course Description:** A study of the principles and applications relating to Hydraulics and Pneumatics used in industrial equipment applications. The course will cover symbology used in fluid power, flow, and pressure relationships, and hydraulic circuitry. This course is designated as a basic introductory course for both electrical and non-electrical majors.

**Date Modified:** Dec 2014

**Faculty Developer(s)/Instructional Designers(s):** Mark Highum

**Employer/Industry Partner:** Engineered Machine Products (EMP), Stewart Manufacturing, Cal Grinding

**College Contact:** Mark Highum

**Phone:** 906.217.4083

**Email:** highumm@baycollege.edu

**Additional Information/Comments:**

**Textbook used:** Introduction to Fluid Power by James Johnson ISBN 978-0-7668-2365-5

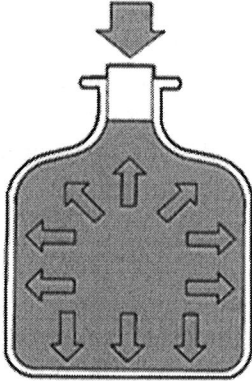
**Labs used:** Festo Learnline Hydraulics and Pneumatics trainers and associated lab materials

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

The eight community colleges and M-CAM is an equal opportunity employer/program provider. Auxiliary aids and services are available upon request to individuals with disabilities. TTY users please call 1-877-878-8464 or visit [www.michigan.gov/mdcr](http://www.michigan.gov/mdcr).

This work is licensed under a Creative Commons Attribution 4.0 International License.





**COURSE SYLLABUS**      **Fall 2016**  
**ELEC 285**  
**Fluid Power**

**MECHATRONICS**  
**DIVISION OF TECHNOLOGY**  
**BAY DE NOC COMMUNITY COLLEGE**

**LEAD INSTRUCTOR: MARK HIGHUM**

**I. COURSE INFORMATION:**

**Title:**..... *Fluid Power*

**Number:**.....ELEC 285 01 10

**Credit/contact hours:**.....4/4

**Prerequisites:**.....None

**Classroom number:**.....402E/972

**Class Hours:**.....Tues/Thurs 12PM- 1:50 PM

**II. INSTRUCTOR INFORMATION:**

**Name:**.....Mark Highum

**Office location:**.....402D

**Office Hours:**..... Tuesdays/Thursdays 11 AM – 12 PM, 2 – 4 PM

**E-Mail:**..... [highumm@baycollege.edu](mailto:highumm@baycollege.edu)

**Office Phone:**.....906-217-4083

**III. TEXTS, READINGS, MATERIALS:**

**Texts:**                      No textbook required

**Materials Required for the course:**

- A. Text (provided by Instructor)
- B. Notebook
- C. USB storage device (optional)

#### **IV. ONLINE COURSE COMPONENT**

There is no required online component to this class. The instructor will make some course materials available through the MyBay portal. Additionally, the student will be required to submit some classwork and lab reports via the MyBay portal. The instructor will use the Bay College email system for any needed communication to students.

#### **V. CATALOG DESCRIPTION:**

A study of the principles and applications relating to Hydraulics and Pneumatics used in industrial equipment applications. The course will cover symbology used in fluid power, flow, and pressure relationships, and hydraulic circuitry. This course is designated as a basic introductory course for both electrical and non-electrical majors.

#### **VI. STUDENT ASSESSMENT:**

All Bay College students will be expected to participate in assessment activities during their course of study at the college. These activities will include participating in assessment of General Education Outcomes, classroom assessment for specific course lessons, or assessment of skills needed for a specific program. These assessments will help instructors and the college make decisions to improve instruction and student learning.

**VII. STUDENT LEARNING OUTCOMES:**

| <b>Course Outcomes</b>  | <b>Assessment Method</b> |
|---|--------------------------|
| Define and apply fundamental Hydraulic / Pneumatic principles; including Pascal's Law, and Bernoulli's principle. | Lab /Homework/ Exam      |
| Identify Basic Hydraulic / Pneumatic symbols.   | Lab /Homework/ Exam      |
| Identify Basic Hydraulic / Pneumatic components.  | Lab /Homework/ Exam      |
| Analyze the operation of Hydraulic / Pneumatic actuators.   | Lab /Homework/ Exam      |
| Analyze the operation of Hydraulic / Pneumatic valves.  | Lab /Homework/ Exam      |
| Analyze the operation of Hydraulic / Pneumatic solenoid controlled valves.  | Lab /Homework/ Exam      |
| Analyze the operation of Hydraulic / Pneumatic pilot controlled valves.   | Lab /Homework/ Exam      |
| Analyze the operation of Hydraulic / Pneumatic pressure sources.  | Lab /Homework/ Exam      |
| Analyze the use of instrumentation in Hydraulic / Pneumatic systems.  | Lab /Homework/ Exam      |
| Compare Hydraulic / Pneumatic systems.  | Lab /Homework/ Exam      |
| Troubleshoot Hydraulic / Pneumatic systems.   | Lab /Homework/ Exam      |

**VIII. STUDENT EVALUATION/GRADING:**

**% of Grade**

**Unit Exams:**

25%

**Quizzes/Homework:**

15%

**Labs**

35%

**Final exam :**

25%

**Total:**

**100%**

**Grade Scale**

|        |   |   |
|--------|---|---|
| >90%   | = | A |
| 80-90% | = | B |
| 70-80% | = | C |
| 60-70% | = | D |
| <60%   | = | F |

## **IX. COLLEGE POLICIES**

### **SEXUAL HARASSMENT AND DISCRIMINATION STATEMENT**

Bay College takes its responsibilities under Title IX of the Education Amendments of 1972 seriously. Bay College is committed to providing an educational environment free from discrimination or harassment based on race, color, national origin, religion, sex, gender identity, age, disability, or other protected status. Bay College Board Policy 1060 prohibits discrimination or harassment based on the above-named categories. Prohibited acts include but are not limited to sexual assault, sexual harassment, domestic violence, dating violence, and stalking.

Students who experience or observe an incident of sex- or gender-based discrimination are encouraged to report it to a College employee or a member of the College's Title IX team. Faculty and staff are considered "responsible employees" and are required to report any such incident they observe or of which they are made aware. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a College-approved research project. Students also have options to discuss issues confidentially.

Questions concerning discrimination or harassment on the basis of gender may be directed as well to either the Title IX Coordinator or a Deputy Title IX Coordinator:

Kevin Carlson  
Title IX Coordinator  
Office: CB 201J (Escanaba Campus)  
Office: WC 215 (Iron Mountain Campus)  
[kevin.carlson@baycollege.edu](mailto:kevin.carlson@baycollege.edu)  
906-217-4023

Dave Laur  
Deputy Title IX Coordinator  
Office: SC 512 (Escanaba Campus)  
[dave.laur@baycollege.edu](mailto:dave.laur@baycollege.edu)  
906-217-4031

Bridget DeGroot  
Deputy Title IX Coordinator  
Office: SC 523B (Escanaba Campus)  
[bridget.degroot@baycollege.edu](mailto:bridget.degroot@baycollege.edu)  
906-217-4049

## **SEXUAL HARASSMENT AND DISCRIMINATION STATEMENT (Cont.)**

A complaint may also be filed by going to the College website [www.baycollege.edu](http://www.baycollege.edu), selecting the “Campus Safety” link, and selecting the “Incident Report” link <https://publicdocs.maxient.com/incidentreport.php?BayCollege>. This report allows individuals to identify themselves or to submit an anonymous report.

### **Student Academic Assistance**

**Academic Testing Services** provides proctored testing for both online and traditional courses. If you have a class on campus or online that requires you to take exams in testing services and have questions, please stop by room 876 in the HUB at the Escanaba Campus or call (906) 217-4035.

The **Bay College West Student Success Center** provides **tutoring** to students in all courses, as well as **Supplemental Instruction (SI)** in select courses. The Student Success Center is located in room 221 on the upper level next to the Student Services Desk, (906) 302-3035.

The Bay College **Library** provides services that are designed to meet classroom-related and general information needs of students, faculty, staff and the community. The Library’s primary goal is to provide resources that will enhance and expand an individual’s learning experience. Call (906) 217-4055 or stop by JHUC 952.

The **Office of Accessibility** assists students with a variety of services for classroom success and is located in room 811 of the Student Success Center in the HUB at the Escanaba Campus, (906) 217-4017. Services include (*but are not limited to*) specialized testing, classroom note taker, reader and/or scribe, alternative textbooks, use of a recorder for academic needs, interpreter for the deaf, and temporary use of a motorized scooter. These services are also provided to students at Bay College West Campus in room 211, (906) 302-3004.

**Online Learning Support** is available to students. For assistance stop by Online Learning Support in the HUB at the Escanaba campus Monday-Friday 8:30 am-5 pm or call (906) 217-4276 or email [onlinehelp@baycollege.edu](mailto:onlinehelp@baycollege.edu).

**Placement test preparation** is available to students seeking to place well initially or re-test to improve their placement in English, reading, or math. Students can schedule an appointment to receive preparation resources and strategies on how to prepare to take the placement test. Please call (906) 217-4301 or stop by the reception desk for the Student Success Center in the HUB at the Escanaba campus. Placement test preparation is available at West Campus during the fall and winter semesters. Call (906) 302-3035 or stop by room 221.

**Supplemental Instruction (SI)** is an internationally recognized academic support program that targets traditionally difficult courses. Students come together in regularly-scheduled study sessions to compare notes, discuss course materials, develop study tools, practice problem solving, and prepare for exams. These sessions are facilitated by trained SI leaders that attend the course with students and prepare study materials for use during SI sessions. SI staff can be found in the Student Success Center (rooms 827-833 at the Escanaba Campus or room 221 at West Campus) or can be reached via phone at (906) 217-4175.

The **TRiO Student Support Services** program provides many services to students, including academic planning, career exploration, transfer assistance, personal financial training and support, FAFSA assistance, cultural & college trips, leadership opportunities, grant aid, and tutoring in math, writing and General Education courses. The TRiO reception offices are located in room 815 of the Student Success Center in the HUB at the Escanaba Campus, (906) 217-4133 and in the Student Success Center at West Campus, (906)-302-3035.

**Tutoring** has become very popular at Bay College and is offered for all courses. Tutoring requests can be made through the front reception desk of the Student Success Center in the HUB at the Escanaba Campus. Feel free to stop in or call (906) 217-4230.

*Please refer to the college catalog for specific details about services available to students.*

### **Bay College ADA Statement**

Disability-related accommodations and services for all Bay College students are provided through the Office of Accessibility (OOA) located on the Escanaba campus, room 811 of the Student Success Center in the HUB, or call (906) 217-4017, or email [OOA@baycollege.edu](mailto:OOA@baycollege.edu). If you are a student with a disability and think you may require disability-related accommodations or services, please contact the Office of Accessibility. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation in accordance with federal, state, and Bay de Noc Community College guidelines. Our online accessibility policy can be viewed at <http://www.baycollege.edu/Academics/Online-Learning/Accessibility-Policy.aspx>.

### **Technical Support for Online Learning**

Students can receive live support for technical issues they encounter related to online learning.

Hours: 8:30 a.m. to 4:30 p.m. EST, Mon-Fri

Phone: 1.906.217.4276

Email: [onlinehelp@baycollege.edu](mailto:onlinehelp@baycollege.edu)

## **Class Cancellation/College Closing/Notification of Emergency Situations**

Weather concerns: As stated in Bay College's Student Handbook, A reasonable effort to be present is expected. Therefore, students may exercise their own judgment as to whether or not travel to campus is warranted during adverse weather. If you decide not to travel to campus, or determine that you need to leave campus because of threatening weather, you will be expected to contact me via phone as soon as possible to let me know why you will be absent and to discuss options for completing the missed work. Students are reminded of the opportunity to receive weather related and other emergency messages from the College through a cell phone text messaging option, called e2campus.

Enrollment into the emergency notification process can be completed by visiting Bay's website, navigating to the Campus Safety tab and following the instructions for emergency text messaging.

Should the instructor need to cancel a class session, every effort will be made to provide at least a one week notice of this cancellation. In the event of illness or other unforeseen conditions, the instructor will contact the students via the college email system as early as possible.

## **Academic Integrity**

It shall be the policy of Bay de Noc Community College Board of Trustees that the college provides opportunities for students to gain the knowledge, skills, judgment and wisdom they need to function in society as responsible citizens. Plagiarism, falsifying data, and other forms of academic dishonesty are inconsistent with the college's goals and mission; Students are expected to pursue their education at Bay College with honor and integrity. In line with this college policy, any student found cheating, copying, or otherwise misrepresenting his/her performance, or any way gaining an unfair advantage over other students will be subject to disciplinary actions according to the Bay College Academic Integrity Procedures.

## **Course Withdrawal**

It is the student's responsibility to withdraw/drop from the class if he or she chooses to do so. You may drop this class within the first two weeks (**Sept 9**) with reimbursement for the tuition. You may withdraw within the third through tenth week (**Nov 4**) and receive a WP (if passing at the time of the withdrawal request) or WF (if failing at the time of the withdrawal request). After the tenth week students are required to request an Administrative Appeal. All students who do not follow the drop/withdrawal procedure will receive an "F" for the class. Please refer to the college catalog for more specific details on this issue.



## **X. Guidelines for Success**

**Attendance:** Students are expected to attend all class sessions. Should a student not be able to attend a class session, he/she is expected to talk to the instructor about material that was missed. Absences that are expected by the student should be discussed with the instructor prior to missing the class.

**Missed Assignments:** Assignments (and exams) are not normally accepted late. If the instructor allows a missed assignment (or exam) to be made up, it will be due within one week of the original due date. Any late assignment after one week will be counted as half credit.

**Participation:** Students are expected to participate in class discussions. Taking notes is not required, but is encouraged. Students are expected to read the assigned text prior to the class session. The instructor retains the right to use the book, handed out material and lecture notes for the exams.

**Acceptable Use Policies:** apply to all workstations and servers in CNSS classrooms and labs. Any student found to be violating acceptable use policies will be referred to the Dean of Business and Technology for discipline.

**Incomplete:** An incomplete grade is given only in extenuating circumstances, and only with prior arrangement with the instructor.

**XI. TENTATIVE COURSE SCHEDULE: (This schedule is provided as a guide and is not to be construed as a contract)(Assignment/grade section is for student record keeping)**

| <b>DAY</b>   | <b>DATE</b> | <b>SUBJECT/TOPIC</b>                   | <b>Assignment/Grade</b> |
|--------------|-------------|--|-------------------------|
| <b>Tues</b>  | 8/30/16     | Introduction                           |                         |
| <b>Thurs</b> | 9/01/16     | Fluid Power Concepts and Principles    |                         |
| <b>Tues</b>  | 9/06/16     | Fluid Power Concepts and Principles    |                         |
| <b>Thurs</b> | 9/08/16     | Compressed Air Supply and Distribution |                         |
| <b>Tues</b>  | 9/13/16     | Compressed Air Supply and Distribution |                         |
| <b>Thurs</b> | 9/15/16     | <b>Exam One</b>                        |                         |
| <b>Tues</b>  | 9/20/16     | Single Acting Cylinders                |                         |
| <b>Thurs</b> | 9/22/16     | Double Acting Cylinders                |                         |
| <b>Tues</b>  | 9/27/16     | Indirect Control                       |                         |
| <b>Thurs</b> | 9/29/16     | Memory Control                         |                         |
| <b>Tues</b>  | 10/04/16    | Automatic Return                       |                         |
| <b>Thurs</b> | 10/06/16    | <b>Exam Two</b>                        |                         |
| <b>Tues</b>  | 10/11/16    | Or Logic Function                      |                         |
| <b>Thurs</b> | 10/13/16    | Or Logic Function                      |                         |
| <b>Tues</b>  | 10/18/16    | And Logic Function                     |                         |
| <b>Thurs</b> | 10/20/16    | And Logic Function                     |                         |
| <b>Tues</b>  | 10/25/16    | Flow Control                           |                         |
| <b>Thurs</b> | 10/27/16    | Flow Control                           |                         |
| <b>Tues</b>  | 11/01/16    | Quick Exhaust                          |                         |
| <b>Thurs</b> | 11/03/16    | <b>Exam Three</b>                      |                         |
| <b>Tues</b>  | 11/08/16    | Sequence Valves                        |                         |
| <b>Thurs</b> | 11/10/16    | Sequence Valves                        |                         |
| <b>Tues</b>  | 11/15/16    | Pressure Regulators                    |                         |
| <b>Thurs</b> | 11/17/16    | Pressure Regulators                    |                         |
| <b>Tues</b>  | 11/22/16    | Coordinated Motion Control             |                         |
| <b>Thurs</b> | 11/24/16    | <b>No Classes - Thanksgiving</b>       |                         |
| <b>Tues</b>  | 11/29/16    | Coordinated Motion Control             |                         |
| <b>Thurs</b> | 12/01/16    | Coordinated Motion Control             |                         |
| <b>Tues</b>  | 12/06/16    | Coordinated Motion Control             |                         |
| <b>Thurs</b> | 12/08/16    | Final Review                           |                         |
| <b>Tues</b>  | 12/13/16    | <b>LAB/ Hands ON Final</b>             |                         |
| <b>Thurs</b> | 12/15/16    | <b>FINAL CUMULATIVE EXAM</b>           |                         |



Subject Matter Expert (SME) Course Review Summary

College: Bay College

M-CAM Training Area:  CNC/Machining  Multi-Skilled/Mechatronics  Production Operation  Welding/Fabrication

Degree Program Name: Mechatronics

Title of Course: ELEC285 Fluid Power

Subject Matter Expert (SME) Reviewer Information

Name: Casey Calouette

Title: Engineer

Phone: 9062413582

Email: ccalouette@calvalves.com

Organization/Affiliation: Cal Grinding, Inc.

Attach Resume or provide credentials (showing years of experience and work experience that is relevant to course content):

AAS : Electrical Engineering Technology – Bay College, 2003

BS : Electrical Engineering Technology – Michigan Technological University, 2005

Ross’s Manufacturing – Design Engineer, Frozen Custard Machine Electrical&Controls Design 2006

Cal Grinding, Inc. – Electrical & Manufacturing Engineer, Automation and Manufacturing Environment, 2006-Present

Synopsis of Findings:

While not as glamorous as the robotics courses, ELEC285 covers the foundations for the supporting hardware that will almost always pair with a robot. In addition simpler systems function using these and nearly every shop will have some, if not all, of these components.

Reviewers Signature \_\_\_\_\_

Date: 3/28/17

## Michigan Coalition for Advanced Manufacturing Subject Matter Expert Course Review

| 1. Course Overview and Objectives  | Exceptional | Satisfactory | Ineffective |
|--|-------------|--------------|-------------|
| The goals and purpose of the course is clearly stated.   |             | X            |             |
| Prerequisites and/or any required competencies are clearly stated.                               |             | X            |             |
| Learning objectives are specific and well-defined.   |             | X            |             |
| Learning objectives describe outcomes that are measurable.                                       | X           |              |             |
| Outcomes align to occupational focus (industry skills and standards).                            |             | X            |             |
| Comments or recommendations:   |             |              |             |
|  |             |              |             |
| 2. Material and Resources  | Exceptional | Satisfactory | Ineffective |
| The instructional materials contribute to the achievement of the course learning objectives.     |             | X            |             |
| The materials and resources meet/reflect current industry practices and standards.               |             | X            |             |
| The instructional materials provide options for a variety of learning styles.                    |             | X            |             |
| Resources and materials are cited appropriately. If applicable, license information is provided. |             | X            |             |
| Comments or recommendations: No instructional textbooks noted on the syllabus.                   |             |              |             |
|  |             |              |             |
| 3. Learning Activities   | Exceptional | Satisfactory | Ineffective |
| Provide opportunities for interaction and active learning.                                       | X           |              |             |
| Help understand fundamental concepts, and build skills useful outside of the learning object.    | X           |              |             |
| Activities are linked to current industry practices and standards.                               | X           |              |             |
| Comments or recommendations: Many opportunities for hands on labs to better grasp the concepts.  |             |              |             |
|  |             |              |             |

**Michigan Coalition for Advanced Manufacturing  
Subject Matter Expert Course Review**

| 4. Assessment Tools/Criteria for Evaluation   | Exceptional | Satisfactory | Ineffective |
|---|-------------|--------------|-------------|
| The course evaluation criteria/course grading policy is stated clearly on syllabus.   | x           |              |             |
| Measure stated learning objectives and link to industry standards.                    |             | x            |             |
| Align with course activities and resources.   |             | x            |             |
| Include specific criteria for evaluation of student work and participation.           |             | x            |             |
| Comments and recommendations:   |             |              |             |
| 5. Equipment/Technology   | Exceptional | Satisfactory | Ineffective |
| Meets industry standards and needs.   | x           |              |             |
| Supports the course learning objectives.  | X           |              |             |
| Provides students with easy access to the technologies required in the course/module. | x           |              |             |
| Comments and recommendations:   |             |              |             |

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

The eight community colleges and MCAM is an equal opportunity employer/program provider. Auxiliary aids and services are available upon request to individuals with disabilities. TTY users please call 1-877-878-8464 or visit [www.michigan.gov/mder](http://www.michigan.gov/mder).

