Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2017
Course Name	Advanced CAD
Course Code	AUTOTECH 2AC3
Date(s) and Time(s) of lectures	C01: Tuesdays 9:30am-11:30am and Thursdays 2:30pm-4:30pm C02: Tuesdays 11:30am-1:30pm and Thursdays 9:30am-11:30am C03: Tuesdays 1:30pm-3:30pm and Thursdays 11:30am-1:30pm Jan 4, 2017 – Apr 6, 2017
Program Name	Automotive and Vehicle Technology
Calendar Description	Parametric solid modeling for parts with complex geometry. Wireframe and complex surfaces. Multi-component assemblies with kinematic constraints. Fitting and kinematic animations for assemblies. Simulation analysis on solid models.
Instructor(s)	Dr. Lucian Balan — Phone: MARC 289-674-0250 ext.59102 E-Mail: Avenue Email Office: MARC 271

2. COURSE SPECIFICS

Course Description	Advanced CAD modeling techniques based on parametric modeling software used in automotive/aerospace industry; modeling parts with complex geometry; relational dimensioning; geometrical and dimensional constraints; creation of solid models for parts with complex shapes; integration of wireframe and complex surfaces; assembly creation from parts and sub-assemblies; assembly constraints and kinematic joints; fitting and kinematic animations for assemblies; use of kinematic constraints to simulate motion of mechanisms and video animation generation; interference and collision detection, part design adjustment; stress analysis simulation applied to solid models. Engineering design with project constraints; conceptual design and design cycle; brainstorming, decision making, and concept selection; design with modeling and simulation; problem identification and design refinement;

Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	50
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
		Total Hours	50

Resources	ISBN	Textbook Title & Edition	Author & Publisher
	978-0-07-170026-9	Catia core tools Computer-aided three-dimensional interactive application (optional)	Michel Michaud. McGraw Hill
	Other Supplies	**Source**	
	USB flash drive	Students must bring their own USB flash drive (2GB or more)	

Prerequisite(s)	AUTOTECH 2AE3, 2CD3, and registration in level II or above of the Automotive and Vehicle Technology program.
Corequisite(s)	*N/A*
Antirequisite(s)	*N/A*
Course Specific Policies	o E-mail communication for this course is through Avenue email (instructor included in class list) o Students are expected to attend all lecture/lab sessions, and to complete and submit reports on all given exercises. o If applicable, assignments and lab reports will be submitted as instructed (either electronic format, or hard copy). o Labwork submissions without attending the corresponding lab sessions will not be accepted. If applicable, assignments and labwork reports will be graded for completion, random picks as indicated in class. o Due dates for course work will be posted on course website or communicated in class. Students are responsible for knowing the assignment deadlines, cut-off dates, exams, and any other announcements made during the lab time, or posted on the course website o For projects submitted as group work, the grade will account for individual contribution of each student to the project work. Where required, intermediate project submissions at distinct stages will also be considered for project grading. o Project meetings are mandatory. Team work and student participation are included in project grading. Projects are submitted as group but work is graded individually based on each student contribution to the project. o Project work requires outside of class work. Students are expected to spend a minimum of six hours out-of-class per week for each project work assigned. o Late projects are marked with a penalty of 5% per day, up to a maximum of five days, after which the project will be graded with zero. o The work submitted should reflect each student's own work. Students are required to keep a copy of their course work (excluding tests, exams, quizzes) on a personal USB flash drive. Students must bring the USB flash drive with them at all lab sessions. Weekly back-ups for project work are advisable. o Course specific software is installed in the computer lab with adequate licensing. The university is NOT responsible for providing individual licenses to students enrolled in this course. o Students are allowed to use their own computers to complete the required course work as long as their submitted files are compatible with the software versions installed in the lab. The instructor will make NO attempt to convert any work submitted in a different format. o All tests must be performed on lab computers. Missed coursework cannot be prorated to the final exam grade.
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of "out-of-class" work for every scheduled hour in class. "Out-of-class" work includes reading, research, assignments and preparation for tests and examinations. Where group work is indicated in the course outline, such collaborative work is mandatory.

	The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception. Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class. Instructor has the right to submit work to software to identify plagiarism.	
3. SUB TOPIC(S)		

Week 1	Engineering Design
	   o Introduction
	   o Design phases
	   o Approach and methods	

Week 2	Engineering Design
	   o Project constraints
	   o Design concepts
	   o Solution ranking
	   o Design cycle	

Week 3	Engineering Design o Applied concepts using SolidWorks	

Week 4	*Project 1 presentations (2 hours)*
	Basic concepts in CATIA
	   o Commands, setup, toolbars
	   o Workbenches
	   Compass tool and part manipulation	

Week 5	Parts design and sketcher
	   o Sketch
	   o Geometric and dimensional constraints
	   o Features and basic shapes
	   o Advanced sketcher
	   o Boolean operations on parts
	   o Part editing	

Week 6	Assembly design
	   o Insert components
	   o Insert subassemblies
	   o Assembly constraints
	   o Contextual design
	   o Part editing and manipulation in assembly	

Week 7	Kinematic simulation
	   o Mechanisms creation
	   o Kinematic joints generation
	   o Motion simulation
	   o Video animation generation	

Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017		

Week 8	Assembling operation simulation
	   o Fitting simulation
	   o Tracks creation
	   o Sequences generation
	   o Clash detection	

Week 9	Wireframe and complex surfaces
	   o Generative shape design workbench
	   o Advanced surface generation techniques	

	o Multi-section surfaces, blend, sweep o Isoparametric curves and Laws o Extrapolating curves and surfaces o Gear template	
Week 10	Drafting o Creating drawings from parts model o Creating views o Modifying views	
Week 11	*Project 2 presentations (2 hours)* Basic concepts in NX o Commands, setup, toolbars o Sketch constraining o Part manipulation	
Week 12	Assembly design in NX o Assembly constraints o Contextual design	
Week 13	Stress analysis in NX o Introduction to stress analysis o Restraints and loads o Sample engineering application	

Classes end: Thursday, April 6, 2017
Final examination period: Tuesday, April 11 to Thursday, April 27, 2016
All examinations MUST be written during the scheduled examination period.

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Project 1 (design) – *beginning of week 4*	20%
Project 2 (modeling and kinematics) – *beginning of week 11*	30%
Poster Project 2 (modelling and kinematics) – *beginning of week 11*	5%
Final Exam – *exam period*	45%
TOTAL	**100%**

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Design detailed parts and assemblies using advanced solid modeling techniques. Create parts with complex shape and surfaces using wireframe and complex surface generation tools available in the modeling software
2. Insert and modify parametric modelled components in an assembly; identify design errors; perform measurements and collision analyses
3. Combine assembly constraints, motion laws, and kinematic joints to produce realistic simulation of the product's kinematic motion and its assembling procedure
4. Solve an engineering design open-end project with given constraints by using modeling and simulation techniques. Use brainstorming, decision making, concept selection, and team collaboration to achieve required functionality.
5. Identify problems in conceptual design process and provide engineering solutions through iterative design cycle.
6. Perform stress analysis on parts, judge and criticize the results
7. Create and improve product design and functionality using team project work

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.
http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects if the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act of fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf .

The following illustrates only three forms of academic dishonesty:
1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for **Undergraduate Students** to report absences for:

1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:

   - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.

   - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.

2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:

   - Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via
http://avenue.mcmaster.ca.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to

http://www.mcmaster.ca/academicintegrity/turnitin/students/

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

http://www.mcmaster.ca/univsec/fippa/fippa.cfm

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. http://sas.mcmaster.ca

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

http://studentconduct.mcmaster.ca/student_code_of_conduct.html