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| **Assurance of Student Learning Report****2021-2022** |
| Ogden College  | SEAS |
| Manufacturing Engineering Technology (Ref. #. 5006) |
| program director: Greg Arbuckle - assessment coordinator: Asghar Rezasoltani |

***Is this an online program***? [ ]  Yes [x]  No

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| ***Use this page to list learning outcomes, and measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.*** |
| **Student Learning Outcome 1:** **Graduates will possess/ demonstrate the ability to identify, formulate strategies and solve technical problems.** |
| **Instrument 1** | **Direct:**  The Association of Technology, Management and Applied Engineering (ATMAE) Certified Manufacturing Specialist (CMS) Certification Exam  |
| **Instrument 2** | **Indirect:** Employer Internship Survey  |
| **Based on your results, check whether the program met the goal of Student Learning Outcome 1.** | **[ ]  Met** | **[x]  Not Met** |
| **Student Learning Outcome 2:** **Graduates will demonstrate an ability to communicate effectively in pertinent areas, both written and graphic.** |
| **Instrument 1** | **Direct:** Lab reports of MFGE 217: Industrial Materials class |
| **Instrument 2** | **Indirect:** Employer Internship Survey |
| **Based on your results, check whether the program met the goal of Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Student Learning Outcome 3:** **Graduates will demonstrate the knowledge and capacity to apply managerial/ leadership principles and practices to appropriate situations.** |
| **Instrument 1** | **Direct:**  The Association of Technology, Management and Applied Engineering (ATMAE) Certified Manufacturing Specialist (CMS) Certification Exam  |
| **Instrument 2** | **Indirect:** Employer Internship Survey  |
| **Based on your results, check whether the program met the goal of Student Learning Outcome 3.** | **[ ]  Met** | **[x]  Not Met** |
| **Program Summary (Briefly summarize the action and follow-up items from your detailed responses on subsequent pages.)**  |
| The faculty within the MET program are evaluating course objectives along with exam category sub-sections to ensure that the material that is tested is covered in the appropriate courses. This will require faculty to evaluate course learning objectives and measurable learning outcomes based on the exam results. The program faculty need to evaluate MFGE 227 and MFGE 370 (Machining), MFGE 217 (Industrial Materials), MFGE 205 (Technical Drafting), MFGE 271, MFGE 371, MFGE 394 (Quality), and MFGE 356 (Production Planning). This year we will evaluate 217, 227,271, and 370, and next year we will evaluate MFGE 371 and MFGE 394. Currently, MFGE 205 is not being taught and the students are taking AS 163. We will plan on offering MFGE 205 beginning next fall. |

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| **Student Learning Outcome 1** |
| **Student Learning Outcome**  | **Graduates will possess/ demonstrate the ability to identify, formulate strategies and solve technical problems.** |
| **Measurement Instrument 1**  | DIRECT measures of student learning: The graduates from the MET program are required to take the Certified Manufacturing Specialist (CMS) exam offered by the Association of Technology, Management, and Applied Engineering (ATMAE) before their final graduation. The ATMAE is the accreditation board of the MET program. 23 Students in the MFGE490 capstone course took the ATMAE’s CMS Exam in Spring 2022. The ATMAE’s CMS Exam required the students to answer questions about the program’s core courses. The following categories of the ATMAE’s CMS exam were used to evaluate SLO1: Computer Integrated Manufacturing (CIM) (4 areas), Electronics (3 areas), Industrial Materials (5 areas), Machining (6 areas), Manufacturing Philosophies (4 areas), Metrology (4 areas), Non-traditional Machining (4 areas), and Technical Drafting (8 areas).  |
| **Criteria for Student Success** | For all eight categories, the student’s average score should be higher than the target measurement. |
| **Program Success Target for this Measurement** | **50%** | **Percent of Program Achieving Target** | **six categories of the total of eight categories passed, and two categories didn’t pass** |
| **Methods**  | All students (N = 23) in the capstone course took the ATMAE’s CMS exam in spring 2022. Here are the average scores for the exam:Computer Integrated Manufacturing (CIM) (4 areas):53.05%, Electronics (3 areas): 63.05%, Industrial Materials (5 areas): 50.00%, Machining (6 areas): 48.91%, Manufacturing Philosophies (4 areas): 52.72%, Metrology (4 areas): 66.67%, Non-traditional Machining (4 areas): 72.28%, and Technical Drafting (8 areas): 30.52%. |
| **Measurement Instrument 2** | INDIRECT measures of student learning: Employers were given an online survey measuring their satisfaction with student learning related to the MET program outcome one. |
| **Criteria for Student Success** | Indirect: Self-reported data ranged from 1-4 on a 4-point Likert scale. The overall target means for combined categories was *M* = 3.0 |
| **Program Success Target for this Measurement** | **70%** | **Percent of Program Achieving Target** | **100%** |
| **Methods** | Thirteen employers filled out the Employer Internship Survey for 13 MET students during the 2021/2022 academic year. All students (13/13= 100%) scored 3.0 or higher on a 4-point Likert scale for the Technical Competency outcome. The average score was 3.65. |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.**  | **[ ]  Met** | **[x]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
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| The faculty within the MET program are evaluating course objectives along with exam category sub-sections to ensure that the material that is tested is covered in the appropriate courses. This will require faculty to evaluate course learning objectives and measurable learning outcomes based on the exam results. The program faculty need to evaluate MFGE 227 and 370 (Machining), MFGE 217 (Industrial Materials), and MFGE 205 (Technical Drafting). This year we will evaluate 217, 227, and 370. Currently, MFGE 205 is not being taught and the students are taking AS 163. We will plan on offering MFGE 205 beginning next fall. |

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| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| Considering that some of the courses are sophomore level, we will need to collect exam results for the next three years to confirm student learning assurance.  |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| Next Certified Manufacturing Specialist (CMS) exam in Spring 2023 |

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| **Student Learning Outcome 2** |
| **Student Learning Outcome**  | **Graduates will demonstrate an ability to communicate effectively in pertinent areas, both written and graphic.** |
| **Measurement Instrument 1** | DIRECT measures of student learning: Lab reports of MFGE 217: Industrial Materials classThe written and graphical presentation competencies were evaluated from the lab reports of the MFGE 217 Industrial Materials class. Dr. Rezasoltani collected and analyzed the reports for MFGE 217 class based on developed rubrics. Scores on the rubric item for this SLO ranged from “Excellent (90-100),” “Very Good (80-89),” “Satisfactory (70-79),” and “Poor ( 60-69).” |
| **Criteria for Student Success** | Seventy (70%) of MET students ( N=8 ) should score 80% or higher on the MFGE 217 lab reports to show their competency in writing and graphic communication skills. |
| **Program Success Target for this Measurement** | **70%** | **Percent of Program Achieving Target** | **100%** |
| **Methods**  | All the MET students (N = 8) in the MFGE 217 submitted the lab reports in Fall 2021 and Spring 2022. 100% of the students (8/8= 100%) scored 80% or higher on the lab reports.  |
| **Measurement Instrument 2** | INDIRECT measures of student learning: Employers were given an online survey measuring their satisfaction with student learning related to the three programmatic outcomes. |
| **Criteria for Student Success** | Indirect: Self-reported data ranged from 1-4 on a 4-point Likert scale. The overall target means for combined categories was *M* = 3.0 |
| **Program Success Target for this Measurement** | **70%** | **Percent of Program Achieving Target** | **0.92%** |
| **Methods** | Thirteen employers filled out the Employer Internship Survey for 13 MET students during the 2021/2022 academic year. Almost all the students (12/13= 92%) scored 3.0 or higher on a 4-point Likert scale for the communication outcome. The average score was 3.73. |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Actions** (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.) |
| The program met the outcome and no action is required.  |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| No follow-up is required. |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| Spring 2023. |

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| **Student Learning Outcome 3** |
| **Student Learning Outcome**  | **Graduates will demonstrate the knowledge and capacity to apply managerial/ leadership principles and practices to appropriate situations.** |
| **Measurement Instrument 1** | DIRECT measures of student learning: The graduates from the MET program are required to take the Certified Manufacturing Specialist (CMS) exam offered by the Association of Technology, Management, and Applied Engineering (ATMAE) before their final graduation. The ATMAE is the accreditation board of the MET program. Students in the AMS490 capstone course took the ATMAE’s CMS Exam in Spring 2022. The ATMAE’s CMS Exam required the students to answer areas about the program’s core courses. The following question categories of the ATMAE’s CMS exam were used to evaluate SLO3: Production Planning (4 areas), Quality (5 areas), and Supervision/Management (8 areas)  |
| **Criteria for Student Success** | For all three categories, the student’s average score should be higher than the target measurement. |
| **Program Success Target for this Measurement** | **50%** | **Percent of Program Achieving Target** | **one category passed, and two categories didn’t pass.** |
| **Methods**  | All students (N = 23) in the capstone course took the ATMAE’s CMS exam in spring 2022. Here are the average scores for the exam: Production Planning: 50.00%, Quality: 43.26%, Supervision/Management: 62.45% |
| **Measurement Instrument 2** | INDIRECT measures of student learning: Employers were given an online survey measuring their satisfaction with student learning related to the three programmatic outcomes. |
| **Criteria for Student Success** | Indirect: Self-reported data ranged from 1-4 on a 4-point Likert scale. The overall target means for combined categories was *M* = 3.0 |
| **Program Success Target for this Measurement** | 70% | **Percent of Program Achieving Target** | 0.92% |
| **Methods** | Thirteen employers filled the Employer Internship Survey for 13 MET students during the 2021/2022 academic year. Almost all the students (12/13= 92%) scored 3.0 or higher on a 4-point Likert scale for the Technical Competency outcome. The average score was 3.69. |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.** | **[ ]  Met** | **[x]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
| The faculty within the MET program are evaluating course objectives along with exam category sub-sections to ensure that the material that is tested is covered in the appropriate courses. This will require faculty to evaluate course learning objectives and measurable learning outcomes based on the exam results. The program faculty need to evaluate MFGE 271, MFGE 371, and MFGE 394 for the Quality category and evaluate MFGE 356 for the Production Planning category. This year we will evaluate MFGE 271 and next year we will evaluate MFGE 371 and MFGE 394.  |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| Considering that some of the courses are sophomore level, we will need to collect exam results for the next three years to confirm student learning assurance.  |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| Next Certified Manufacturing Specialist (CMS) exam in Spring 2023 |

**\*\*\* Please include Curriculum Map (below/next page) as part of this document**

**Curriculum Map for Manufacturing Engineering Technology (MET) Program**

**School of Engineering & Applied Sciences**

**Western Kentucky University**

The "Core Competencies in Manufacturing Engineering Technology" (see table below) provide guidelines to prepare students for the B.S. degree in Manufacturing Engineering Technology

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| **Core Competency/Outcome**  | **Content** | **By the completion of the MET program, the student should:** | **Courses**  |
| **Industry-Wide Technical Competency –*****Graduates will possess/ demonstrate the ability to identify, formulate strategies and solve technical problems.*** | - CAD drawing fundamentals- Manufacturing process applications and operations: assembly processes, fabrication processes, electrical/electronic manufacturing processes, continuous flow/line balancing processes, hot and cold forming processes, casting and molding processes, heat treatment processes, joining, welding, and assembly processes, etc. - Automated Systems & Control Operations:automated equipment, automated systems, computer control, hydraulics and pneumatics, robotics, process control, analytical testing, etc. - Industrial Materials - Continuous improvement tools and techniques - Knowledge of statistical process control | • Design manufacturing production and production support systems.• Understand the various manufacturing types, processes, and products.• Understand and perform manufacturing process applications and operations.• Understand the basic automated systems & control operations.• Set up, operate, monitor, control, and improve manufacturing processes• Be able to maintain equipment, tools, and workstations.• Be able to apply statistical principles to manufacturing applications. • Understand the scientific principles involved in manufacturing processes. | MFGE120 Basic Electricity MFGE205 or AS163- CADDMFGE217 Industrial Materials MFGE227 Introduction to Manufacturing MethodsMFGE271 Industrial Statistics MFGE310 Safety & ErgonomicsMFGE328 Robotics & Mach VisionMFGE 342 Manufacturing OperationsMFGE 343 Automated SystemsMFGE 356 Systems Design & OperationsMFGE 370 Computer Numerical ControlMFGE 371 Quality AssuranceMFGE 394 Lean & Supply Chain SystemsMFGE490A Senior ResearchAGMC 371/372 Agricultural MechanicsPHYS 231/232 Physics CHEM 105/106 or CHEM 120/121MATH 117 Trigonometry  |
| **Communications Skills Competency-** ***Graduates will demonstrate an ability to communicate effectively in pertinent areas, both written and graphic*** | Communication skills (i.e., oral, graphic, and written communication, etc.) | • Demonstrate the use and practice of different levels of graphic and written communication skills.  | COMM145 Fund Speaking/CommunicationCOMM345 Advanced Public SpeakingMFGE205 or AS163- CADDMFGE217 Industrial Materials MFGE271 Industrial StatisticsMFGE328 Robotics & Mach VisionMFGE 356 Systems Design & OperationsMFGE 394 Lean & Supply Chain SystemsMFGE430 Tech MGT/Team BuildingSEAS390 Project Management  |
| **Management/Leadership Competency-** ***Demonstrate the knowledge and capacity to apply managerial/ leadership principles and practices to appropriate situations.*** | - Interaction skills (i.e., teamwork, mentoring, leadership, interpersonal skills, etc.)- Organizational skills (i.e., project management, planning & organizing, training skills, etc.)- Quality assurance tools & techniques - Quality assurance audits - Total quality management - Continuous improvement - Elements of supply chain- Techniques of Inventory management - Principles of lean manufacturing - Materials handling - Plant facility & capacity - Production scheduling - Production systems - Environmental/Health/Safety- Problem solving and decision making | • Understand the manufacturing business as a system that integrates multiple disciplines, processes, and stakeholders.• Demonstrating the ability to work effectively with others. • Be able to develop manufacturing process plans and documentation.• Apply quality tools and techniques to solve problems by generating, evaluating, and implementing solutions.• Ensure product and process meet quality system requirements as defined by customer specifications.• Be able to manage production and continuous improvement process.• Manage, plan and monitor the movement and storage of materials and products in coordination with suppliers, internal systems, and customers.• Employ equipment, practices, and procedures which promote a healthy, safe, and secure work environment. | MFGE310 Safety & ErgonomicsMFGE 342 Manufacturing OperationsMFGE 356 Systems Design & OperationsMFGE 371 Quality AssuranceSEAS390 Project Management MFGE 394 Lean & Supply Chain SystemsMFGE490A Senior ResearchMFGE430 Tech MGT/Team Building |