Three Rivers COMMUNITY COLLEGE **Spring 2017 Syllabus**

Manufacturing Process Lecture/Lab – MFG K102
Room B108/B110, Mondays, 5:30 – 9:56 p.m.

Instructors: PROF Andrew Shetland ph.: 860-917-4535
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Contact Methods: **Email / Telephone**

Email:

Email is considered an official method for communication at Three Rivers Community college because it delivers information in a convenient, timely, cost-effective, and environmentally aware manner. Students are expected to check their official TRCC email on a frequent and consistent basis in order to remain informed of college-related communications. The College recommends checking email daily. Students are responsible for the consequences of not reading, in a timely fashion, college-related communications sent to their official TRCC student email account. Students should possess the ability to logon to Blackboard (or any other required course management software or Web site).

Course Description:

Manufacturing methods of metals and plastics including metal casting, forming, machining, welding, and plastic processing. Through lecture, open discussion and practical hands on experience, this course will develop a working knowledge of machining practices for the manufacturing engineer.

This is a survey class intended to provide an introduction to the wide variety of manufacturing processes currently in use. The lab will provide a tactile experience for students in a subset of the processes and practices found in the American manufacturing industry.

MFG K102; 3 CREDIT HOURS; MANUFACTURING PROCESSES / LAB
This course studies manufacturing: making goods and wares by industrial processes. The course will provide theoretical experience in the scientific, engineering, and economic principles on which the various manufacturing processes are based. This course provides laboratory emphasis on common metal cutting tools and lathe operations, as well as on associated precision measuring tools and instruments. The labs will involve set-ups and procedures for milling machines, lathes, grinders, drill presses, and some measuring instruments.

Text Book:

Introduction to Manufacturing Processes – Groover, Mikell P., Oct 2011/12 ISBN : 978-0-470-63228-4

Lecture & Lab Outcomes:

- Students will practice the skills needed to work effectively in teams and as an individual.
- Students will demonstrate the ability to use appropriate mathematical and computational skills needed for engineering technology applications.
- Students will combine oral, graphical, and written communication skills to present and exchange information effectively and to direct manufacturing activities.
- Students will know of a professional code of ethics.
- Students will describe concepts relating to manufacturing quality, timeliness, and continuous improvement
- Students will describe how the concepts of metal manufacturing, statistics, process automation, computer-aided design and manufacturing, and organizational management affects manufacturing operations.
- Students will illustrate an ability to think critically and identify, evaluate and solve complex technical and non-technical problems; demonstrate creativity in designing problem solutions; and conduct and interpret experimental data and outcomes.
- Students will recognize the need to be lifelong learners.

The course will consist of a lecture and a lab. This course is taught using a variety of instructional methods that might include lecture, class discussion, small group work, project creation, electronic discussion, and group presentations. In both the lecture and lab, open student discussion is encouraged including the asking of questions and relating their own experiences.

Lecture & Lab Performance Criteria:

The above outcomes will be assessed using these performance criteria:

- Working in teams –
  - Produce research information for a team
  - Demonstrate understanding of team roles when assigned
  - Share in work of team
  - Demonstrate good listening skills
- Mathematical and computational skills-
  - Ascertain problem conditions by identifying known and unknown quantities in formulating a problem for solution
  - Demonstrates the correct selection and application of pertinent formulae, principles and concepts
  - Pursue solutions in a methodical, logical manner with results correctly explained with sufficient detail and properly documented
  - Submit problem solutions with a minimum of computational errors, identifying and selecting the correct dimensional units
- Use of communication skills-
  - Identify the reader / audience, assess their previous knowledge & information needs, and organize / design information to meet these needs
  - Provide content that is factually correct, supported with evidence, explained with sufficient detail and properly documented
  - Test reader / audience response to determine how well ideas have been relayed
  - Submit work with a minimum of errors in spelling, grammar & usage
- Know Code of Ethics-
  - Demonstrate knowledge of professional code of ethics / conduct
  - Evaluate the ethical dimensions of professional engineering, mathematical and scientific practices
- Concepts relating to manufacturing quality, timeliness, and continuous improvement-
  - Identify the factors that influence manufactured products quality, cost, and timeliness
  - Demonstrate familiarity with concepts of 'waste' and waste reduction processes as related to manufacturing
  - Determine systems required to ensure products / services are designed & produced to meet / exceed customer requirements
  - Apply the fundamentals and concepts of lean, just-in-time and Kanban during manufacturing system design
- Describe how the concepts affect manufacturing operations-
  - Identify the elements of manufacturing automation commonly found in manufacturing enterprises; including CAD/CAM, CNC, machine vision & automated inspection, automated material handling and storage, and robotics
  - Demonstrate familiarity with typical manufacturing processes – integrated manufacturing systems
  - Show knowledge of key drivers of manufacturing system performance
  - Perform geometric modeling using CAD software; prepare a simple CNC program and produce a sample part
- Illustrate an ability to think critically and identify-
  - Show the ability to evaluate the credibility of sources of information
  - Demonstrate the ability to refine generalization, establish rational & pertinent assumptions, and avoid oversimplifications
  - Exhibit the ability to generate, analyze / evaluate, and assess multiple engineering problem solution options
  - Produce documentation that reflects organization and application of engineering principles in specifying solution to an engineering problem

- Lifelong learning-
  - Demonstrate an awareness of what needs to be learned; formulate questions based on research need
  - Develop research plan appropriate to the investigative method
  - Identify, retrieve and organize information
  - Use a variety of methods and emerging technologies to keep current in the field

Grading Policy:

It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3 credit class, you should expect to study an average of 6 hours per week outside of class. Some students may need more outside study time and some less. Two exams will be given during the semester with the possibility of quizzes as appropriate. Approximately one hour of the class meeting will be devoted for each exam. Final grades will be based on a normal distribution of all students taking the course based on the following weighting:

COMPONENT	WEIGHTING	DUE DATE
LearnMate1: BluePrint Reading	10%	13 FEB 2017
Lab Report 1: Molding	10%	27 FEB 2017
Exam I	10%	20 MAR 2017
LearnMate2: CNC Milling	10%	27 MAR 2017
Ethics Case Study	10%	03 APR 2017
Lab Report2: CNC	10%	17 APR 2017
LearnMate3: Intro to Advanced Manufacturing	10%	01 MAY 2017
Final Presentations	10%	08 MAY 2017
Lab Report 3: Machining	10%	15 MAY 2017
Exam II	10%	15 MAY 2017

Grading Policy: Grades will be assigned according to the following scale:

94 -100	A
90 - 93	A -
87 - 89	B +
83 - 86	B
80 - 82	B -
77 - 79	C +
73 - 76	C
70 - 72	C -
67 - 69	D +
63 - 66	D
60 - 62	D -
Below 60	F

Attendance: Attendance will be taken, after 3 absences from scheduled class dates 5% will be deducted from the final grade.

Instructor Assistance: Seeking help from the instructor outside of class is encouraged if you are having difficulty understanding course material. You are encouraged to seek assistance during class as well as during by appointment outside of class hours.

Academic Integrity: Academic integrity is essential to a useful education. Failure to act with academic integrity severely limits a person's ability to success in the classroom and beyond. Furthermore, academic dishonesty erodes the legitimacy of every degree awarded by the College. In this class and in the course of your academic career, present only your own best work; clearly document the sources of the material you use from others; and act at all times with honor.

Withdrawal: A student who finds it necessary to discontinue a course must complete a "Withdrawal Request Form" available in the Registrar's office within the time limits of the semester calendar. Students who do not withdraw, but stop attending will be assigned an "N" grade which may impact their financial aid status. The last day to withdraw from classes is **May 8th, 2017**.

Disabilities Statement: If you are a student with a disability and believe you will need accommodations for this class, you must contact the TRCC's Disabilities Counseling Services at (860) 892-5751 or (860) 383-5240. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. Please note that the instructor cannot provide accommodations based upon disability until the instructor has received an accommodation letter from the Disabilities Counselor.

Digication: All students are required to maintain an online learning portfolio in Digication that uses the college template. Through this electronic tool students will have the opportunity to monitor their own growth in college-wide learning. The student will keep his/her learning portfolio and may continue to use the Digication account after graduation. A Three Rivers General Education Assessment Team will select and review random works to improve the college experience for all. Student work reviewed for assessment purposes will not include names and all student work will remain private and anonymous for college improvement purposes. Students will have the ability to integrate learning opportunities. If desired, students will have the option to create multiple portfolios.

Date	Class #	Topic	Reading	Lab	LearnMate	DUE
23 JAN	1	INTRO to MFG METROLOGY LAB SAFETY	Ch 1, 4	Metrology	BluePrint Reading	
30 JAN	2	MATERIAL PROPERTIES / LEARNMATE SETUP	Ch 2, 3	Silicone Molding / Hammer	BluePrint Reading	
06 FEB	3	PLASTICS / ELASTOMERS	Ch 8, 9	Silicone Molding / Hammer	BluePrint Reading	
13 FEB	4	MATERIAL REMOVAL (MECH)	Ch 15, 16, 17	Silicone Molding / Hammer	BluePrint Reading	LM1
20 FEB	NO CLASS	**-NO CLASS (PRES. DAY)**				
27 FEB	5	MATERIAL REMOVAL (OTHER)	Ch 18, 19	Hammer		LR1
06 MAR	6	COMPUTER NUMERICAL CONTROL (CNC) RAPID PROTOTYPING	Ch 26, 29	Hammer	CNC	
13 MAR	NO CLASS	**SPRING BREAK**			CNC	
20 MAR	7	**EXAM I**		Hammer	CNC	EX1
27 MAR	8	ETHICS	Case Study Handout	CNC / Hammer	CNC	LM2
03 APR	9	ETHICS CASE STUDY DUE		CNC/ Hammer		CS
10 APR	NO CLASS	**-NO CLASS**				
17 APR	10	PRODUCTION SYSTEMS (LEAN / SIX SIGMA)	Ch 25, 28, 30	CNC / Hammer	Advanced Manufacturing	LR2
24 APR	11	MATERIAL ADDITION (Welding)	Ch 22, 23, 24	Welding / Hammer	Advanced Manufacturing	
01 MAY	12	MATERIAL ADDITION (Assembly)		Welding / Hammer	Advanced Manufacturing	LM3
08 MAY	13	FINAL PRESENTATIONS	Ch 12, 13, 14	Hammer	Advanced Manufacturing	FP
15 MAY	14	EXAM II				LR3 EX2

LearnMate (10% Each): https://trlm.trcc.commnet.edu

Mechanical Blue Print Reading (DUE 13 FEB 2017) Enrollment Key: Draw17

1. Identifying Lines and Their Functions
2. Single, Multiple, and Auxiliary View
3. Reading and Locating Blue Print Dimension
4. Determining Tolerances
5. Identifying Thread Dimension
6. Identifying Tapers and Machine Surfaces
7. Cutting Plane and Sections
8. Geometric Dimensioning, Wear Limits, and Assembly Drawings
9. Identifying Welding Symbols
10. Reading Plot Plans
11. Reading Footing, Foundations, and Floor Plans
12. Reading Concrete and Structural Steel Prints
13. POST TEST

CNC Milling Technology with Benchmill 6000 (DUE 27 MAR 2017) Enrollment Key: Turn17

1. Introduction and Safety
2. CNC Motion Control Software
3. Mounting the Workpiece
4. Tooling
5. Reference Positions
6. Verifying a Program
7. Running a Program
8. Fundamentals of NC Programming
9. Programming the House
10. Machining Project #1
11. Arc Programming
12. Programming the Star
13. Machining Project #2
14. Programming Your Initials
15. Final Project
16. POST TEST

Introduction to Advanced Manufacturing (DUE 01 MAY 2017) Enrollment Key: Advanced17

1. Introduction
2. Careers in Manufacturing
3. Seeking a Manufacturing Career
4. The Manufacturing Company
5. Planning and Staffing a Manufacturing Company
6. Manufacturing Processes
7. Computers in Manufacturing
8. Automation in Manufacturing
9. The Arrow Plane
10. POST TEST

LAB REPORTS (10% Each):

1. **Molding (DUE 27 FEB 17)**
2. **CNC (DUE 17 APR 17)**
3. **Machining (DUE 15 MAY 17)**

LAB REPORT FORMAT (3-5 Pages)

I. COVER PAGE (Include Title, Student Name, Course Name, & Date)

II. INTRODUCTION

III. BILL OF MATERIALS / TOOLS NEEDED

IV. OBJECTIVE
- **a. Describe in one to two sentences the purpose of the laboratory exercise. This section should include why the lab was conducted.**

V. PROCEDURES
- **a. Describe what steps and methods were used in order to accomplish the laboratory exercise.**
- **b. What order of operation was required to produce the outcome?**
- **c. Why were these steps accomplished in this order?**

VI. RESULTS
- **a. How did the finished product of the lab compare to the expected outcomes?**
- **b. What could have been done differently in the procedures in order to produce a better outcome?**

VII. CONCLUSION
- **a. Consider mass production of these parts, could the part be modified or designed differently in order to produce larger quantities at a more rapid rate of production with a high yield of parts within specification?**

VIII. REFERENCES

CASE STUDY (10%)
INCIDENT AT MORALES:

LAB REPORT FORMAT (5 Pages)

I. COVER PAGE (Include Title, Student Name, Course Name, & Date)

II. INTRODUCTION
- **a. Describe the situation at Phaust Chemicals. Layout the main characters, the major project deliverables, and the major project constraints.**

III. PROBLEM STATEMENT (use the Incident at Morales handout to assist with possible questions to answer for this portion of the case study)
- **a. As a result of the project constraints, what ethical issues arose (list these issues from most important to least important)?**
- **b. How did the decisions made for each of these ethical issues affect the outcome of the project (internal/external stakeholders, environment, etc…)**
- **c. Whose responsibility should it have been to ensure that the 'right' thing was done when these issues arose?**

IV. CONCLUSION
- **a. What have you learned about engineering ethics?**
- **b. Should governments be more involved by putting additional laws/regulations in place to mandate the 'appropriate' choices be made by individuals and organizations?**
- **c. How will you conduct yourself as a 'professional' someday?**

V. REFERENCES

PRESENTATION (10%):

PRESENTATION (5-10 Minutes)

I. COVER SLIDE (Include Title, Student Name, Course Name, & Date)

II. INTRODUCTION
- **a. Give a quick overview of the process to be discussed.**

III. HISTORY
- **a. When was the process developed?**
- **b. Who developed it?**
- **c. How has this process impacted history?**

IV. DESCRIPTION
- **a. General description of how the process works?**
- **b. What are the process limitations (what materials can/cannot be processed, quantities are produced, tolerances can be held, etc)?**
- **c. What types of materials/products are produced using this process?**

V. FUTURE / CONCLUSION
- **a. What advancements do you anticipate for this process? Be imaginative!**
- **b. Provide a summary of what you just presented.**

VI. REFERENCES SLIDE