Western University
Department of Mechanical & Materials Engineering

MME 3381a - "Kinematics and Dynamics of Machines"

COURSE OUTLINE – 2018-2019

CALENDAR DESCRIPTION:

Displacement, velocity and acceleration analysis of linkage mechanisms; inertia force analysis of mechanisms; balancing of reciprocating and rotating masses; free and harmonic vibrations of single degree of freedom systems.

COURSE INFORMATION:

Instructor:	Professor Remus Tutunea-Fatan Office: ThreeC+ 3462 Email: rtutunea@eng.uwo.ca
Lectures:	Tu 9:30 pm – 10:30 pm (SEB 2100) W 3:30 pm – 4:30 pm (UCC 146) Th 9:30 pm – 10:30 pm (SEB 1200)
Tutorials:	W 4:30 am – 6:30 pm (UCC 146)
Labs:	M 8:30 am – 11:30 am (SEB 3098) Tu 1:30 pm – 4:30 pm (SEB 3098) W 8:30 am – 11:30 am (SEB 3098) Th 1:30 pm – 4:30 pm (SEB 3098) F 2:30 pm – 5:30 pm (SEB 3098)

PREREQUISITES: MME 2213a/b, AM 2270a/b
COREQUISITE: MSE 3381 a/b

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

CONSULTATION HOURS: By advance notice via email or drop in.

ACCREDITATION UNITS: Engineering Science = 75%, Engineering Design = 25%

TOPICS:

- Fundamentals of mechanical vibrations
- Fundamentals of mechanisms and machines
- Techniques in geometric constraint programming
- Planar linkage design
- Graphical position, velocity, and acceleration analysis
- Design and analysis of cam-based mechanisms
- Design and analysis of gear-based mechanisms
- Static and dynamic force analysis of mechanisms
- Dynamic force analysis
- Balancing of rotating and reciprocating machines

LEARNING OUTCOMES:

Upon successful completion of this course, students will:

- Understand the fundamental principles of the vibratory motion
- Understand and assess the functionality of a mechanism
- Select or design a mechanism for a specific purpose
- Analyze the position, velocity and acceleration of a linkage using graphical, analytical and computer-based methods
- Model and analyze a mechanism using motion simulation software
- Use hand calculations, computer simulation, and experiments in designing and analyzing machines
- Verify, compare and interpret differences between the results obtained through different means of analysis
- Evaluate the implications of an incorrect mechanism design

CONTACT HOURS: 3 lecture hours, 2 tutorial hours, 0.5 laboratory hours, half course

RECOMMENDED TEXTBOOKS: Waldron K.J., Kinzel G.L., Agrawal S.K., *Kinematics, Dynamics, and Design of Machinery*, 3rd Edition, Wiley, 2016

Beer F.P., Johnston E.R., Mazurek D.F., *Vector Mechanics for Engineers: Statics and Dynamics*, 11th Edition, McGrawHill, 2016

EVALUATION:

The final course grade will be determined according to the following weighting scheme:

In-class/tutorial quizzes (closed book)	20%
Motion analysis tutorials	5%
Project	15%
Laboratory sessions	10%
Final examination (closed book)	50%

Quizzes, projects and laboratories will be carried out according to the following *tentative* schedule:

Evaluation Format	Weight	Effort Type	Assigned	Due
Quiz 1	4%	Individual	Sep. 19th	Sep. 19th
Lab 1	5%	Team	Week of Sep. 24th	Week of Oct. 1st
SW tutorials	5%	Team	Week of Sep. 24th	Week of Oct. 15th
Project	15%	Team	Week of Oct. 15th	Week of Nov. 26th
Quiz 2	4%	Individual	Oct. 3th	Oct. 3th
Quiz 3	4%	Individual	Oct. 24th	Oct. 24th
Quiz 4	4%	Individual	Nov. 7st	Nov. 7st
Quiz 5	4%	Individual	Nov. 21th	Nov. 21th
Lab 2	5%	Team	Week of Nov 19th	Week of Nov 26th
Quiz 6	4%	Individual	Dec. 5th	Dec. 5th

COURSE POLICIES

The following course-specific policies will be enforced throughout the course:

Laboratory sessions

- Failure to pass the laboratory component of the course will attract automatic course failure.
- Passing of the laboratory component is equivalent with obtaining more than 50% on the laboratory component of the course.
- A maximum of **one** make-up session will be offered to students who have missed a laboratory session with academic consideration.
- Missing of a laboratory session without academic consideration will translate into a zero mark for that laboratory session.

Quizzes

- Highest five quiz marks will be used to calculate the 20% of the final grade associated with quiz marks.
- No make-up quiz options will be offered regardless of the circumstances for which the quiz was missed.
- Missing of a quiz without academic consideration will translate into a zero mark for that quiz.
- Missing of one quiz with academic consideration will change the default rule above to "highest **four** quiz marks will be used to calculate…"
- Missing of two or more quizzes with academic consideration will determine the automatic reweighting of the missed quizzes into the final examination. However, in this case, no "quiz dropping" option will be offered.

Project

- While the default assumption is that everyone contributes equally to the team effort (*i.e.*, project and labs) and hence everyone should receive the same mark for the team submission, individual adjustments of the marks are also permitted and they are left at latitude of the instructional team (*i.e.*, course instructor and teaching assistants).

Term work

- If a minimum of 50% is not obtained on the term work, the student will fail the course regardless of the mark obtained on the final examination.

Final examination

- Only non-programmable calculators will be allowed during the final examination.
- If a minimum of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.

Submissions

- Quizzes will be fifty minutes long and will be submitted at the end of the allotted time

- Lab reports will be due at the end of the lab session in which data was collected
- Late submission of the SW tutorials will be penalized with 20% per day
- Late submission of the project will be penalized with 20% per day
- Final exam will be three hours long and will be submitted at the end of the allotted time

UNITS: Metric and US customary.

ENGLISH: In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

CLASSROOM DEMEANOR: The instructor is committed to providing a respectful learning environment for all students involved in this course. This is a collective responsibility of the instructor and students, and therefore students partaking in this course agree to abide by this criterion. This includes arriving at lectures on time, and acting in a professional manner during class.

ATTENDANCE: Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

CHEATING: University policy states that cheating, including plagiarism, is a scholastic offense. The commission of a scholastic offence is attended by academic penalties which might include expulsion from the program. If you are caught cheating, there will be no second warning (see Scholastic Offence Policy in the Western Calendar).

SSD: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

NOTE: Students who have failed an Engineering course (i.e. < 50%) must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.

Western Engineering

Western University
Faculty of Engineering
2018-2019

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic accommodation will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services office if you are in first year) that there are compelling medical or compassionate grounds that can be documented before academic accommodation will be considered. Different regulations apply to term tests, final examinations and late assignments. Read the instructions carefully. (see the 2018 Western Academic Calendar).

A. *GENERAL REGULATIONS & PROCEDURES*

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.

2. If you are an upper year student and you are missing a test/assignment/lab or examination that is worth LESS THAN 10% of your mark, you should report to your department office to request relief. If your course work is MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097.

3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.

4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.

5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. *TERM TESTS*

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.

2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, you should report to your department office to request relief. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request relief.

3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).

4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. *FINAL EXAMINATIONS*

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number (please spell your full name).

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a special examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

PLEASE NOTE: **It is the student's responsibility to check the date, time and location of the Special Examination.**

D. *LATE ASSIGNMENTS*

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
   ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. *SHORT ABSENCES*

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. *EXTENDED ABSENCES*

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

G. *DOCUMENTATION*

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. *ACADEMIC CONCERNS*

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**

3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2016 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness
Academic Accommodations for Students with Disabilities
Academic Accommodations for Religious Holidays
Course Withdrawals
Examinations
Scheduling of Term Assignments
Scholastic Offences
Student Medical Certificate
Engineering Academic Regulations

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines: First term half course (i.e. "A" or "F") September 14, 2018
Full courses and full-year half course (i.e. "E", "Y" or no suffix) September 14, 2018
Second term half course (i.e. "B" or "G") January 15, 2019

***Drop Deadlines*:** First term half course (i.e. "A" or "F"): November 12, 2018
Full courses and full-year half courses (i.e. "E", "Y" or no suffix): November 30, 2018
Second term half or second term full course (i.e. "B" or "G"): March 7, 2019

Undergraduate Services Office:	SEB	2097	Tel: (519) 661-2130	E-mail:	engugrad@uwo.ca
Dept. of Chemical and Biochemical Engineering:	TEB	477	Tel: (519) 661-2131	E-mail:	cbeugrad@uwo.ca
Dept. of Civil and Environmental Engineering:	SEB	3005	Tel: (519) 661-2139	E-mail:	civil@uwo.ca
Dept. of Electrical and Computer Engineering, Software Engineering Mechatronics Engineering	TEB	279	Tel: (519) 661-3758	E-mail:	eceugrad@uwo.ca
Dept. of Mechanical and Materials Engineering:	SEB	3002	Tel: (519) 661-4122	E-mail:	mmeundergraduate@uwo.ca

Revised 8-Aug-18