**Master Syllabus**

**Course:** ENGT 251 – CNC Milling

**Section #:** 01

**Semester:** Fall 2013

**Course Credits:** 2Lecture, 2 Lab, 3 Credit Hours

**Developer:** John Daum 217-875-7211 X447

**Dev/Rev Date:** Spring 05

**PCS #: IAI #:** (if applicable)

**Class Data:**

Section: 01

Time: 1:00-2:50 M, T, W, Th

Room: E152

Begins 10/15/13, ends 12/13/13

**Instructor Information:**

Name: John Daum

Phone: 217-875-7211 ext 447

Office: E152A

Email: [jdaum@richland.edu](mailto:jdaum@richland.edu)

**Office Hours**:

Mon, Wed: 12:15-12:30

Mon, Tue, Wed, Thur: 3:00-3:50

And By Appointment

**Course Description:**

ENGT 251-CNC Milling is an advanced course covering the programming, setup, and operation of a CNC Milling machine to create a variety of parts. Topics include an advanced use of the various functions of the machine's controller, and advanced skills and knowledge of tooling and machine setups. CNC programming techniques and machine setup will include roughing, finishing, profiling, pocketing, and drilling and tapping. Job setup sheets will be created utilizing the part print. Machine capabilities will be utilized in both a production and job-shop environment. The student will utilize the CNC Mill on a major metal working project requiring the use of all the equipment in the machine shop.

This course has been modified in content and delivery to meet the critical objectives for the INAM grant program.

Applicable toward graduation where program structure permits:

* Certificate or Degree – All certificates, A.A.S., A.L.S
* Group Requirement – Not Applicable
* Area of Concentration – Not Applicable

**Course Prerequisite:**

ENGT 104, ENGT 150, ENGT 151, or approval of the instructor.

**Course Objectives/Outcomes:** The student will be able to perform or demonstrate the following skills at the end of the course.

|  |
| --- |
| **Course Outcomes:** |
|  |
| 1. Demonstrate knowledge of basic OSHA requirements, general shop safety, and machine tool safety procedures |
| 1. Interpret basic part prints and/or technical drawing including Geometric Dimensioning & Tolerancing (GD & T) and apply the information as it relates to gauging, dimensioning, and tolerancing. 2. Apply a working knowledge of basic measuring and inspection tools and use appropriate measuring devises to confirm a part’s compliance to required specifications including GD&T symbols. 3. Preform conversion, computations, and calculations that result in parts production to specific industry standards and specifications |
| 1. Program, setup and operate a CNC mill to machine a part in full conformance to the part drawing |
| 1. Operate an advanced CNC machine and interpret advanced CNC programs |
| 1. Develop a Job Setup Sheet |
| 1. Interpret adnvanced CNC G & M code programs and apply editing procedures as needed. |
| 1. Program and utilize Canned Cycles. |
| 1. Program loops, and subroutines |
| 1. Troubleshoot CNC programming errors. |
| 1. Demonstrate advanced setup of a CNC Mill. |
| 1. Use offline software for advanced programming |
| 1. Calculate feeds and speeds. |
| 1. Install part holding and fixturing |
| 1. Select and install cutting tools and set offsets |
| 1. Drill and tap bolt circles. |
| 1. Rough and finish mill pockets and profiles. |
| 1. Make machine adjustments to meet close-tolerance part quality requirements. |
| 1. Perform CNC Mill troubleshooting. |
|  |
| **RCC Cross-Disciplinary Outcomes:** |
| 1. The degree-seeking student will be able to communicate effectively (read, write, speak and listen). |
| 1. The degree-seeking student will think critically and creatively |
| 1. The degree-seeking student will manage technology and evaluate information in various research and applied contexts. |
| 1. The degree-seeking student will act professionally and responsibly |

**Text:**

Machining and CNC Technology, 3rd Edition, Author: Michael Fitzpatrick,

ISBN: 13 9780077805418, McGraw-Hill, 2014 (Optional, Reference from ENGT 150/151)

Machinery’s Handbook, 26th Edition, Industrial Press Inc. (optional)

**Topical Outline:**

|  |  |
| --- | --- |
| Week | Topic |
| 1 | Basic CNC Mill operation overview |
|  | Advanced CNC Mill Operation |
| 2 | Part fixturing and Work shift |
|  | Advanced MDI Mode operation |
| 3 | Tool Changer and tool offsets |
|  | Feeds and Speeds calculations |
| 4 | Advanced milling techniques |
|  | Advanced CNC program structure |
| 5 | Advanced Programming techniques |
|  | Canned Milling Cycles |
| 6 | Subroutines |
|  | Mill Program troubleshooting |
| 7 | Milling Machine troubleshooting |
|  | Quality issues |
| 8 | Projects |

**Methods of Delivery:**

This course utilizes competency based learning which requires the student to perform tasks designed to demonstrate the ability to meet course requirements. The course incorporates lecture, discussion, group activities, individual activities, assigned reading, problem solving, critical thinking, and structured competency-based laboratory experiences.

**Grading Policy:**

Grades will be compiled from the following weighted scale:

Labs and projects 30% A = 90 - 100

Tests and quizzes 30% B = 80 - 89

Final Project 30% C = 70 – 79

Class participation, attendance, and teamwork 10% F = 69 or below

Grades will be determined by a composite score of unit exams, comprehensive final examination, group activities, written projects, and student project assignments. Please note that speed and efficiency will be an attribute measured during testing. Homework is mandatory and will be graded. Late work will be marked down one letter grade and will not be accepted after the next class period. **This includes unapproved absences on test days!!**

**Methods of Evaluation:**

This course incorporates discussion, problem solving, reading and writing, student questions, cooperative group activities, and lectures. Students are strongly encouraged to come to class prepared to ask questions and participate in the learning process in the classroom

Letter grades and lab scores will be based upon the following attributes listed below:

Accuracy, speed, overall quality, attention to detail, conformance to requirements, teamwork, dependability, proper use and care of tools and equipment, clean-up of equipment, troubleshooting and minimizing mistakes, following instructions, ability to perform increasingly higher level tasks.

Grading criteria is detailed as follows:

" **A** "Always executes skills without supervision, can explain and show others. Exceeds all requirements and expectations, with no rework, in an efficient, timely manner. Able to solve most problems independently and takes on higher level tasks. Helps others.

" **B** " Frequently executes skills without supervision. Meets all requirements, with limited rework, working at a reasonable pace. Able to solve most problems with limited input from others. Does not need help. Can take on some higher level tasks.

" **C** " Usually executes skills without supervision. Meets all requirements, with occasional rework, using maximum time allotted. Not able to solve problems without limited help from others. Not ready for higher level tasks.

" **D** " Infrequently executes skills without supervision. Inconsistent in ability to perform required tasks. Is in constant need of help. Normally needs others to help complete work. Can not solve problems without significant help from others. Can not complete tasks in a timely manner. Unable to do more than the minimum.

" **F** " Did not perform the required work. Unacceptable attendance and class participation. Unable to execute skills without supervision. Use help from others to complete work. Can not solve troubleshooting problems. Does not complete tasks in a timely manner.

**Supplies:**

The following items are required:

1. Scientific Calculator ( cell phones are not acceptable)
2. Safety Glasses
3. USB Flash Drive (1 GB)
4. Shop coat (optional)
5. Ruler with fractional inch and metric (millimeters)
6. 3-ring notebook
7. Pencils
8. Graph paper
9. Loose leaf lined paper
10. Highlighter
11. Micrometer 0-1”
12. Dial Caliper 0-6”
13. Material for final project

**Attendance:**

*Regular attendance is necessary for satisfactory completion of a course. An instructor may drop a student who has failed to attend the first two class sessions. At midterm the College will drop any student who has failed to meet the attendance standard or attain sufficient progress as certified by the instructor. During the allotted timeframe as determined by the President of the College or the President’s designee, an instructor may drop a student who has failed to meet attendance standards or attain sufficient progress in the course but is not required to do so. This report will be used to determine certain financial aid awards*

Each unexcused missed class will result in a 2% deduction in the attendance grade. Three or more unexcused absences may result in an administrative drop. **Student must notify instructor prior to class for approval of absence**. No tests/quizzes may be made up without prior approval. **Students wishing to drop class must complete written drop request form, which includes instructor’s signature, or a grade of “F” may result.**

**Instructor Absence:**

In the unlikely event that the instructor is unable to attend class, a note will be posted in the classroom by the department assistant stating such. In case of instructor delay, students should practice good time management skills by working on course material until the instructor arrives. In no case will the class be cancelled without an official notice from the department assistant. The instructor will make every attempt to contact students ahead of time if class is cancelled due to illness. It is the student’s responsibility to keep their registration contact phone number up to date.

**Important Course Content Information:**

**Field Trip:**

A field trip will be utilized to study real world examples. A report will be due one week after the visit. The topic will be assigned after the visit. The report should be a minimum of two typed pages of concise discussion, applying material studied to actual observations. The paper must be typed using word processor software, double-spaced, with 12 pt font. Due to scheduling conflicts, field trips and lab time cannot be made up. Since field trips cannot be made up, missing a field trip will drop your final grade by one letter!

**Classroom Procedures:**

Students will conform to the RCC Student Conduct policies included in the College Course Catalog. Violations of these rules will result in a reduction of your class participation grade and possible removal from class:

* Students are expected to be prepared and ready to perform at the best of their abilities.
* Students are expected to be on time!
* Cell phones and pagers must be turned off before entering the class room.
* Food and beverages are not allowed in the classroom.
* The student is to be courteous to others and respect their right to have an opportunity to learn.
* The student will conduct him/herself in a professional manner at all times.
* Students “suspected” of being under the influence of alcohol or illegal drugs will be asked to leave the classroom.

**ADDITIONAL HELP:**

BE SURE TO GET HELP BEFORE IT IS TOO LATE!

Office hours will be announced. The student is encouraged to get additional help when the material is not comprehended. Engineering Technology is a cumulative subject; therefore, getting behind is a difficult situation for the student.

**STUDY GROUPS**

The student is encouraged to study with other students. A study group of 2 to 4 persons is an excellent opportunity to ASSIST in the learning of technology. Each student in the study group should be responsible for the understanding of all of the material.

**Online Resources Available:**  Additional study resources are available on World Wide Websites: I encourage you to explore the many internet resources as a source of study assistance.

**Human Relations Policy:**

* This course incorporates concepts regarding all races, creeds, sexes, and ethnic groupings, and the belief that they must learn to live together.

**RCC Core Values:** The following core values will guide the class:

* Commitment - We are dedicated to meeting the needs of the communities we serve.
* Respect - We recognize the expertise of all members of the College community and encourage individual contributions.
* Excellence - We strive to develop and pursue higher standards.
* Accountability - We assume and demonstrate responsibility for our actions.
* Diversity/Inclusiveness - We believe that our similarities and differences are opportunities for establishing a common bond and strengthening the College.

**RCC Academic Integrity Policy:**

*All students are expected to maintain academic integrity in their academic work and honesty in all dealings with the College. A student who cheats, plagiarizes, or furnishes false, misleading information to the College is subject to disciplinary action up to and including failure of a class or suspension/expulsion from the College.*

**Safety & Labs/Clinicals**

**Safety Warning:**

**LAB EQUIPMENT UTILIZES HIGH PRESSURE COMPONENTS, HIGH VOLTAGE POWER SOURCES, ROTATING SHAFTS, AND FLYING CHIPS. WEAR SAFETY GLASSES WHEN OPERATING ANY LAB EQUIPMENT. FAMILIARIZE YOURSELF WITH ALL OPERATING INSTRUCTIONS AND SAFETY REQUIREMENTS PRIOR TO OPERATING EQUIPMENT!!!!!ASK FOR ASSISTANCE IF YOU ARE UNCERTAIN ABOUT THE OPERATION OF ANY MACHINE OR PROCESS. BE AWARE OF OTHER STUDENT’S ACTIVITIES!!**

**Assumption of Risk if class-organized travel off campus**

Opportunities may be available for class activities off campus. The student is responsible for choosing the method of travel, and is responsible for his or her own safety when traveling off campus. The student assumes all risks for any travel off campus.

**Student Responsibility for Insurance:**

The College provides no medical, long-term disability or life insurance for students, and as such, the student assumes full responsibility for any medical or loss of time expenses, if any should occur during the period of this event, including but not limited to classroom, field trips, and travel outside of the classroom.

**Core Abilities/SCANS:**

1. Reading
2. Mathematics
3. Teamwork

Participate as a team member – contribute to group effort

1. Responsibility
2. Problem Solving
3. Information

Acquire and evaluate information

Organize and maintain information

Interpret and communicate information

**National/ State/ Local Skill Standards:**

* Illinois Skill standards for Manufacturing are not published at this time.
* Illinois Skill standards for Machining are incorporated when applicable.
* NIMS - National Institute for Metalworking Skills are incorporated when applicable
* MSSC – Manufacturing Skills Standards Council are incorporated when applicable
* Caterpillar Training Institute Machinist Skills are incorporated when applicable

**Learning Feedback System**

Students now have the opportunity to evaluate courses each semester through the Learning Feedback System available online. Faculty will announce when the Learning Feedback System is available for the course and explain the process for accessing the LFS. Some faculty may also use the LFS at midterm. Students are notified by e-mail when the LFS is available.

**my.richland.edu**

Richland uses my.richland.edu as the information portal for students. Users can access a wide variety of web-based services, including online registration, academic information, Richland e-mail, the Canvas Learning Management System, and the Library research databases. Academic information available includes current semester schedule, unofficial transcripts, grade point average projection, financial aid information review, online payment services, and degree auditing to determine degree completion progress. Student grades are posted only on the my.Richland.edu website. Grades will not be mailed to students unless requested.

Students with a “hold” placed on their records due to a financial obligation to the College or other unmet requirement will be unable to view academic records.

**Support Services**

**College Telephone Number: 217-875-7211**

**Academic Success Center**

**Accommodations,** Room C148, Ext. 379

Responsibilities: Services for students with documented disabilities, including advisement, counseling, adaptive equipment and materials, instructional aids, tutors, note takers, interpreters, and testing accommodations

**Testing,** Room S116, Ext. 238

Responsibilities: Placement testing in English, mathematics, reading, health courses; make-up testing as arranged by instructor; testing for online courses

**Tutoring,** Room S118, Ext. 419

Responsibilities: Tutoring on walk-in or appointment basis, study groups, computers

**Student Success Center**

**Advising and Registration**, Room C129, ext 267

Responsibilities: Advisement, registration, general student services

**Career Services**, Room C129, Ext. 307, 205

Responsibilities: Career assessments, job placement information and transfer information and assistance

**Counseling Services**, Room C129, Ext. 252

Responsibilities: Academic advising, personal counseling.

**Financial Aid and Veteran Affairs,** Room N136, Ext 274

Responsibilities: federal and state aid, veteran and entitlement benefits, scholarships

**Student Records**, Room C129, Ext. 257

Responsibilities: grades, transcripts, graduation

**Transfer Center**, Room C129, Ext. 222

Responsibilities: Transfer information, college visits, and campus representatives on campus

**Veteran Services**, Room C129, Ext. 307, 205

Responsibilities: assist veterans with comprehensive college services

**Learning Resources Center (Library)**, Room C152, Ext. 303

Responsibilities: Manages print and electronic resources for students, faculty, and the broader College community. Offers research assistance, information literacy sessions, course reserves, and individual and group study areas.

**Online Learning Support**, [ochelp@richland.edu](mailto:ochelp@richland.edu) Room W143, Ext. 376

Responsibilities: Assists students with navigation in an online course, access and navigation in the student information system, and technical questions regarding personal computer system requirements and troubleshooting. Assistance is also given to students in hybrid and technology enhanced courses. Staff provide technical support through e-mail, telephone, and walk-in service.

The best way for students to contact the Online Help Desk:

From Canvas – click on the “Help” link in the upper right corner and choose Report a Problem.

Non-Canvas related issues: e-mail [ochelp@richland.edu](mailto:ochelp@richland.edu). The Request goes directly to the Help Desk e-mail and is checked regularly.

**Open Computer Labs**

Students may use computers in the Learning Resources Center and in the Academic Success Center.

**Student Engagement**

**Student Success**, Room C131, Ext. 314

Responsibilities: Passport workshops, academic success strategies and workshops, Success.net, (assist with identifying academic need early), and work with probation and suspension students.

**Student Support Services/TRiO Program,** Room C143, Ext. 440.

Responsibilities: Program designed for first-generation college students, offering academic and personal support.

**Perkins Program**: Room E185, Ext. 223

**Message from Leslie DeVore,** Carl Perkins Federal Grant Administrator:

*The Perkins program is a federally-funded program designed to assist students in helping them become academically successful. For a student to be eligible for the Perkins Program they must be enrolled in an occupational program.*

*If a student is enrolled in an occupational area, they are automatically enrolled in the Perkins Program. Students may call the Perkins Program Coordinator for more information 875-7211, Ext. 223 or stop by E185.*

*All students should apply for financial aid (forms can be obtained from Student Development and Services on the first floor). Funding for the Carl Perkins Program is based on the number of students requesting financial aid.*

**College Calendar Fall 2013**

Aug. 19 M Classes Begin

Aug. 24 S Saturday Classes Begin

Aug. 27-28 T-W Farm Progress Show (No Classes)

Sept. 2 M Labor Day (College Closed)

Oct. 14 M Columbus Day Observance (College Closed)

Oct. 15 T Midterm

Nov. 11 M Veterans Day (College Closed)

Nov. 27 W College Closed after 5 p.m.

Nov. 28-30 Th-S Thanksgiving (College Closed)

Dec. 10 T Last Day for Withdrawal with “W” for 16-Week Classes\*

Dec. 14 S Saturday Final Exams

Dec. 11-16 T-M Final Exams

Dec. 23-31 Holiday Break

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Date** | **Topics** | **Homework/Tests:** |
| **1** | Oct 14 | Basic CNC Mill operation overview |  |
|  |  | Advanced CNC Mill Operation |  |
| **2** | Oct 21 | Part fixturing and Work shift |  |
|  |  | Advanced MDI Mode operation |  |
| **3** | Oct 28 | Tool Changer and tool offsets |  |
|  |  | Feeds and Speeds calculations |  |
| **4** | Nov 4 | Advanced milling techniques |  |
|  |  | Advanced CNC program structure |  |
| **5** | Nov 11 | Advanced Programming techniques |  |
|  |  | Canned Milling Cycles |  |
| **6** | Nov 18 | Subroutines |  |
|  |  | Mill Program troubleshooting |  |
| **7** | Nov 25 | Milling Machine troubleshooting |  |
|  |  | Quality issues |  |
| **8** | Dec 2 | Projects | Projects Due |
| **9** | Dec 9 | Projects Due | Final Test Dec 12 |
|  |  |  |  |

**Schedule subject to change by instructor**

**INAM Grant**

“This workforce solution was funded by a grant awarded by the U.S. Department of Labor’s Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timelines, usefulness, adequacy, continued availability, or ownership. This solution is copyrighted by the institution that created it. Internal use, by an organization and/or personal use by an individual for  non-commercial purposes, is permissible. All other uses require the prior authorization of the copyright holder.”