

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:**            *APPLIED MECHANICS - DYNAMICS*

**CODE NO. :**                *MCH 111*    **SEMESTER:**    **TWO**

**PROGRAM:**                **AVIATION TECHNOLOGY (FLIGHT)**

**AUTHOR:**                    **GEOFFREY DISANO/ALVIN OLAR**

**DATE:**                      **JAN 2006**    **PREVIOUS OUTLINE :**    **JAN 2001**

**APPROVED:**

|  |             |             |
|--|-------------|-------------|
|  | _____       | _____       |
|  | <b>DEAN</b> | <b>DATE</b> |

**TOTAL CREDITS:**        **4**

**PREREQUISITE(S):**    **PHY 125 & MCH 110**

**HOURS/WEEK:**            **3**

**Copyright ©2005 The Sault College of Applied Arts & Technology**  
*Reproduction of this document by any means, in whole or in part, without prior written permission of Sault College of Applied Arts & Technology is prohibited.*  
*For additional information, please contact Colin Kirkwood, Dean,  
Technology, Skilled Trades, Natural Resources & Business  
at (705) 759-2554, Ext. 2688.*

**I. COURSE DESCRIPTION:**

This second course in mechanics, *Dynamics*, deals with chapters 10 to 15 inclusive, of the reference text by Walker. It provides both a review of, and a more in-depth study of many of the concepts of dynamics introduced in the first semester physics course. The student will also be exposed to a number of concepts not previously encountered in either semester one *Statics (MCH 110)* or semester one *Physics (PHY 125)*.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

- 1) in his or her own words write definitions for the concepts introduced;
- 2) answer questions requiring an understanding of the concepts presented;
- 3) respond to questions requiring extrapolation of the course content;
- 4) solve problems requiring an understanding of the course theory.

**I Kinematics of Particles**

Potential Elements of Performance:

- a) *Distance and Displacement*
- b) *Speed and Velocity*
- c) *Acceleration*
- d) *Uniformly Accelerated Motion*
- e) *Falling Bodies – the acceleration due to gravity*
- f) *Projectiles*

II **Rotational Motion**

Potential Elements of Performance:

- a) Angular Displacement (radians)
- b) Angular Velocity
- c) Angular Acceleration
- d) Angular Motion with uniform acceleration
- e) Relationship between *Rectilinear Motion* and *Angular Motion*
- f) *Normal and Tangential Acceleration*
- g) *Total Angular Acceleration*

III **Kinetics: Forces and Motion**

Potential Elements of Performance:

- a) Newton's Second Law of Motion
- b) Accelerating Forces – horizontal and vertical motion
- c) '*Dynamic Equilibrium*' – the *Linear Inertia Force*
- d) '*Angular Dynamic Equilibrium*' – the *Angular Inertia Torque*

IV **Work, Energy and Power**

Potential Elements of Performance:

- a) the concept of *work*
- b) Work done by constant forces
- c) Work done by variable forces
- d) *Energy*
- e) *Gravitational Potential Energy*
- f) *Kinetic Energy*
- g) *Conservation of Energy – Translational*
- h) *Moment of Inertia* of bodies
- i) *Kinetic Energy of Rotation*
- j) *Conservation of Energy – Angular*
- k) *Power*
- l) *Efficiency*

V **Impulse and Momentum**

Potential Elements of Performance:

- a) *Linear Impulse*
- b) *Linear Momentum*
- c) *Angular Impulse*
- d) *Angular Momentum*
- e) *Conservation of Momentum*

**III. TOPICS:**

1. Kinematics of Particles: the Study of Motion
2. Rotational Motion
3. Kinetics: the Relationship between Forces and Motion
4. Work, Energy and Power
5. Impulse and Momentum

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

**Walker, Keith M., APPLIED MECHANICS FOR ENGINEERING TECHNOLOGY, 6<sup>th</sup> edition. Prentice-Hall, Inc. Englewood Cliffs, New Jersey. 2000**

**V. EVALUATION PROCESS/GRADING SYSTEM:**

Your final grade in MCH 111 will be determined on the basis of **four tests** to be administered during the semester. Each test will examine your knowledge of a number of topics and will be administered within one week of completing those topics. The topics covered in each of the four tests are as follows:

- Test #1 --- Topic No. I  
                  Topic No. II
- Test #2 --- Topic No. III
- Test #3 --- Topic No. IV
- Test #4 --- Topic No. V

The four tests are of equal weight (ie. each of the four tests is worth 25% of your final grade). As a result, **provided you have received a passing grade in each of the unit tests**, your final grade will simply be an average of your four test results. In order to obtain your letter grade the following percentage-letter grade equivalents will be used:

| <u>Grade</u> | <u>Definition</u>   | <u>Grade Point Equivalent</u> |
|--------------|---|-------------------------------|
| A+           | 90 - 100%   | 4.00                          |
| A            | 80 - 89%  | 4.00                          |
| B            | 70 - 79%  | 3.00                          |
| C            | 60 - 69%  | 2.00                          |
| D            | 50 – 59%  | 1.00                          |
| F (Fail)     | 0 – 49%   | 0.00                          |
| CR (Credit)  | Credit for diploma requirements has been awarded.   |                               |
| S            | Satisfactory achievement in field placement or non-graded subject areas.  |                               |
| U            | Unsatisfactory achievement in field placement or non-graded subject areas.  |                               |
| X            | A temporary grade. This is used in limited situations with extenuating circumstances giving a student additional time to complete the requirements for a course (see <i>Policies &amp; Procedures Manual – Deferred Grades and Make-up</i> ). |                               |
| NR           | Grade not reported to Registrar's office. This is used to facilitate transcript preparation when, for extenuating circumstances, it has not been possible for the faculty member to report grades.  |                               |

If your final average is below 50%, **or** if you have received a failing grade in one or more of the unit tests, whether you received an 'X' (Incomplete) or an 'F' (Fail) grade is entirely at the teacher's discretion. The decision will be based upon your *final average* (e.g. 32% **would** result in an F grade while 49% **might** result in an X grade); *your attendance* during the semester; *your attitude* while in the classroom; *your perceived level of effort* during the semester, etc.

In any case, should you find yourself with an X grade at the end of the semester, in order to upgrade your mark to a passing grade you will be required to write a "make-up" **examination covering the entire course content**. *Should you receive a passing grade on the make-up examination (50% or higher) your X grade will be upgraded.* The best you can do after receiving an X grade as a result of a failing average is a C! If you were required to write the make-up examination as a result of having failed one test you may substitute the exam result for this test result.

Prior to administering any test you will be notified a full week in advance. Should you, for any reason (*within reason of course*), not be able to be in attendance on

a day for which a test has been scheduled it is ***your responsibility*** to notify the professor **prior** to the test! *If your reasons are acceptable*, a date will be set during which you may write a *substitute* test for the one you have missed.

## VI. SPECIAL NOTES:

### Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs office. Visit Room E1101 or call Extension 493 so that support services can be arranged for you. *This of course will not affect Aviation – Flight students due to the nature of the entrance requirements for the program. It may however affect students from outside the Aviation – Flight program who may be taking this course for a credit in another area of study.*

### Retention of course outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

### Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Rights and Responsibilities*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:

The course outline as detailed on pages 2 and 3 and *summarized* on page 4 lists the subtopics to be covered under each of the five main topic headings. Some topics may be deleted from the outline or given only cursory coverage at the discretion of the professor and/or others may be introduced. In other words, *the professor reserves the right to modify the course as he/she deems necessary depending on the needs of the student and the availability of resources.* This creates the possibility for some latitude in the grading scheme as detailed on pages 4 and 5.

Substitute course information is available in the Registrar's office.

*Attitude and Conduct specific to the Aviation – Flight Program*

*Attitude plays an important role in your ability to exercise good judgement. Although attitude is not being graded (except with regard to making a call between granting an 'X' grade over an 'F' grade), it affects your ability to learn as well as your safety as a student and future as a professional pilot. Students who display a strong tendency toward any of the five hazardous attitudes pose a grave risk to themselves and others. For this reason these students will be counseled and put on behavioural contract. If counseling is ineffective, then the student will be withdrawn from the program.*

*The five hazardous attitudes are identified as Anti-authority, Impulsivity, Invulnerability, Machismo and Resignation. These hazardous attitudes are described in "Human Factors for Aviation – Basic Handbook" on pages 151 and 152.*

**NOTE:** The above two paragraphs were taken from the course outline for *Flight Operations AVT 377-2*. Although more pertinent to an *aviation* course as such than a course in *dynamics*, since the students taking this course are doing so as part of their Aviation – Flight program there is a certain amount of relevance to this course as well.

*Mid Term Grades for Aviation – Flight students*

As the aviation – flight student is required to maintain a 'B' average to remain in the program, mid term grades will reflect this requirement by assigning an 'S' (satisfactory) grade only to those students who are maintaining at least a 70% current grade in the course. A 'U' grade (unsatisfactory) will be assigned to students who, at mid term, are carrying a grade of 69% or less. This does not necessarily mean that the student is failing the course at mid term however. Should the student be carrying a 'D' or a 'C' grade at mid term, which of course is a passing grade, he/she will still be given a 'U' reflecting the specific requirements of the aviation – flight program.

## VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of the following:

- 1) A discussion with the professor will determine if the course that the student has previously taken at another *post secondary institution* is sufficiently close in content to warrant consideration.
- 2) Given that step (1) above is granted, the student will need to bring to the professor an **official** *course outline* for the course in question to verify step (1). See **VIII Direct Credit Transfers** below.
- 3) The student will be required to have available in the Registrar's office an **official** *transcript* from the *post secondary institution* in question. This transcript will contain the final grade of the course which is being presented to obtain a credit for this course in *dynamics*. See **VIII Direct Credit Transfers** below.
- 4) Given that the student has obtained at least a '**B**' standing in the course in question, a credit in MCH 111 will be granted.

## VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for *direct credit transfer (advanced standing)* should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide an **official** *transcript* (**not a photocopy**) and an **official** *course outline* (**not a photocopy**) related to the course in question.