

## **Partnering - a University, a Community College, and Industry Developing a Paradigm for Cooperation**

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In September of 1996 Western Michigan University, Muskegon Community College, and industry in the Muskegon, Michigan region reached the latest milestone in a cooperative effort started three years ago. A bachelor's degree in manufacturing engineering from a state university is being offered, in its entirety, through on-site classes in Muskegon, Michigan.

This cooperative effort started three years ago when the World Class Manufacturing Council of Muskegon County (WCMC) approached Western Michigan University's (Western's) College of Engineering and Applied Science to request Western's assistance in meeting an educational need in the Muskegon region. WCMC believed that a local source of trained engineers was needed to support WCMC's efforts in continuing the transition of the local economy from one dominated by declining "smokestack" industries into one based on internationally as well as nationally competitive manufacturing companies. Additionally, the ability to grow existing manufacturing operations (and to attract new manufacturing operations, especially high technology based operations) was seen to be hindered by a shortage of technically competent, manufacturing-oriented engineers in the region. WCMC wanted a manufacturing-oriented engineering degree offered in Muskegon.

In response to the request from the WCMC, the dean of Western's College of Engineering and Applied Science began looking into the possibility of offering an engineering degree in its entirety in the Muskegon area. Muskegon (the name of both a county and its major city) is approximately 100 miles northwest of Kalamazoo, the location of the campus of Western and where Western traditionally offers its undergraduate engineering programs.

Muskegon is the home of Muskegon Community College (MCC), whose programs include an associate degree that is articulated with the state's four-year colleges and universities. Additionally, MCC offers a variety of vocational and technical courses and degrees utilizing the state-of-the-art laboratory facilities (including drafting and CAD, machining, metallurgy, metrology, robotics and automation, and electronics) in its technology building.

Muskegon Community College (MCC) was at the time in the process of completing a 95,000 square foot building, the Higher Education Center (HEC), where three cooperating universities (including Western) were to offer upper division and graduate courses. MCC was (and is) extremely interested in expanding the upper division offerings from cooperating universities to

better utilize the new facility and to offer opportunities for its students to continue their education locally and in as seamless a manner as possible.

Students in Muskegon were able to complete the first two years of most engineering curriculums at MCC, but had to leave the immediate Muskegon area to earn an EAC/ABET accredited engineering degree. Many of MCC students went on to Western (and other four year colleges and universities) to complete their engineering degrees; but for a variety of reasons, including family considerations and finances, many local students were unable to leave Muskegon to pursue an engineering degree.

Western's presence in Muskegon was the Muskegon Regional Center (MRC), a branch of Western's Division of Continuing Education, located in rented space near MCC's campus. The MRC offered courses toward a bachelors' degree in technology (currently titled BS in Industrial Management), a BA/BS in General University Studies, eight (8) master's degree programs, and a teaching certificate program. These Western courses were (and are) primarily for part-time evening students and utilize local part-time instructors and regular Western faculty members who commute from Kalamazoo one night a week. One regular faculty member (a tenured professor from the Department of Industrial and Manufacturing Engineering teaching in the MS Engineering Management program, MS Industrial Engineering program, and the BS in Industrial Management program) is located in Muskegon. The MRC staff consists of the regional center director and her secretary. The Muskegon Regional Center moved into the Higher Education Center at Muskegon Community College upon completion of construction.

Initial study indicated that an engineering program in Muskegon was viable. Development of a proposal to establish an engineering program was initiated. Early on it was decided that a location-specific engineering program would be needed for Muskegon and that it could be tailored to local needs. Western established two basic requirements that had to be accomplished by any off-campus engineering program: (1) that curriculum be accreditable by EAC/ABET (in keeping with College of Engineering and Applied Science policy) and (2) that the off-campus program be self supporting (in keeping with Western policy). To ensure meeting local needs and expectations, program development was a joint effort of local industry (in the form of WCMC members), MCC, and Western.

Development of the curriculum for the new engineering program was overseen by a steering committee composed of representatives of WCMC, Western, and MCC. Western's dean of engineering and the director of Western's MRC (a non-academic position) represented Western. MCC was represented by its dean of community services, a science professor (who teaches engineering physics, statics, and dynamics), and the head of MCC's technology department. WCMC was represented by a group of 13 engineers, engineering managers, and manufacturing managers from 13 local manufacturing companies. This steering committee developed an overall structure for the curriculum as well as defining specific skills and experiences that the courses in the curriculum should provide:

*“The goal of this curriculum is to develop students who have the ability to take a product design or concept and design the manufacturing process. Students must*

be able to communicate effectively and be problem solvers in an industrial environment.

The industrial steering committee further specified that the curriculum must provide

- Team experiences
- An understanding of the design process from concept to customer
- A working knowledge of probabilities and statistics
- Extensive opportunity for oral and written communications
- A working knowledge of CAD, process modeling, and simulation
- An understanding of how to design for manufacturability
- A firm foundation in mathematics, science, and engineering science”

From this goal and these requirements, a sequence of courses was developed using existing MCC courses, existing Western courses, and new Western courses tailored to the needs of the new program. The sequence of courses selected allows the program to meet both the “old” and “new” EAC/ABET criteria for manufacturing engineering programs. Additionally, the degree was designed to be offered on a two plus two basis with MCC teaching the lower division courses (60 semester hours) and Western teaching the upper division courses (as well a three lower division engineering courses - one course per semester during the freshman year and one course in the sophomore year - or 70 credit hours). Development of specific courses was done by the faculty of Western’s College of Engineering and Applied Science. The resulting program contains 15 new courses - 13 MFE (manufacturing engineering) courses and 2 electrical engineering courses (new courses with their content tailored to the requirements of this program)..

A plan to deliver the program in Muskegon was also developed. Considering Western’s requirement that off-campus programs be self supporting, the costs for conducting the program were carefully detailed.

One way in which the startup costs for the program were minimized was in the area of capital costs (specifically laboratories). Muskegon Community College is an enthusiastic supporter of the manufacturing engineering program as exemplified by MCC’s agreement to allow Western to use the existing MCC for Western’s engineering classes as required. Western and MCC have also agreed to cooperate in the enhancing, adding, and expanding labs in the future. This significantly reduces the cost of creating a new engineering program. Additionally, MCC allocated faculty office space in the HEC for the Western faculty teaching in this program.

To teach the new MFE courses, a new department in the College of Engineering and Applied Sciences, the Department of Manufacturing Engineering, was established in Muskegon. Although a Department of Industrial and Manufacturing Engineering exists at the Kalamazoo campus, it does not offer a degree program in manufacturing engineering - its most closely related bachelor

degrees are in manufacturing engineering technology and industrial engineering. The establishment of a new department located in Muskegon (with offices in the HEC at MCC) places Western faculty on-site for teaching, student advising, and student recruiting and retention. It also allows for departmental policy and procedures to reflect the expectations of the college for this faculty unit.

The eventual ability of the program to pay for itself is dependent on its student base. The results of a professional marketing research study exceeded the steering committees' projections of demand for an engineering degree program in Muskegon County (and confirmed that a Muskegon-based program would also draw students from the counties to the north and south of Muskegon County). Based on this research, it was established that when the program was offering its full schedule of courses and had filled the pipeline with students, the program would be a break-even proposition for Western.

The problem was that this ramp up would take about 4 years. During the first three years, reduced course offerings and smaller class sizes (plus one time startup costs) were projected to create a shortfall in excess of \$470,000. To offset this shortfall, local manufacturing companies, the MCC Foundation, local civic groups, and Western's Division of Continuing Education pledged supplemental support to underwrite the program during its first three years. Indicative of the support this program has had from MCC is the lead in raising funds that was taken by MCC's president. Additionally, the MCC Foundation was a major contributor.

The plan for the curriculum and the plan for conducting the program were submitted to the various committees, councils, and boards with final approval for the program being obtained in the summer of 1996. Almost immediately upon final approval of the program, the Department of Manufacturing Engineering was made operation with the hiring of its first faculty member and the offering of the first Western course in the program.

The catalog/ brochure for the bachelor of science in manufacturing engineering describes the program as a cooperative effort by Western and MCC. The course listings are for the appropriate Western and MCC courses - the MCC to Western course conversions are done in the background. The program is designed to be seamless with the students in the program accepted at Western and MCC concurrently with a transition from a course load of predominately MCC courses to one of totally Western courses in the senior year.

If successful (and all the cooperating parties are doing everything possible to make the program successful), the program provides substantial benefits to all the parties involved. The local manufacturing companies now have their local source of degreed engineers as well as a means to develop promising employees through additional education. The engineers coming from the program will have the skills identified as important to local industry. The engineers graduating from the program will be familiar with the local area and have their roots in it. Additionally, local industries now have easier access to the research capabilities and applications' expertise of Western Michigan University.

Muskegon Community College benefits from the close ties it has established with Western. The manufacturing engineering program will be adding equipment and capabilities to the labs at MCC that will benefit students not in the manufacturing engineering program . Both MCC and Western are now more competitive in proposals for grants that encourage cooperation between institutions. Additionally, Muskegon Community College is demonstrating its ability to support bachelor's degree programs in Muskegon that may lead to more bachelor degree programs being offered locally. This allows MCC to continue to grow and to be a significant voice in the development of higher education in the area.

Students in the program are benefiting from the close ties the program has with local companies in the availability of internships with local industry. The costs of completing this program are substantially less than taking all the courses at a four-year college since half the courses are taken at the lower rates charged by the community college while the remainder can be taken without leaving home. A significant benefit in time and money to the students is the seamless movement between MCC and Western that results in no wasted effort in courses which do not transfer.

Finally, Western Michigan University benefits from an increased presence in a growing area of the state. The potential for additional programs in this part of the state is becoming a possibility from increased awareness of Western's willingness to serve the region in non-traditional ways. Companies are recognizing Western as a potential partner in growth. This is also leading to increased opportunities for faculty involvement with Muskegon area companies in research, consulting, and training. Additionally, Western has reaped significant good-will in the region from its efforts in establishing this program.

In conclusion, Western Michigan University, Muskegon Community College, and industry in the Muskegon area have come together to develop a program that benefits not only the cooperating partners but the Muskegon community that they serve. This paradigm of cooperation is a model which others can use in meeting local engineering education needs through the offering of quality degree programs at minimal cost.

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