THE NEW JERSEY CENTER FOR ADVANCED TECHNOLOGICAL EDUCATION

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Established in 1995 with support from the National Science Foundation Advanced Technological Education program, the New Jersey Center for Advanced Technological Education (NJCATE) is dedicated to the improvement of Engineering Technology Education.. The overarching goal of the Center is to aid in the development of a highly skilled technical workforce, in order to meet the current and future needs of industry in a highly competitive global economy.

NJCATE is a partnership of educational institutions with industry, government and professional societies working together to achieve its goals for restructuring engineering technology education. By taking a holistic approach to the redesign of engineering technician education through concurrent work on a number of components, NJCATE is creating systemic change. Concurrent work on curriculum and instructional materials development; professional development; program articulation to insure a seamless transition through the various educational sectors; outreach to industry, students and the community at large; as well as dissemination of project information through an established clearinghouse mechanism, ensure that all aspects of technician education are dealt with. The creation of an innovative associate degree program to serve as a model for restructuring technician education in general, but specifically, engineering technician education provides a vehicle for the development of curricular elements and instructional strategies.

The new ***MECOMTRONICS ENGINEERING TECHNOLOGY*** program responds directly to the need for technicians who can function in the high-performance workplace and perform multiple work roles. This multifunctional technician will be skilled in the areas of mechanical, computers, telecommunication and electronics technology. The Mecomtronics, who will function with an awareness of the ethical, economic and environmental issues that impact on society, will assist in the design, development, and production of cost effective, state-of-the-art products.

The ***MECOMTRONICS CURRICULUM*** is industry-driven, competency-based and utilizes an integrated approach to the organization of core and technical subject matter. The concurrent educational delivery at the heart of the curriculum design, in which mathematics, science, and English communications core content and ethical and social issues are articulated with technical competencies throughout the program, emulates the just-in-time (JIT) manufacturing model.

In developing the curriculum, faculty from across partner institutions, working with industry representatives, identified over 250 competencies, based on industry standards, professional association standards, industry surveys, and a job task analysis. These competencies were grouped to articulate relevant core and technical knowledge and skills, and then sequenced for delivery.

Activity-based learning in the context of realistic projects, jointly developed with industry partners, provides the conceptual framework. Workplace experiences and a capstone project further ensure relevancy and work-readiness upon graduation.

The associate degree program modular structure provides flexibility for delivery on a semester or quarter basis. Integration of core subject content with technical studies is achieved throughout the entire program, while leaving each of the core discipline areas as autonomous courses with credit allocation commensurate with effort and level of traditional coursework. This preserves existing institutional course structures and provides for transferability of course credit. The structure allows for individual institutions to tailor course content to their regional industry needs. The modular approach of this curriculum allows for use of the curriculum building "blocks" in a variety of engineering technology programs. The instructional modules are authored by interdisciplinary teams of faculty from institutions across the US.

MECOMTRONICS ENGINEERING TECHNOLOGY PROGRAM OUTLINE

Semester 1	**Semester 2**	**Semester 3**	**Semester 4**
MCT 101 Intro to Technology 2CR 3 HRS	MCT 106 Automated Systems 4 CR 6 HRS	MCT 205 Manufacturing Processes & Quality Management 4 CR 6 HRS	MCT 202 Special Topics in Engineering Technology 3 CR 3 HRS
Social Science/Humanities Elective 3 CR 3 HRS	MCT 104 Electrical and Mechanical Power Systems 4 CR 6 HRS	MCT 203 Control and Automation of Manufacturing Systems 3 CR 5 HRS	MCT 206 Capstone Project 3 CR 5 HRS
MCT 103 Foundations of Mecomtronics 4 CR 6 HRS	MCT 102 Support and Maintenance of Computer Systems 2 CR 3 HRS	MCT 201 Telecommunications with Industrial Applications 3 CR 5 HRS	Social Science/Humanities Elective 3 CR 3 HRS
ENG 131 Research, Composition and Presentation I 2 CR 2 HRS	ENG 132 Research, Composition and Presentation II 2 CR 2 HRS	ENG 133 Research, Composition and Presentation III 2 CR 2 HRS	Technical Elective or Co-OP 3 CR 5 HRS
MAT 145 Integrated Mathematics I 2 CR 2 HRS	MAT 146 Integrated Mathematics II 2 CR 2 HRS	MAT 245 Integrated Mathematics III 2 CR 2 HRS	MAT 246 Integrated Mathematics IV 2 CR 2 HRS
PHY 145 Mecomtronics Physics I 2 CR 3 HRS	PHY 146 Mecomtronics Physics II 2 CR 3 HRS	PHY 245 Mecomtronics Physics III 2 CR 3 HRS	PHY 246 Mecomtronics Physics IV 2 CR 3 HRS
Physical Education 1 CR 2 HRS	This project is supported by the National Science Foundation Advanced Technological Education Program		**Total Credits 64**

The Mecomtronics Curriculum Model incorporates techniques that are specifically appropriate for the technical student and are closely aligned with the needs and practices of the workplace. Students will use traditional, as well as on-line electronic resources and industry-supplied data as sources of information. They will work in teams in a studio environment, with the instructor acting as a facilitator of learning, providing guidance and mentoring. Ethics and values are integrated throughout the courses as natural parts of professional practice. This approach to introducing ethical issues does not rely on a separate course on ethics, but provides for inclusion of brief but frequent ethical discussions, called teachable moments, in existing courses. Codes of Conduct for the practicing engineering technician and the engineering technology student have

been developed, as have ethical case studies that will be incorporated into the instructional modules.
Components of this innovative curriculum are currently being pilot-tested, with full curriculum implementation scheduled to begin in the Fall of 1998 at three partner institutions: Middlesex County College, Raritan Valley Community College and St. Louis Community College.

Curriculum changes are taking place at the secondary school level as well. Working closely with secondary school partners to effect change at the secondary school level is resulting in the development of integrated instructional modules to be used in a number of high-school courses. An integrated mathematics, science and communications module, ***Fairground Rides,*** is currently being pilot tested at Woodbridge Township High School in New Jersey.

Extensive efforts to expose middle and high school students to opportunities in technician careers are being pursued. Middle and high school students participate in various hands-on activities that create awareness of the profession and introduce students to the applications of mathematics, science and technology-based, real world problems. Through these learning activities, students gain exposure to, and a better understanding of, the technological world. Special outreach programs are developed to provide opportunities for members of underrepresented populations to participate in these activities, as well as in academic enrichment, mentoring and career exploration activities.

Professional development of faculty, teachers and industry personnel is essential to implement the necessary changes in technician education. College faculty and secondary-school teachers, as well as industry personnel, participate in workshops, summer institutes and conferences sponsored by NJCATE. Workshops on topics such as: cooperative learning, student assessment, activity based learning, use of technology, as well as ethics are presented. Summer Institutes bring faculty from across the country together to experience innovative curricula and methodologies, learn about the authoring process for instructional modules in preparation for becoming authors and implementors of new curricula. Extensive dissemination efforts of the models developed by NJCATE have created interest both nationally and internationally.

Strong partnerships with industry are key to the viability of career programs. Industry personnel are active participants in the development, validation, and marketing, of the Mecomtronics program. They participate formally in the Center's activities through an Industrial Advisory Board, the Project Steering Committee and the National Visiting Committee. The collaborative effort is aimed at ensuring an up-to-date curriculum, taught in an atmosphere of realism, through on-going industry validation. Industry is a strong proponent of the Mecomtronics model for educating technicians, as witnessed through the support it provides.

As NJCATE further matures it will expand activities into other disciplines of technician education. Currently linked to Center activities is another NSF-sponsored project that focuses on the development of a ***Telemedia Communications Technology*** program, that combines the areas of multimedia and telecommunications. Future plans include bringing integrated education to industry training and expanding the provision of professional development and technical assistance services to industry and education.

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