MNT 106: Manufacturing Quality Assurance & Control Techniques – Course Description, Topics, and Learning Objectives

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2012-2013
QUINSIGAMOND COMMUNITY COLLEGE

NEW COURSE PROPOSAL

Course Discipline/Division: Manufacturing Technology
Course Number: MNT 106
Course Name: Manufacturing Quality Assurance & Control Techniques
Prerequisites and/or corequisites (confer with affected department coordinator): MNT 101
CIP code (check with IRaP Office): 15.0613
Effective Term/year: Fall 2013
Give a rationale for the new course. Be sure to indicate whether this course replaces another course. The proposed new course provides education and training for geometric dimensioning and tolerance as well as quality control and inspection techniques. These changes represent curriculum design that supports national and state wide skills standards from MSSC-CPT (Manufacturing Skill Standards Council- Certified Production Technician) and MACWIC (Massachusetts Career Workforce Innovation Collaborative – Applied Manufacturing Technology Certification).
Is the course content similar to other courses now offered? Yes ___ No _X___ If yes, attach a statement for the coordinator of the department offering the similar course.
Please indicate if this course will serve as any of the following types of electives ___ Elective ___ Discipline specific _X__ Program specific (Manufacturing Technology A.S., Certificate, and CAD Certificate) ___ Multiple perspective (confer with the Liberal Arts Coordinator)
Is this course required for a program? If yes, submit a separate Program Revision Proposal or New Program Proposal. Yes – CAD Certificate and Manufacturing Technology Certificate

Expected enrollment per term: 20	Expected enrollment per year: 20

Will any of the following be required: Additional staff Yes – Adjunct faculty Additional space _No Additional equipment __No Provide a rationale for any needs indicated above and include approximate cost of equipment.
Library print and non-print resources in support of this course: $500

Course Materials

Course number: MNT 106		
Course name: Manufacturing Quality Assurance & Control Techniques		
Credits: 4		
Lecture Hours: 45	Lab hours: 15	Clinic Hours: 0
General course description and prerequisites (as it will appear in the catalog): **MNT 106 Manufacturing Quality Assurance & Control Techniques 4 cr** This course enhances the use of blueprint reading skills through the study of geometric dimensioning and tolerances. Students analyze the dimensional and performance requirements of individual parts or components. Students utilize industry-standard practices in the field of inspection to qualify component part conformance to a given blueprint. Quality control techniques drive the success of engineering and manufacturing companies. This course provides students with an understanding of the critical nature of quality, and recognizing potential problems before they appear. Students use high precision measuring equipment and statistical process control (SPC) methods to determine and support quality control requirements. Prerequisite: MNT 101 S		
All required texts and paperbacks, including information on publisher and edition used (provide a suggested text): GD&T: Application And Interpretation (ISBN 10: 1605252492 / ISBN 13: 9781605252490) - Bruce A. Wilson and Banner Center Manufacturing Essentials Unit 5 Quality Assurance		
Instructional Objectives (list): Through a combination of lectures, demonstrations, assignments, weekly readings, and completion of worksheets, students: 1. Create accurate engineering drawings using ANSI and ISO standards; 2. Interpret and analyze geometric dimensioning and tolerance symbols on a drawing and apply inspection methods to prove product conformance ; 3. Demonstrate effective use of mechanical measuring equipment; 4. Understand quality practices in relation to cost and continuous improvement; 5. Create and examine graphical data for quality control; 6. Identify and describe statistical process control (spc); 7. Identify and describe the concepts used to measure the quality of a manufacturing process; 8. Describe a variety of quality improvement systems; 9. Demonstrate problem solving techniques as used in quality assurance;		
Teaching procedures: (provide suggested teaching methodology): A combination of lectures, demonstrations, assignments, weekly readings, and completion of worksheets		
Course topics and/or assignments and/or required and/or supplemental reading (provide a list of suggested course topics):		

Week	Subject	Topics		Lab
1	Intro	Introduc on to GD&T	Chapter 1	Multiple choice
		Introduc on quality management and lean.		True or false
		Linear measurement and conversions. Frac ons, decimal, inch to metric.		Short answer
2	GD&T	Blue print reading and naviga on.		
		Dimensioning and tolerance symbology	Chapter 2	Multiple choice
		General dimensioning requirement	Chapter 3	Application problems
		Drawing sheet sizes		
		Understand and discuss ANSI and ISO standards		
3	GD&T	Dimension applica on and limits of size	Chapter 4	Multiple choice
		Form tolerance	Chapter 5	Application problems
4	GD&T	Datums and datum feature references	Chapter 6	Multiple choice
		Orienta on tolerance	Chapter 7	Application problems
5	GD&T	Posi on tolerance	Chapter 8	Multiple choice
6	GD&T	Run out and pro le	Chapter 10	Multiple choice
7	Mechanical inspec on	Introduc on to measuring equipment		
		How to use a micrometer		Create a run chart using a micrometer
		How to use a Vernier caliper		
		How to use depth gauges		
		How to use a digital height gauge		
		Demonstrate the use and selec on of inspec on equipment		Measure part supplied against the print
8	Mechanical inspec on	Advanced inspec on		Measure part supplied against the print
9	Company visit	Tour a local company to iden fy their quality control techniques		United lens, metso, phillips precision
10	Introduc on to quality management	Iden fy and describe elements of a quality management system used in manufacturing.	Module 1	Exercise 1
		Determine the need for con nuous quality improvements.		
		Examine the cost of poor quality.		
		Examine the use of graphical data.		End of module quiz
11	Introduc on to measuring process	Iden fy and describe the concepts used to measure the quality of a manufacturing process.	Module 2	Exercise 2

	control			
		Demonstrate the use of measurement principles and equipment.		
		Iden fy and describe sta s cal process control (SPC) tools used in manufacturing.		
		Iden fy and describe mistake-proo ng methods.		
		Demonstrate mean and median computa ons, and the development and use of run and control charts to control process quality.		End of module quiz
12	Quality improvement systems	Describe a quality management system audit and the assurances it provides.	Module 3	Exercise 3
		Describe the root cause failure analysis process and how to facilitate the process.		
		Iden fy and describe correc ve and preven ve ac ons.		
		Iden fy and describe the CAPA (correc ve and preven ve ac on) system		
		Process.		
		Iden fy the steps in documen ng a CAPA report.		
		Iden fy and describe the components of the Toyota quality system house and the ISO 9000 process.		
		Iden fy manufacturing quality awards.		
		Describe a typical benchmarking process.		
		Describe the design of experiment process.		
		Iden fy and describe the elements of a process capability study.		
		Describe the objec ve of measurement system analysis.		End of module quiz
13	Problem solving	Iden fy and describe the steps for crea ve problem solving.	Module 4	Exercise 4
		Iden fy the reasons for performing inspec ons.		
		Describe the importance of acceptance sampling.		
		Iden fy possible ways of disposing of nonconforming products.		

		Iden fy the contents of an inspec on plan.		
		Discuss the role of a produc on technician in a quality circle.		
		Discuss how gathering data relates to the problem-solving process.		
		Discuss the use of check sheets, pie charts, and bar charts in the problem-solving process.		
		Iden fy and describe the key elements of a shbone diagram.		End of module quiz
14	Final exam review			
15	Final			

Other information:

- Suggested basis for student grading and criteria for evaluating student performance

1. EXAMS & QUIZ (50%)
2. CLASS PARTICIPATION (15%)
3. ATTENDANCE (15%)
4. PROJECT (20%)

- Suggested attendance policy

All students are expected to attend every session. Students are responsible for all that transpires in class whether or not they are in attendance. Excessive absences or lateness may lead to a failing grade or removal from the class roster. Students must notify the instructor of **any** anticipated absences. Any student who misses a test date without prior approval will be penalized 10 points from their exam score for each class until a makeup exam is taken.

- Suggested assessment methodologies

  Using both formative and summative assessment through exams, quizzes, student projects and class discussions as described above.

Please submit a syllabus for this new course to your dean.

List the Student Learning Outcomes for this course in the table below. Recommendations for writing SLOs can be found in the *General Information for Academic Affairs Proposals* document that is available on the QCC's Intranet under Frequently Used Forms (Academic Governance Forms).

COURSE STUDENT LEARNING OUTCOMES FOR MNT 106 MANUFACTURING QUALITY ASSURANCE & CONTROL TECHNIQUES

Upon completion of the course, students will be able to:	
1	Apply accurate and effective dimensioning.
2	Design and understand geometric tolerances using ANSI and ISO standards
3	Differentiate ISO and ANSI screw threads as well as customized thread design
4	Ability to use a variety of precision inspection equipment
5	Set up and manage inspection protocols to prove product conformance
6	Analyze and explain inspection requirements based on production methods
7	Create and examine x-bar charts, control charts, run charts, and Pereto charts
8	Justify a need for inspection relative to adding value to the product
9	Discuss and explain the basics of lean in quality systems

How does the course support general education? Using the chart below, indicate the degree or level of connection between the course and outcome as indicated here.

I – Introductory/Background – There is an indirect relationship between the course and the outcome. The outcome itself is not the focus of the course but at least one element of the course serves as a building block to the achievement of the final outcome. For example, course elements may provide the knowledge, skills or attitudes necessary for the ultimate achievement of the outcome.
M – Intermediate/Transitional - There is more of a direct relationship between the course and the outcome than Introductory. A mixture of course elements supports the final achievement of the outcome, but the final integration of knowledge, skills and attitudes necessary for its achievement is not accomplished in this course. For example, knowledge, skills and/or attitudes (at least 2 of the 3) required for achievement of the outcome may be the focus of the course or course element, but the integration of all three is not.
E – Emphasized – There is a direct relationship between the course and the outcome. At least one element of the course focuses specifically on the complex integration of knowledge, skills and attitudes necessary to perform the outcome.

CONNECTION OF MNT 106 MANUFACTURING QUALITY ASSURANCE & CONTROL TECHNIQUES TO GENERAL EDUCATION STUDENT LEARNING OUTCOMES	I,M,E
Communication Skills: Students will write and speak effectively.	I
Information Literacy: Students will locate, evaluate and apply reliable and appropriate information.	M
Quantitative Reasoning: Students will apply the concepts and methods of mathematics to solve problems.	E
Scientific Reasoning: Students will relate scientific methods of inquiry to the acquisition of knowledge.	M
Technical Literacy: Students will utilize computer an emerging technologies effectively.	E
Aesthetics: Students will appreciate the variety of human experiences as expressed through the arts.	N/A
Multiple Perspectives: Students will demonstrate knowledge and appreciation of diverse cultures.	N/A

Ethics: Students will develop an awareness of personal obligations and responsibilities in one's community of influence.	I
Impact of Technology: Students will reflect on the impact of scientific and technological advances on the individual, society and the environment.	E
Civic Literacy: Students will demonstrate awareness of the responsibilities of local, national and international citizenship.	I

If the course is required in a program or it is an elective in a program, please indicate how the course contributes to the Program Student Learning Outcomes. List the Program Student Learning Outcomes and indicate the degree or level of connection between the course and outcome as I, M, or E. Please delete this table if it is not applicable.

CONNECTION OF MNT 106 MANUFACTURING QUALITY ASSURANCE & CONTROL TECHNIQUES to PROGRAM STUDENT LEARNING OUTCOMES FOR MANUFACTURING TECHNOLOGY		
1	Ability to apply knowledge of mathematics & science	M
2	Ability to design and conduct experiments, as well as to analyze and interpret data.	M
4	Ability to function productively on multicultural and multidisciplinary team	I
5	Ability to identify, formulate, and solve manufacturing systems problems	M
6	Ability to understand, practice, and nurture professional and ethical responsibilities	M
7	Ability to communicate effectively in both the written and spoken modes.	I
8	The intellectual and educational breadth necessary for understanding the impact of manufacturing systems solutions in a global and societal context.	M
9	Ability to use the contemporary techniques, skills, and tools necessary for effective manufacturing systems practice.	I
10	Understand the behavior and properties of materials as they are altered and influenced by processing in manufacturing.	M
11	Understand the design of products, and the equipment, tooling and environment necessary for their manufacture	I
12	Ability to apply advanced methods to the analysis, synthesis, and control of manufacturing systems.	I
13	Ability to measure manufacturing process variables and draw credible technical inferences	E