Faculty of Engineering
Department of Mechanical Engineering
COURSE OUTLINE

MECH 460/521 – Computer Aided Manufacturing

Term – Summer 2016 (201605)

Instructor	**Office Hours**
Dr. Martin Jun	Days: M Th
Phone: 3179	Time: 10:00 – 11:00 am
E-mail: mbgjun@uvic.ca	Location: EOW 515

List all prerequisites and co-requisites:

LECTURE DATE(S)

Section: A /CRN30601	Days: M Th	Time: 8:30 – 9:50 am	Location: ECS 124

TUTORIAL SECTIONS

Section: T	Days:	Time:	Location:

LAB SECTIONS

Section: B (Multiple) Insert additional rows if required	Days: (or leave blank and state how/when labs will be scheduled)	Time:	Location:
Lab #1:	M	1:00 – 3:50 pm	B119
Lab #2:	Tu	9:30 am – 12:20 pm	B119
Lab #3:	Tu	4:30 – 7:20 pm	B119
Lab #4:	W	8:30 – 11:20 am	B119
Lab #5:	W	1:30 – 4:20 pm	B119
Lab #6:	Th	1:00 – 3:50 pm	B119
Lab #7:	Th	4:00 – 6:50 pm	B119
Lab #8:	F	9:30 am – 12:20 pm	B119

Lab times and locations are also available from the timetable through Sign in to UVic, My Page.

TA Name	**E-mail**	**Office**
Syed Baqar	alibs@uvic.ca	ELW B127
Ahmad Esmaeilirad	aerad@uvic.ca	ELW B127
Jason Lee	Jason92@uvic.ca	ELW B127
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Required Text	**Optional Text**
Title:	
Author:	

Learning Outcomes next page

Publisher/Year:	
Reference Materials:	

COURSE OBJECTIVES: Verbose description of the material being covered in the course. How does the course build/relate to other courses in the program.

Introduction to machining operations, features of numerically controlled machine tools, and types of CNC programming. Manual part programming with G-codes, canned cycles, subprograms, custom macros, and simulation program. NC machine tools and control and machine tool kinematics. CNC machining of curved surfaces with ball-mill and end-mill cutters; matching of tool and surface geometry. Curved surface machining strategies and case studies. Rapid prototyping. Machining mechanics and dynamics.

LEARNING OUTCOMES: At the end of this course, students will be able to:
(refer Bloom's Taxonomy Sharepoint Site for suggested verbs)

At the end of MECH 460, students should be able to:

- Perform manual part programming with G-codes
- Generate tool paths for CNC machining a part design using CAM software
- Understand basic components of NC machines
- Understand issues in tool path planning
- Identify tool path planning differences with 5-axis machining
- Understand different technologies for rapid prototyping
- Calculate cutting forces in orthogonal cutting
- Understand relations among cutting forces, tool wear, cutting energy, and shear strain in cutting operations

Weight & Date(s) of Assessments:	**Weight**	**Date**
Assignments:	10%	
Labs	25%	
Mid-term	40%	Date:
Project	25%	Date: TBA

ASSIGNMENTS (Include Assignment Schedule) (Description & Method of Delivery) (remove example text)

Three problem sets will be distributed over the course of the term via the MECH 460 Course Space site. Assignment submissions are to be made to the MECH 460 Course Space site.

Assignment #	**Modules**	**Start**	**Due (5 pm)**
1	G-code programming	05.09	05.19
2	Machining simulation analysis	05.24	06.09
3	Machining mechanics	06.13	06.27
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LABORATORIES (Description & Method of Delivery) (remove example text)

The laboratory sessions will be used to complete instruction and training on CNC machining.
Lab reports are to be completed individually for Labs 1-4 and in teams of 4 students for Lab 5. Laboratory report submissions are to be made to the MECH 460 Course Space Site.

Lab #	Modules	Start	Due (5 pm)
1	2: CNC machining of 2-D shapes. Use MasterCAM for Solidworks to generate initials of a name or other artistic creation, generate tool paths, verify machining using VERICUT, CNC machine part.	05.09	05.20
2	3: Introduction to the VERICUT software. Learn how to monitor the simulation, find and detect errors, add fixtures and stock models, load NC program, and locate program origin.	05.16	05.27
3	4: Learn how to configure VERICUT setup, add a second setup, perform cut stock transition between setups, and create a new project with multiple setups.	05.24	06.03
4	5: CNC machining of 3-D shapes. Use Solidworks to define a part, create a graphical tool path, and produce a cutter location file. Generate a G-code file using the MasterCAM for Solidworks, and verify machining using VERICUT.	05.30	06.10
5	6-7:3-axis CNC Curved Surface Generation and Machining Verification. Create 3D model in Solidworks, produce tool paths for 3-axis roughing and finishing operations using MasterCAM for Solidworks, create a VERICUT project, setup for verification of the machining operations, and machine part.	06.6	06.24

PROJECTS: (Description & Method of Delivery) (remove sample text)

Project submissions will be in the form presentation and report and will be submitted in electronic format. Students must complete CNC machining of the project and machined samples are part of the project.

NOTE: (sample notes for the instructors)
Failure to complete all laboratory requirements will result in a grade of N being awarded for the course.
Failure to pass the final exam will result in a failing grade for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

COURSE LECTURE NOTES

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

There will be no supplemental examination for this course.

GENERAL INFORMATION

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

"**Attendance**

Students are expected to attend all classes in which they are enrolled. An academic unit may require a student to withdraw from a course if the student is registered in another course that occurs at the same time….

An instructor may refuse a student admission to a lecture, laboratory, online course discussion or learning activity, tutorial or other learning activity set out in the course outline because of lateness, misconduct, inattention or failure to meet the responsibilities of the course set out in the course outline. Students who neglect their academic work may be assigned a final grade of N or debarred from final examinations.

Students who do not attend classes must not assume that they have been dropped from a course by an academic unit or an instructor. Courses that are not formally dropped will be given a failing grade, students may be required to withdraw and will be required to pay the tuition fee for the course." UVic Calendar, (2015) http://web.uvic.ca/calendar2015-09/FACS/UnIn/UARe/Atte.html

Accommodation of Religious Observance (AC1210)
http://web.uvic.ca/calendar2015-09/GI/GUPo.html

Discrimination and Harassment Policy (GV0205)
http://web.uvic.ca/calendar2015-09/GI/GUPo.html

Faculty of Engineering, University of Victoria
Standards for Professional Behaviour

"It is the responsibility of all members of the Faculty of Engineering, students, staff and faculty, to adhere to and promote standards of professional behaviour that support an effective learning environment that prepares graduates for careers as professionals…."

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour which contains important information regarding conduct in courses, labs, and in the general use of facilities.
http://www.uvic.ca/engineering/current/undergrad/index.php#section0-23

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the Undergraduate Calendar for the UVic policy on academic integrity.

Policy on Academic Integrity
http://web.uvic.ca/calendar2015-09/FACS/UnIn/UARe/PoAcI.html

Course Schedule (remove example text)

Module	Topics	Date/Week
1	Time domain simulation. Second order Des, finie differences, multi-step and multi-value methods, explicit and implicit techniques.	01.09
2	Fourier analysis. Fourier's hypothesis, Fourier series & the Fourier transform; wave spectra: spectral moments, significant wave height & wav statistics.	01.14 – 01.21
3	Airy waves. Derivation of linear wave kinematic equations; shallow and deep water conditions.	01.23 – 01.28
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