Prepared: Sal Ienco Approved: Corey Meunier

Course Code: Title	MCH100: APPLIED MECHANICS
Program Number: Name	4080: CIVIL ENG TECHNICIAN
Department:	CIVIL/CONSTRUCTION
Semester/Term:	18W
Course Description:	You are surrounded by a wide variety of structures such as buildings, bridges, and dams. These structures play such an important role in our lives that we cannot ignore them. As a technician, you will need to know this subject well enough to intelligently facilitate communication between designers and construction personnel. This Applied Mechanics course explores mathematical expressions which have been developed to describe how various elements of structures work. But at the same time every effort is made to link the mathematical expression to structural function. To that end you are encouraged to visually appreciate various structures in your community while understanding the mathematical relationships found in structures. This course is the first in the series of courses that leads to MCH212 and ends with CIV225.
Total Credits:	4
Hours/Week:	4
Total Hours:	60
Prerequisites:	PHY100
Substitutes:	ARC100, MCH110, PHY118
This course is a pre-requisite for:	MCH212
Vocational Learning Outcomes (VLO's): **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4080 - CIVIL ENG TECHNICIAN** #7. use industry-specific electronic and digital technologies to support civil engineering projects. #8. participate in the design and modeling phase of civil engineering projects by applying engineering concepts, basic technical mathematics and principles of science to the review and production of project plans. #11. apply teamwork, leadership and interpersonal skills when working individually or within multidisciplinary teams to complete civil engineering projects.

Essential Employability Skills (EES):	#3. Execute mathematical operations accurately. #4. Apply a systematic approach to solve problems. #5. Use a variety of thinking skills to anticipate and solve problems. #6. Locate, select, organize, and document information using appropriate technology and information systems.
Course Evaluation:	Passing Grade: 50%, D
Other Course Evaluation & Assessment Requirements:	Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 - 59% 1.00 F (Fail)49% and below 0.00 CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar`s office. W Student has withdrawn from the course without academic penalty. Attendance Students are only allowed to miss three classes without a documented explanation. One mark will be deducted from your overall grade for each undocumented explanation. The maximum deduction in overall grade is not to exceed 15%. Valid documented explanation include: • Medical reason • Family emergency • Child care issue • Transportation problems The documented explanation has to be sent to me by e-mail no later than three days from a missed class. A Doctor note, etc., is to be attached as a PDF file to your e-mail.
Evaluation Process and Grading System:	<table><tr><th>Evaluation Type</th><th>Evaluation Weight</th></tr><tr><td>Quizzes/Assignments/Experiments</td><td>40%</td></tr><tr><td>Test 1</td><td>30%</td></tr><tr><td>Test 2</td><td>30%</td></tr></table>
Books and Required Resources:	Statics and Strength of Materials by Barry Onouye Publisher: Pearson ISBN: 0-13-111837-4
Course Outcomes and Learning Objectives:	**Course Outcome 1.** Upon successful completion, the student will be able to: 1.Recall and apply basic trigonometry and measurement units to the study of statics. **Learning Objectives 1.** 1.1 Illustrate with a sketch of a right-angled triangle the accepted method of labeling both the

sides and the angles of this triangle.
1.2 Recall the six trigonometric functions and apply these to simple right-angled triangle problems
to solve for the lengths of unknown sides or the magnitude of unknown angles.
1.3 Apply the basic principle known as the Pythagorean Theorem.
1.4 Recall both the sine law and the cosine law and apply these to the solution of triangles which
are non-right-angled. Show how the cosine law is related to the Pythagorean Theorem.
1.5 Recall the relationships that exist by way of conversion factors between the S.I. metric and the Imperial system of units for quantities such as length, mass, weight and force. Convert between systems of units using the method of multiplying by ratios equal to one.

Course Outcome 2.

Upon successful completion, the student will be able to:
2. Solve technical problems by applying principles of statics involving the manipulation of vectors.

Learning Objectives 2.

2.1 Define what is meant by a scalar quantity and list at least a dozen examples of scalar quantities.
2.2 Define what is meant by a vector quantity and list seven examples of vector quantities.
2.3 List the various types of forces along with their characteristics and the commonly used units for forces both in the S.I. metric and the Imperial system of units.
2.4 Describe what is meant by the resultant of a system of forces.
2.5 Describe what is meant by the equilibrant of a system of forces.
2.6 Using the method known as the parallelogram method, determine the resultant of two vector
quantities using both a graphical and a mathematical approach.
2.7 Using the method known as the string polygon method, determine the resultant of two or more
vector quantities using a graphical approach.
2.8 Given a vector quantity superimposed onto an x-, y-coordinate plane, resolve the vector into its two orthogonal components, namely its x-component and its y-component.
2.9 Determine the resultant of two or more vector quantities by the analytical method known as the
method of components.

Course Outcome 3.

Upon successful completion, the student will be able to:
3. Solve technical problems by applying principles of statics involving moments about axes caused by single force or a combination of forces

Learning Objectives 3.

3.1 Define what is meant by the moment or torque of a force about a given point of rotation.
3.2 Write the equation for determining the moment or torque of a force about a given point of rotation.
3.3 Calculate the moment of a force by:

i. Multiplying the total force by its perpendicular distance to the point of rotation,
ii. Multiplying each of the forceÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢s components by their respective perpendicular distances to
the point of rotation.
3.4 Determine the resultant moment for a system of moments.
3.5 Name the three factors that together constitute what is known as a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coupleÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
3.6 Calculate the moment of a given couple.
3.7 Replace a given couple with an equivalent couple at a different location.
3.8 Analyze the effects of couples on a body.

Course Outcome 4.

Upon successful completion, the student will be able to:
4. Solve technical problems by applying principles of statics involving equations of equilibrium and the free body diagram.

Learning Objectives 4.

4.1 Write the 3 equations that represent the three requirements that must be met for a body to be in a state of ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ static equilibriumÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
4.2 Explain what is meant by a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ free body diagramÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
4.3 List the assumptions or conventions that one must employ when drawing free body diagrams and replacing supports with equivalent supporting forces.
4.4 Construct a free body diagram for parts or the whole of given mechanisms or structures.
4.5 Differentiate between ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ externally applied loadsÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ internal reactionsÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
4.6 Apply the three conditions of equilibrium to free body diagrams and determine the reactions.
4.7 Describe what is meant by a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ two force memberÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and explain the implications for a free body diagram involving such members.
4.8 Apply the principles of equilibrium to the solution of problems involving static systems of pulleys.

4.9 Describe what is meant by and solve problems involving ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coplanar concurrent force systemsÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
4.10 Explain the difference between what is known as a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ concentrated loadÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and what is known as a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ distributed loadÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
4.11 Describe what is meant by and solve problems involving ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coplanar parallel force systemsÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ including both uniform and non-uniform beam loading.
4.12 Describe what is meant by and solve problems involving ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coplanar, non-concurrent force systemsÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.

Course Outcome 5.

Upon successful completion, the student will be able to:

5. Analyze trusses by evaluating joints and isolating sections.

Learning Objectives 5.

5.1 Recognize the difference between the forces of ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ tensionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ CompressionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ in structural members such as struts and ties.
5.2 Differentiate between the structures known as ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ trussesÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and those known as ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ framesÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
5.3 Identify ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ members that carry no loadÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ in trusses and frames. Appreciate the importance of identifying such members in the solution of internal forces in structural members such as trusses and frames.
5.4 Describe what is meant by a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ two-force memberÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and list the implications that this type of member has on the solution of forces in members of trusses and frames.
5.5 Describe what is meant by and list the assumptions that apply to, what is known as a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ pin connectionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ in a truss or a frame.
5.6 Determine the loads in individual members of coplanar pin-connected trusses and frames by using method of joints and being certain to identify whether the members are in tension or compression.
5.7 Determine the forces in selected members of a truss by using method of sections and being certain to identify whether the members are in tension or compression.
5.8 Identify and draw a free body diagram of a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ partial trussÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ that is part of the entire truss.
5.9 Describe what is meant by a ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ three-force memberÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and identify clearly the difference between this type of member and the previously used ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ two-force memberÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.

Course Outcome 6.

Upon successful completion, the student will be able to:
6. Solve technical problems by applying principles of statics involving friction.

Learning Objectives 6.

6.1 Write the characteristics that pertain to the force known as the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ friction forceÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
6.2 Sketch the graph of the friction force versus the applied force when a force is applied to a block, initially at rest, on a horizontal, flat surface. The applied force starts at zero and increases gradually up to and beyond the point where the block begins to slide.
6.3 Indicate clearly the two distinct regions of the graph drawn above, namely, the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ static regionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ kinetic regionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
6.4 Explain what is meant by the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coefficient of frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.
6.5 Write the equation for the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coefficient of static frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢.

	6.6 Write the equation for the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ coefficient of kinetic frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢. 6.7 Explain what is meant by the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ angle of frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢. 6.8 Write the equation for the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ angle of frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ in terms of the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ maximum force of static frictionÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ and the ÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ normal reaction forceÃƒÆ`Ã`Â¢ÃƒÂ¢`Ã`Â¬ÃƒÂ¢ Ã`Â¢ between the object and the surface upon which it rests. 6.8 Solve a variety of problems involving friction. These problems will include those that require the student to determine whether motion is impending or not. Also, solve those problems that require the student to determine whether tipping or sliding will occur. **Course Outcome 7.** Upon successful completion, the student will be able to: 7. Apply teamwork, leadership and interpersonal skills when working individually or within a team to complete the survey field camp projects. **Learning Objectives 7.** 7.1 Take initiative while working with your team to complete in class assignments and laboratories. 7.2 Assume accountability for self in managing the use of time and resources to meet established deadline. 7.3 Work as an effective team player to complete in class assignments and laboratories while promoting a positive work environment. 7.4 Use effective time-management and organizational techniques to prioritize project tasks and to accomplish goals set by the team. 7.5 Use conflict resolution skills in the classroom and laboratory including cooperation and compromise. **Course Outcome 8.** Upon successful completion, the student will be able to: 8. Use industry-specific electronic technologies to support the calculations for typical statics problems. **Learning Objectives 8.** 8.1 Solve vector addition problems using an Excel spreadsheet. 8.2 Solve vector addition problems using AutoCAD.
Date:	Friday, January 19, 2018
	Please refer to the course outline addendum on the Learning Management System for further information.