

**National STEM Consortium  
Reviewer Form**

NSC Certificate Area

Composite Materials  
Technology

Cyber Technology

Electric Vehicle  
Technology

Environmental  
Technology

**Mechatronics**

Title of Course: **MEC INTRODUCTION TO MANUFACTURING PROCESSES**

Please provide a qualitative analysis of the NSC Certificate program course materials based on the three criteria below (approximately one page per criterion). At the end of each review please use a scale of 1-3 (1=low; 2=medium; 3=high) to rate the overall quality of the materials in relation to that criterion.

Criteria:

- (A) Meets industry standards and needs (Identify relevant Industry Standards and Needs: technical, personal and interpersonal).
- (B) Represents “best in class,” nationally portable, one-year certificate programs that are in demand by workers and employers.
- (C) Can be disseminated quickly and widely to community colleges throughout the United States.

Name of Reviewer: *Marilyn Barger*

Date of Review: *06/30/2014*

**(A) Meets industry standards and needs (Identify relevant Industry Standards and Needs: technical, personal and interpersonal).**

(i) Industry Relevance:

There is a national need for skilled workers to begin to address the installation and operation of automated systems in many industrial facilities of all kinds that use different focused advanced technologies. The National Association of Manufacturers’ (NAM) Manufacturing Institute (MI) has defined this need as related to industrial maintenance and machine operations, which includes understanding and working knowledge of basic manufacturing processes. Industries across the country are rapidly improving and adding technology to their primary processes to improve their production efficiency and effectiveness. The fast pace of technology change has heightened manufacturers need for more highly skilled and knowledgeable workers.

Various processes, machinery, and operations will be examined with emphasis placed and systems.

The materials provided within the MEC Introduction to Manufacturing Processes primarily addresses basic knowledge of the breadth of manufacturing processes which are important for all employees working anywhere in a production environment, including the front-line material handlers, machine operators, multi-skilled maintenance technicians, specific trade skills and others.

The MEC Introduction to Manufacturing Processes course packet meets this need with a good basic instructional package for instructors, teachers and faculty. The materials reference current resources about fundamental manufacturing processes and their applications and installation in state of the art facilities. Course materials also map to the current Department of Labor Competency Model for Advanced Manufacturing.

(ii) Standards Relevance:

The Introduction to Manufacturing Processes course is a three credit-hour (approximately 60 mixed lab and lecture contact hours) descriptive introductory course. Topics covered include the benefits, limitations, and applications of different machine processes and engineering materials for product manufacturing. The course also focuses on the adaptability of machinery to a variety of manufacturing processes. Each process is covered from a technical perspective; correct terms are introduced so that the student will be able to use the language of the engineer and/or technologist. Various processes, machinery, and operations are examined emphasizing process operational parameters that influence design considerations, product quality, and costs. The overall aim is to establish the technical knowledge and secure vocabulary for selection, design, and planning of manufacturing processes and systems.

The course pack provided for review includes 14 lesson plans with each one estimated at one to three hours of delivered instruction. A comprehensive listing of topics to cover, references to a well-known introductory text, and well-defined student learning outcomes as well as some loosely outlined demonstrations and/or hands-on activities. The lesson plans refer the instructional materials that appear to be provided with the recommended text. The ancillary items include presentations aligned to the book chapters and review questions and practice problems.

This course supports one of the four required Manufacturing Skill Standards Council (MSSC) assessments of the Certified Production Technician (CPT) credential ([www.msscusa.org](http://www.msscusa.org)). This particular assessment is “Manufacturing Processes and Production”. The Introduction to Manufacturing Processes course covers the breadth of that MSSC assessment but also goes into more detail about each topic. Therefore, students successfully completing the course should be able to easily pass this assessment. This course does not provide direct informational support for the overarching NSC Mechatronics curriculum aligned certification Siemens Mechatronics Levels 1 and 2, but is essential for technicians working in manufacturing facilities.

**(B) Represents “best in class,” nationally portable, one-year certificate programs that are in demand by workers and employers.**

In addition to the identified need defined by NAM, the NSC Mechatronics Team college partners had defined specific local and regional industry needs for general manufacturing technicians as

well as automation and mechatronic technicians in their original grant application. These high skill and high wage jobs generally attract students, veterans, unemployed, and underemployed workers due to the intrinsic hands-on nature of the work, continuous lifelong learning opportunities as well as strong career advancement potential. The development of this workforce requires curricula that provide the knowledge and skills required to meet current industry needs. The structure of a course that delivers this content is optimal when it meets “best in class” characteristics. I believe that the MEC Introduction to Manufacturing Processes course developed through the National STEM Consortium Curriculum Development Project has some of the characteristics of a “best in class” curriculum. “Best in class” curriculum can be defined as providing state-of-the art and current content; formatted for flexible delivery options; and offer a comprehensive package of materials so a qualified faculty could offer the course with no additional materials.

The Introduction to Manufacturing Processes course in the NSC Mechatronics Certificate program is an overview of a broad scope of manufacturing processes commonly used in a number of industry and business sectors. It provides a solid, overview of modern day manufacturing facilities. Additionally, the local and/or regional needs were defined by the NSC Mechatronics Team college partners had defined for mechatronics technicians in their original grant application.

The course materials provided are very good, up to date, comprehensive, well written and appropriate for the introductory course for Manufacturing Processes. They include all the information typically found in a syllabus plus significant details about learning outcomes; scope and sequence; general education skills and knowledge covered in each lesson (mathematics, reading comprehension, etc.). They also identify technological literacy, creativity, troubleshooting and problem solving and teamwork practice and skills. Several specific, appropriate and current text and multimedia resources are identified in each lesson plan as well as alternative approaches for delivering the material. Each lesson includes a detailed outline and student learning outcomes by topic. The lesson plans also include suggestions for how to deliver the course in a blended environment, which will be helpful for anyone interested in offering portions of the course modules via an online platform. No assessments are provided in the course pack, however the lesson plans do offer guidance on what knowledge and skills should be assessed and suggests some types of assessments to use for both in class quizzes and tests (leaving assessment development up to the instructor). Student teamwork exercises are limited to group work to answer text questions. Some case study analysis is mentioned, but no specific case studies are provided or referenced in the course pack.

Industry has made it clear that students must have the opportunity to work directly with related equipment, and this course provides some hands-on, project-based learning opportunities for students. The course provides a foundation for the desired industry workplace skills to build upon in subsequent courses. It also specifies how expected background knowledge and how critically important personal and interpersonal skills are occasionally integrated into this technical course by using work team environments throughout the course assignments, demonstrations and case study activities. The course pack encourages use of good teaching and learning strategies for mastery of topics in the course.

**(C) Can be disseminated quickly and widely to community colleges throughout the United States.**

The structure of the Introduction to Manufacturing Processes course is based primarily on a solid, current text, delivered primarily in a lecture format using available multimedia. Some demonstrations and group problem solving activities are recommended. All of the course materials would be easy for an education institution to implement as the same course anywhere in the United States by a faculty or instructor with an appropriate technical background. This content is also conducive to language translation to facilitate the course being delivered globally. The course is divided into three modules of twenty hours of combined lecture, demonstrations, quizzes, tests, and group problem solving. The three distinct modules provide flexibility for anyone delivering the course material in various length college credit courses or in short-term non-credit courses/modules. The inclusion of generic demonstrations will help many potential users to stand up this course with their own equipment. The MEC Introduction to Manufacturing Processes course also recommends a well-respected textbook that is universally available and evidently comes with supportive instructional materials. The course package, as delivered to me via zip file would provide a good starting point for an instructor to implement quickly provided he/she had the appropriate background, laboratory equipment and access to additional support materials.

**OVERALL QUALITY RATING**

<b>MEC INTRO TO MANUFACTURING PROCESSES - COURSE REVIEW CRITERIA</b>	<b>SCORE (1-3, 3 highest)</b>
(a) Meets industry standards and needs (Identify relevant Industry Standards and Needs: technical, personal and interpersonal).	3
(b) Represents “best in class”, nationally portable 1-year certificate that is in demand by workers and employers	2
(c) Can be disseminated quickly and widely to colleges in the US	2