

**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 HIGH TECH MANUFACTURING**

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: *09/30/2013*

**(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 in industrial facilities of many kinds with different focused technologies. The National Association of Manufacturers’ (NAM) Manufacturing Institute (MI) has defined this need to include industrial maintenance technicians and machine operators, which includes the mechatronics skill set. The materials provided within the Introduction to High Tech Manufacturing course address the basic knowledge and skills required of all employees working anywhere in a production environment, including the front-line material handlers and machine operators. The Introduction to High Tech Manufacturing course meets this need with an instruction package that includes lecture notes, visual

presentations, standard content text book references, student and instructor reference materials, demonstrations, and student hand's-on activities that introduce and reinforce fundamentals of the manufacturing work environment including safety; quality systems and measurements; manufacturing processes and materials; and maintenance awareness fundamentals.

The first module is an in-depth overview of the industrial safety practices that are fundamental to manufacturing production facilities. Course topics cover industry-relevant OSHA standards, communication expectations, inspections, and violations. It continues covering work environment hazards identification, analysis, and communications. Personal protection equipment, fire safety and prevention, lockout/tagout procedures, electrical safety, machine guarding, ergonomics, and blood borne safety.

The second module provides an overview of manufacturing processes including proper use of measurement tools; mechanical components; the basic concepts electrical systems and motors, the fluid power fundamentals and technical print reading. These concepts are covered in the two MSSC modules (1) Manufacturing Processes and Production and (2) Quality Practices and Measurements. The final module addresses basic troubleshooting and problem solving techniques, concepts and protocols for preventative maintenance, and an overview of important quality systems and quality assurance concept and practices. These topics are aligned to the forth MSSC module: Maintenance Awareness.

(ii) Standards Relevance:

The MEC Introduction to High Tech Manufacturing is designed to provide education and training specifically to support attainment of the Manufacturing Skills Standards Council (MSSC) Certified Production Technician (CPT) credential. MSSC states, "The purpose of the Certified Production Technician (CPT<sub>AE</sub>) program is to recognize through certification individuals who demonstrate mastery of the core competencies of manufacturing production at the front-line (entry-level through front-line supervisor) through successful completion of the certification assessments. The goal of the CPT<sub>AE</sub> certification program is to raise the level of performance of production workers both to assist the individuals in finding higher-wage jobs and to help employers ensure their workforce increases the company's productivity and competitiveness." To this end, the MSSC CPT credential is comprised of five separate modules: Safety; Quality Practices & Measurement; Manufacturing Processes & Production; Maintenance Awareness and Green Production. (Note that the fifth module for Green Production is not required at this time to earn the CPT credential nor are the topics covered in the MEC Introduction to High Tech Manufacturing course.)

The introduction to High Tech Manufacturing course outline and student outcomes provides sufficient materials to support student learning. For example, the standards for the Safety module of MSSC defines specific worker standards for this module under these categories all of which are included in the NSC MEC Introduction to High Tech Manufacturing course.

- **Safe and Productive Workplace**
- **Safety procedures**

- **Personal Safety Practices**
- **Safety Policies and Regulations**
- **Safety-related Maintenance Procedures**
- **Safety Training**
- **Communication Skills that Enhance Safety**
- **Teamwork skills that Enhance Safety**
- **Training skills that Enhance Safety**

Similar lists of topics for the remaining MSSC modules are covered in the modules 2 and 3 in the NSC MEC Introduction to High Tech Manufacturing.

**(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 by NAM, the NSC Mechatronics Team college partner had defined specific local and regional industry needs for mechanical systems as well as mechatronics technicians in their original grant application. These high skill and high wage jobs generally attract students, 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 industry needs. The structure of a course that delivers this content is optimal when it meets “best in class” characteristics. The Mechanical Systems course developed through the National STEM Consortium Curriculum Development Project has the characteristics of a “best in class” course.

The Mechanical Systems course in the NSC Mechatronics Program is a comprehensive program of study of mechanical components commonly used in a number of industry business sectors. There is a national need for skilled workers in industrial facilities of many kinds with different focused technologies. The National Association of Manufacturers (NAM), its Manufacturing Institute (MI) have defined this need to include industrial maintenance technicians, which includes the mechatronics skill set. Additionally, the local and/or regional needs were defined by the NSC Mechatronics Team college partners had defined specific local and regional industry needs for mechanical systems as well as mechatronics technicians in their original grant application. These high skill and high wage jobs generally attract students, 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 Introduction to High Tech Manufacturing course in the NSC Mechatronics Program is an overview course covering the knowledge and skills defined in the four modules of the MSSC CPT credential. The fundamental body of knowledge and skills support all sectors of manufacturing as defined by the NAM. This manufacturing sector list includes: Automation, Aerospace, Energy, Pharmaceuticals & Medical, Food Processing, Automotive, Machinery, Motor Vehicles, Transportation & Logistics, Construction, Paper, Wood, & Printing, Chemical,

Metal Fabrication, Plastics & Rubber, and Computer & Electronics. The NSC MEC Introduction to High Tech Manufacturing provides a solid foundation for workers in all these industry sectors and so are applicable not only across the United States, but across the globe.

The course materials provided are very good, up to date, well written and appropriate for the introductory course for High Tech Manufacturing course. Many appropriate resources are identified for each topic in every module, and at least one approach to delivering the material is suggested. Each lesson includes lecture notes, handouts, and activity materials, expected student learning outcomes, reference list, and a guideline for how much time should be spent on each topic and lab or classroom activity. The lesson plans include suggestions for how to deliver the course in an online environment, which will be helpful for those interested in offering the course modules online. It also specifies how expected background knowledge and how critically important personal and interpersonal skills are integrated into the technical course by using work team environments. The course integrates knowledge and skill attainment throughout the course encouraging implementation of the best teaching and learning strategies for this 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 High Tech Manufacturing course is based on text, presentations, and online resources. All of the course materials would be easy for an education institution to implement as the same program anywhere in the United States. This content is also conducive to language translation to facilitate course delivery globally. The course is divided into fifteen lessons of typically 3 hours of combined lecture and laboratory practice. Lessons are grouped into 3 distinct modules, which provide a lot of flexibility for anyone delivering the course material in various length college credit courses or in short-term non-credit courses. The Mechanical Systems course also recommends a well-respected textbook universally available. The course package, as delivered to me via zip file would be very easy for an instructor to implement quickly provided he/she had the appropriate background and laboratory equipment.

**OVERALL QUALITY RATING**

| <b>INTRODUCTION TO HIGH TECH MANUFACTURING - 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               | 3                             |
| (c) Can be disseminated quickly and widely to colleges in the US  | 3                             |