FORMAT 1
Submit original with signatures + 1 copy + electronic copy to UAF Governance.
See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Mechanical Engineering	College/School	CEM
Prepared by	H. Ed Bargar	Phone	474-5873
Email Contact	bargarh@asme.org	Faculty Contact	H. Ed Bargar, Chuen-Sen Lin

1. ACTION DESIRED (CHECK ONE): Trial Course [ ]   New Course [X]

2. COURSE IDENTIFICATION: Dept **ME**   Course # **406**   No. of Credits **3**

Justify upper/lower division status & number of credits: **This is an upper division elective course. It expands upon subject matter taught in several existing 300 and 400 level courses. 3 credits provide sufficient time to present the material while meshing with other requirements of the degree program.**

3. PROPOSED COURSE TITLE: **Computer Aided Manufacturing (CAM)**

4. To be CROSS LISTED? YES/NO   **No**   If yes, Dept: [ ]   Course # [ ]
(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. To be STACKED? YES/NO   **No**   If yes, Dept. [ ]   Course # [ ]

6. FREQUENCY OF OFFERING: **Every other Spring**
Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved)   **Spring 2013**

8. COURSE FORMAT:
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check all that apply)	[ ] 1	[ ] 2	[ ] 3	[ ] 4	[ ] 5	[X] 6 weeks to full semester
OTHER FORMAT (specify)						
Mode of delivery (specify lecture, field trips, labs, etc)	**Lecture and Lab**					

9. CONTACT HOURS PER WEEK: **1.5** LECTURE hours/weeks   **4.5** LAB hours /week   [ ] PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty/cd/credits.html for more information on number of credits.

OTHER HOURS (specify type) [ ]

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

ME 406 – Computer Aided Manufacturing (CAM), 3 Credits: Introduction to computer aided manufacturing. This includes the principles of computer aided process planning (CAPP) and an introduction to computer numerical control (CNC) tools used in manufacturing. Emphasis will be on methodology with hands-on applications of computer software and specific machine tools. Prerequisites: ME 321; Senior Standing or Instructor Permission. (1.5+4.5)

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities [ ]   S = Social Sciences [ ]

Will this course be used to fulfill a requirement for the baccalaureate core?	YES [ ]	NO [X]

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6 [ ]   W = Writing Intensive, Format 7 [ ]   Natural Science, Format 8 [ ]

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	YES [ ]	NO [x]

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?	[ ] **TIMES**

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?	[ ] **CREDITS**

13. GRADING SYSTEM: Specify only one.

LETTER: [X]   PASS/FAIL: [ ]

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	ME 321

These will be *required* before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS	Senior standing or permission of instructor

16. PROPOSED COURSE FEES	$ 31

Has a memo been submitted through your dean to the Provost & VCAS for fee approval? Yes/No	Yes

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? Yes/No	Yes

If yes, give semester, year, course #, etc.:	This course is the result of the expansion of ME401. ME401 (a CAD & CAM course) has been offered many times. It will be split into this course and another course specializing in CAD only.

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

None

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No [X]	Yes [ ]	Teaching materials include instructor's handouts/notes and software and hardware instructional manuals from the vendors.

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

No to minimal impact on faculty teaching load.

21. POSITIVE AND NEGATIVE IMPACTS

Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.

This course will provide our students with knowledge and skills in computer aided manufacturing and prepare our students with a CAM background to increase employment opportunity.
This action may have no to minimal effect on faculty teaching load.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

The CAD/CAM course (ME 401) was first added to the ME curriculum in 1999. The offer of a single Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) class instead of a CAD class and a CAM class separately (as offered at most other universities) was due to insufficient CAM facilities at that time. After 1999, the department has gradually increased its CAD/CAM capability through purchasing more hardware and leasing more software using funds received from external funding agencies and the University as well.

During the last few years, the enrollment in the ME Department has increased dramatically and more students expressed their desire/need to learn more in the area of CAD/CAM applications. The department, therefore, decided to expand the current single CAD/CAM course into two courses (a CAD course and a CAM course).

The continued growth of CAM technology and tooling in industry has changed the earlier simple planning process for simple, single task tools to require a more complete product planning process for multi-task tools. In order to prepare our students with more up-to-date knowledge and to become more competitive in the employment market with a background in the CAM area, an individual 3-credit CAM course instead of a 3-credit CAD/CAM course is justified.

APPROVALS: SEE ATTACHED SIGNATURES.

	Date	
Signature, Chair, Program/Department of:		

	Date	
Signature, Chair, College/School Curriculum Council for:		

	Date	
Signature, Dean, College/School of:		

	Date	
Signature of Provost (if applicable)		

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

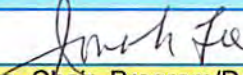|	Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee		

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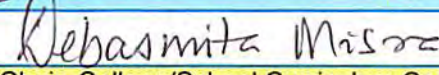
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APPROVALS:

		Date	2/10/2011
Signature, Chair, Program/Department of: *Mechanical Engineering*			
Debasmita Misra		Date	2/23/11
Signature, Chair, College/School Curriculum Council for: *CEM*			
		Date	2/24/11
Signature, Dean, College/School of: *CEM*			
		Date	
Signature of Provost (if applicable)			

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

		Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee			

ATTACH COMPLETE SYLLABUS (as part of this application).
Note: The guidelines are online: http://www.uaf.edu/uafgov/faculty/cd/syllabus.html
The department and campus wide curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course change will be <u>denied</u>.

SYLLABUS **CHECKLIST** FOR ALL **UAF** COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
  ❑Title, ❑ number, ❑credits, ❑prerequisites, ❑ location, ❑ meeting time
  (make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
  ❑ Name, ❑ office location, ❑ office hours, ❑ telephone, ❑ email address.

3. Course readings/materials:
  ❑ Course textbook title, ❑ author, ❑ edition/publisher.
  ❑ Supplementary readings (indicate whether ❑ required or ❑ recommended) and
  ❑ any supplies required.

4. Course description:
  ❑ Content of the course and how it fits into the broader curriculum;
  ❑ Expected proficiencies required to undertake the course, if applicable.
  ❑ Inclusion of catalog description is *strongly* recommended, and
  ❑ Description in syllabus must be consistent with catalog course description.

5. ❑ Course Goals (general), and (see #6)

6. ❑ Student Learning Outcomes (more specific)

7. Instructional methods:
  ❑ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:
  ❑ A schedule of class topics and assignments must be included. <u>Be specific</u> so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:
  ❑ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:
  ❑ Specify how students will be evaluated, ❑ what factors will be included, ❑ their relative value, and
  ❑ how they will be tabulated into grades (on a curve, absolute scores, etc.)

11. Support Services:
  ❑ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services:
  The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials.
  ❑ State that you will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities."

Spring Semester, 20xx	ME 406	Syllabus	1of 6

Course: **ME 406 – Computer Aided Manufacturing (CAM)** (*3 credit elective course*) (Hours: 1.5+4.5)

Pre/Co-requisites: ME 321 (Pre)

Department: Mechanical Engineering

Textbook: No required text. Software & machine tool instruction manuals from specific vendors will be used. See the class Web site.

Class Web Site: Follow links from: http://medept.engr.uaf.edu.

Professor: H. Ed Bargar, PhD, PE

e-mail: bargarh@asme.org

Phone: 474-5873

Message Phone: 474-7136

Office: Duckering Rm. 351A

Office Hours:
Mon/Wed/Fri	xx:xx – xx:xx
Tue/Thu	xx:xx – xx:xx
(or as arranged).	

Meeting Times & Locations:

Lecture:	Tue	xx:xx – xx:xx	Duckering 333
Lab:	xxx/xxx	xx:xx – xx:xx	Duckering 333

Catalog Description:

Introduction to computer aided manufacturing. This includes the principles of computer aided process planning (CAPP) and an introduction to computer numerical control (CNC) tools used in manufacturing. Emphasis will be on methodology with hands-on applications of computer software and specific machine tools.

Objectives:

This course covers how computer aided design (CAD) relates to computer aided manufacturing (CAM). Emphasis is placed on the requirement that the entire process, from the inception of the idea for a part to the completion of its manufacture, must include integrated planning in order that the manufacturing process be efficient. Students utilize Solidworks (CAD) and CAMWorks (CAM) software to produce example parts. The machine interpretable code produced by CAMWorks is used by CNC machine tools in the lab to manufacture the parts. Upon completion of this course, the student should be familiar with:

1. Why an efficient manufacturing process requires considerations other than just the design of the particular part.

2. Basic machine tool considerations and additional considerations required for CNC machines to take advantage of software generated machining instructions.

3. How Solidworks and CAMWorks work together to produce code that can be used by CNC machine tools.

4. How to modify the CAMWorks output code for a specific CNC machine tool.

ABET Criteria 3 – Program Outcomes:

This course helps students meet outcomes:

(c) *ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability.*

(i) *recognition of the need for, and an ability to engage in life-long learning.*

(k) *ability to use the techniques, skills and modern engineering tools necessary for engineering practice.*

ABET Criteria 4 - Professional Component:

This course meets requirements set forth in ABET evaluation guidelines under Criteria 4. (b) Professional Component. Specifically, this course is part of the engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study.

Grading:

Grading shall be on the standard straight scale:

90 – 100	→	A	70 – 74	→	C
87 – 90	→	A–	67 – 70	→	C–
84 – 87	→	B+	64 – 67	→	D+
80 – 84	→	B	60 – 64	→	D
77 – 80	→	B–	57 – 60	→	D–
74 – 77	→	C+	< 57	→	F

The grade structure is:

Midterm Exam   25%   Final Exam   25%   Homework/Lab   50%

Attendance is **required**.

Homework and lab assignments will consist of specific project tasks. All assignments shall be submitted on the due date noted. **No late work shall be accepted** without prior approval from the professor.

Exams must be taken on the dates scheduled. Variation from this policy must be arranged with the professor **prior to** the scheduled exam date.

Student Responsibilities:

Students shall abide by the *attendance* and *Code of Conduct* guidelines set forth in the latest edition of the UAF Catalog. One variance from the guideline listed in the *Code of Conduct* is that students are permitted to work together on homework assignments. This team work approach more closely approximates real world engineering practice. It is assumed that all group members will contribute to the solutions.

No food nor drink are permitted in the classroom/lab as they present a possible safety hazard. All **electronic devices** such as cell phones, pagers, and music players shall be turned off while in the classroom/lab. These disruptive activities interfere with the learning environment for the individual violating the policy and the other students in the class. The computers and machine tools in the classroom/lab represent a large investment for the University and due care must be take to avoid damaging these resources. Of greater import are the safety aspects of activities that may distract the student while working with this equipment and could result in severe accidents.

One of the most important things an engineering student needs to learn is effective communication. This includes how to prepare and present work in a professional manner that can be understood and reviewed by peers, clients, and other interested parties. *The most brilliant engineering designs and analyses are worthless if they cannot be effectively communicated to others.* To that end, all work must be submitted in the manner prescribed later in this addendum.

All assignments must be submitted on the due date noted when the assignment was made. **No late work shall be accepted** without prior approval of the professor.

Attendance at all lectures and lab sessions is required. Students are responsible for **signing-in** on the class attendance roster during each class meeting.

Other Student Services:

Students requiring special dispensation due to a disability should contact Disability Services in room 208 (phone: 474-5655), Whitaker Building and request a letter of accommodation. Please provide this letter within two weeks of the beginning of the semester so that proper arrangements can be made to provide an adequate learning experience.

Students may find information concerning tutoring and other services and resources in the UAF Catalog. This information is included by reference in this syllabus rather than being specifically restated in order to prevent possible conflicts should the information change in the Catalog.

The College of Engineering and Mines offers a tutoring lab in Duckering 246. Tutoring for this course may be obtained there. See the Tutoring Lab schedule for specific details.

Class Web Site:

A Web site for this class may be reached by following the appropriate links from http://medept.engr.uaf.edu .

This Web site lists important information about the course. It also includes links to the professor's lecture notes, homework/lab assignments, and the solution sets for exams and assignments. Links to other interesting information may also be posted at this site. Students are encouraged to visit the site often, as it changes regularly, and download information as needed.

Exams, Homework, & Grading:

There are two exams, a Midterm Exam and the Final Exam. The exams are comprehensive only in the sense that course material builds on previous lessons. Make-up exams are normally not permitted. If an absence during the scheduled exam time is anticipated, the **student is responsible** for making arrangements with the professor **in advance** to take the exam at an earlier date.

Homework and lab assignments/projects are designed to augment the student's understanding of the material covered in the lectures and provide the student with hands-on experience with computer aided manufacturing. As such, these projects are heavily weighted in the grading scheme. Students are encouraged to work together on these projects in order to gain a better understanding of the concepts, the CAD/CAM software, and the CNC tooling. If you are having difficulties with the concepts or the hands-on equipment, please ask the professor for additional help.

Homework Format:

It is imperative that engineering work be well organized and neatly presented in order to convey the desired information to peers, clients, and other interested parties in a clear, logical manner. Developing these skills of written communication is critical to an engineer's career development.

All work other than project drawings shall be neatly hand-written and submitted on "engineering" paper such as that produced by National Brand. Each task shall begin on a new page and only the front side (non-grid side) of the paper shall be used. Alternatively, work may be prepared using computer software and submitted on plain bond paper. Computer processed pages shall have a header formatted to mimic "engineering" paper in appearance (a template is available on the Web site).

The header of each page shall include: the assignment number and due date in the left header tab; the course identifier (ME 405) in the center header tab; the

ME406_syllabus_revised

student's name in the right header tab; and the problem number and page number in the top right margin block. An example is shown below:

```
|HW # [xx]                                        |[Prob#]|
|Due: [Due date]    |   ME 406   | [Student's name]| x of xx|
```

The beginning of each task will start with a section heading of "**Problem:**" followed by a statement of the task. This may be paraphrased or copied directly from the assignment. It is a concise statement of the given information and the desired results.

Next comes the solution section titled with the heading "**Solution:**". This is where all work required to solve the task is shown. It includes diagrams, schematics, and plots necessary to show the process under investigation or fully describe the problem solving method. All sources for constants, table values, and/or equations are cited. Assumptions are stated along with reasoning justifying the assumptions. Solution methodology is explained. The intended solution or outcome of the task shall be made obvious by the presentation of the work.

Project drawings shall be presented in sufficient detail and views for the parts to be fully understood and manufactured. The drawings shall be submitted with the standard title block provided by the professor for use in the class with the Solidworks software.

Course Schedule:

The course schedule shall be approximately as shown below. Some adjustment may be made as warranted.

Week	Lecturer Topic	Lab Topic
1 – 3	Introduction. Design planning for efficient manufacturing. Introduction to CNC machine tools.	Review of Solidworks software. Using CAMWorks within Solidworks. Begin the design of project part #1.
4 – 6	Workholders and the relation between the workholder, the workpiece, and the machine tool. Modifying CAMWorks generated code to machine tool code for project part #1.	Complete project part #1 design and generate CAMWorks code. Modify the code for the specific CNC tooling. Machine project part #1.
7 – 9	Advanced CNC tools aid to CAM and their additional requirements.	Begin the design of project part #2.
10 – 12	Automated measuring and adjustment of CNC for enhanced manufacturing.	Complete project part #2 design and generate CAMWorks code. Modify the code for the specific CNC tooling. Machine project part #2.
13 – 14	Large scale CNC tooling in UAF's Machine Shop.	Select one of the project parts, make the required modifications, and machine it on the SL-20 or VF-2 in the Machine Shop.