MECHANICAL ENGINEERING TECHNOLOGY (MET) TRANSFER ASSURANCE GUIDE (TAG)
September 4, 2009

Ohio Transfer Module:

Ohio Transfer Module (OTM) Requirements: 36-40 semester hours / 54-60 quarter hours. Students should select courses within the OTM that complement the selected major and meet any specific general education requirements. Students are encouraged to complete the OTM within their associate degree programs, to ensure maximum transferability and application of credit.

Required Disciplines	Minimum Required Hours	Recommended Courses
Area I. English Composition	3 sem. / 5-6 qtr.	
Area II. Mathematics	3 sem. / 3 qtr.	**College Algebra (Prerequisite) and Pre-Calculus(Prerequisite)**
Area III. Arts & Humanities	6 sem. / 9 qtr.	
Area IV. Social Sciences	6 sem. / 9 qtr.	
Area V. Natural & Physical Science	6 sem. / 9 qtr.	**General Physics I (Algebra-based) (Prerequisite).** Full sequence may be required by some institutions.

Additional courses beyond the minimum required hours, from any of the disciplines listed above, will count toward the completion of the OTM (36-40 semester hours or 54-60 quarter hours).

Advising Note: Students should consult with receiving institution to ensure courses are completed in proper sequence.
Students wanting cooperative education programs should consult with target institution as soon as possible.

Major Courses– Hours/courses listed below that count toward the major or pre-major requirements.

a. Statics – OET007	Credits: 3 semester hours / 4 quarter hours
Advising Notes: **Prerequisite:** Physics or Algebra/Trigonometry	
b. Strength of Materials – OET008	Credits: 3 semester hours / 4 quarter hours
Advising Notes: **Prerequisite**: Statics	
c. Fluid Mechanics – OET009	Credits: 3 semester hours / 4 quarter hours
Advising Notes: **Prerequisite:** Physics or Statics	
d. Manufacturing Processes – OET010	Credits: 3 semester hours / 4 quarter hours
Advising Notes:	
e. CAD – OET012	Credits: 3 semester hours / 4 quarter hours
Advising Notes: **Prerequisite:** Engineering Drawing or Engineering Graphics (may be addressed within CAD course)	
f. Engineering Materials – OET013	Credits: 3 semester hours / 4 quarter hours
Advising Notes:	
G. 3D Modeling – OET021	Credits: 3 semester hours / 4 quarter hours
Advising Notes:	

Transfer Assurance Guides Total Guaranteed Credits (Range)		
• Ohio Transfer Module	36 – 40 sem.	54 – 60 qtr.
• Pre-major / Major	0 – 21 sem.	0 – 28 qtr.

Institutional Requirements: For entrance and graduation, a transfer student must meet all institutional requirements which would include, but may not be limited to: minimum grade point average, residency requirements, upper division credits attained, minimum grades in specific courses, performance requirements (ex. dance, music) and other requirements of native students from the same institution

OET007 - STATICS
3 Semester Hours/4 Quarter Hours
Prerequisite: Physics or Algebra/Trigonometry

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **Break force vectors into component and combine forces into a resultant.***
2. **Compute moment and couples.***
3. **Evaluate systems in force and moment static equilibrium.***
4. **Determine forces on members in a truss, frame, and pulley.***
5. **Apply friction laws to direction, wedges, belt, disk, incline.***
6. **Determine the centroid of areas.***
7. **Determine moments of inertia.***
8. Analyze forces, unit vectors, components in 3-D.

OET008 – STRENGTH OF MATERIALS
3 Semester Hours/4 Quarter Hours
Prerequisite: Statics

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **Compute the stress, strain and deformation in a member carrying axial tensile or compressive loads.***
2. **Compute direct shear stress.***
3. **Compute torsional shear stress and deformation.***
4. **Compute the stress due to loading in beams.***
5. **Consider stress concentrations in stress analysis.***
6. **Compute shear stress in beams.***
7. **Compute the deflection of beams due to a variety of loading and support.***

OET009 – FLUID MECHANICS
3 Semester Hours/4 Quarter Hours
Prerequisite: Physics or statics

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **Explain forces on plane and curved boundaries.***
2. **Define piping systems and the dynamics of pipe flow.***
3. **Design piping systems involving friction, systems with laminar and turbulent flow.***
4. **Understand the difference between absolute and gage pressures.***
5. **Understand the principles of hydraulic power transmission.***
6. **Understand Pascal's Law.***
7. **Understand Bernoulli's Equation.***
8. **Understand the properties of fluids.***

OET010 – MANUFACTURING PROCESS
3 Semester Hours/4 Quarter Hours

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **Demonstrate an understanding of the interrelationships between material properties and manufacturing processes. ***
2. **Distinguish between different manufacturing processes such as forgings, extrusions, castings, forming, and finishing.***
3. **Distinguish between different fabrication processes such as welding, fasteners, and adhesives.***
4. **Apply empirical data to determine speeds and feeds to optimize production efficiencies.***
5. **Demonstrate appropriate safety procedures and methods in a manufacturing setting.***
6. **Demonstrate proficiency in the use of measurement instruments.***
7. Tour local manufacturing facilities.

OET012 – CAD
3 Semester Hours/4 Quarter Hours
Prerequisite: Engineering Drawing or Engineering Graphics

Prerequisite of Engineering Drawing or Engineering Graphics shall be waived if the course appears to address these concepts within the course. Outcome # 8, "Use PC based CAD programs to create 3D solid models", will be viewed as an introduction to 3D. As long as 3D concepts are introduced in this course we will consider this outcome met.

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **Demonstrate an in-depth proficiency of a commercial CAD system.***
2. **Draw a variety of components utilizing orthographic drawings.***
3. **Detail, dimension and specify tolerances on engineering drawings.***
4. **Utilize and apply the principles of sections to draw sectional views.***
5. **Understand the principles of primary auxiliary views.***
6. **Prepare an assembly drawing, details of the assembly, and a bill of materials.***
7. **Draw a multiple sheet/multiple part working drawing.***
8. **Use PC based CAD programs to create 3D solid models***
9. Gain an appreciation of the ANSI Y14.5M-1982 graphics standard by identifying and understanding the symbols and terminology.
10. Understand the standard engineering symbols and prepare engineering diagrams.
11. Prepare electrical connection wiring diagrams.
12. Introduce Geometric Dimension & Tolerancing (GD&T)

OET013 – ENGINEERING MATERIALS
3 Semester Hours/4 Quarter Hours

Related TAGs: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught.

1. **List how engineering materials, metals, polymers, ceramics, and composites are related in origin and structural characteristics. (crystal structure, organic composition and properties, basic chemistry and atomic structure)***
2. **List the properties that must be reviewed when making materials selections. (modulus of elasticity, tensile strength, yield strength, shear strength)***
3. **Differentiate between the properties of stiffness, strength, and toughness. (stiffness – modulus, strength – tensile strength, yield, shear strength)***
4. **Define vocabulary used in steel terminology.***
5. **Describe how steels are made. (melting, casting, hot rolling, cold rolling)***
6. **List and describe the common heat treatments used on steels. (annealing – heat and slow cool, quenching - fast cooling, tempering - low temperature reheating)***
7. **Describe how cold working and alloy additions alter steel properties. (increase strength, lower ductility)***
8. **Specify tool steels based upon their properties and the heat treatment to which they have been subjected. (evaluate operating temperature, strength, stiffness, cyclic loading)***
9. **Develop a guideline on how to screen candidate materials and arrive at the proper choice.***
10. Include a basic understanding of polymers, aluminum, and copper

NOTE: Schools on quarters may use two quarter-hour courses to meet essential outcomes for any of the courses listed above.

OET021 – 3D Modeling
3 Semester Hours/4 Quarter Hours

Related TAG's: Mechanical Engineering Technology

Outcomes marked with an asterisk are essential and must be taught

1. Demonstrate ability to produce 3D models using current parametric modeling software.*

2. Demonstrate the use of datum planes and axes in the creation of the solid model

3. Demonstrate the ability to produce various drawing views such as orthographic, isometric, sectional and auxiliary views. *

4. Demonstrate ability to produce 2D and 3D dimensioned orthographic and assembly drawings, and generate bill of materials.*

5. Demonstrate ability to bi-directionally associate between the model and drawing.*

6. Demonstrate ability to determine the basic physical properties of the model, such as surface area, mass and volume.*

7. Demonstrate a working knowledge of rigid body animation techniques applied to a solid model.

OMT001 - COLLEGE ALGEBRA
3-4 Semester Hours/4-5 Quarter Hours
Recommendation: This course should significantly reflect the Mathematical Association of America's Committee on the Undergraduate Program in Mathematics recommendations.

Related TAGs: Biology, Civil/Construction Engineering Technology, Mechanical Engineering Technology, Electrical Engineering Technology

The successful College Algebra student should be able to:

1. Represent functions* verbally, numerically, graphically, and algebraically.
2. View a function as a set of ordered pairs or a correspondence between two sets.
3. Find the domain and range of functions*.
4. Perform translations and dilations of functions*.
5. Perform operations (addition, subtraction, multiplication, division, composition) with functions*.
6. Use functions* to model a variety of situations.
7. Solve equations, including application problems.
8. Solve systems of linear equations, including 3×3 systems and application problems.
9. Solve nonlinear inequalities.
10. Apply the factor theorem, the remainder theorem, and the rational roots theorem, including application problems.
11. Find inverses of functions* and relate the graph of a function to the graph of its inverse.
12. Analyze the graph of a function* to answer questions about the function (such as intercepts, domain, range, intervals where the function is increasing or decreasing, possible algebraic definitions, etc.)

* This course should consider the following types of functions:
1. polynomial
2. rational
3. root/radical/power

4. exponential and logarithmic
5. piece-wise defined

OMT002 - PRE-CALCULUS
3-4 Semester Hours/4-5 Quarter Hours
Recommendation: This course should significantly reflect the Mathematical Association of America's Committee on the Undergraduate Program in Mathematics recommendations.

Related TAGs: Civil/Construction Engineering Technology, Mechanical Engineering Technology, Electrical Engineering Technology

The successful Pre-Calculus student should be able to:

1. Represent functions* verbally, numerically, graphically, and algebraically.
2. View a function as a set of ordered pairs or a correspondence between two sets.
3. Find the domain and range of functions*.
4. Perform translations and dilations of functions*.
5. Perform operations (addition, subtraction, multiplication, division, composition) with functions*.
6. Solve equations, including application problems.
7. Find inverses of functions* and relate the graph of a function to the graph of its inverse.
8. Analyze the graph of a function* to answer questions about the function (such as intercepts, domain, range, intervals where the function is increasing or decreasing, possible algebraic definitions, etc.)
9. Use functions* to model a variety of situations.
10. Express angles in both degrees and radians.
11. Define the six trigonometric functions in terms of right triangles and the unit circle.
12. Solve right triangles, including application problems.
13. Solve oblique triangles, including application problems.
14. Algebraically manipulate trigonometric expressions using fundamental trigonometric identities.
15. Determine the amplitude, period, and displacement of trigonometric functions.
16. Solve trigonometric equations, including applications.
17. Define inverse trigonometric functions and find their domains, ranges, and graphs.
18. Represent vectors graphically and in both polar coordinates and rectangular coordinates.

19. Perform basic operations with vectors.
20. Solve vector equations, including applications problems.

*This course should consider the following types of functions:

a. polynomial
b. rational
c. root/radical/power
d. exponential and logarithmic
e. trigonometric and inverse trigonometric
f. piece-wise defined

OSC021 – GENERAL PHYSICS SEQUENCE (Algebra-based)

This is a combination of OSC014 Algebra based Physics I and OSC015 Algebra based Physics II.

OSC014 – ALGEBRA-BASED PHYSICS I (w/labs)
4-5 Semester Hours/8-10 Quarter Hours
Co-requisites: College Algebra and Pre-calculus.

Related TAGs: Biology, Chemistry, Civil/Construction Engineering Technology, Electrical Engineering Technology, Mechanical Engineering Technology

Understanding and/application of the following topics using algebra concepts and methods where appropriate:

1. Kinematics – one and two dimensional
2. Vectors – vector Arithmetic
3. Force and Newton's Laws of Motion
4. Work, Energy, Conservation of Energy
5. Linear momentum
6. Collisions
7. Rotational kinematics and dynamics
8. Angular momentum and rotational energy
9. Simple harmonic motion
10. Waves and sound
11. Solid and fluid properties
12. Heat and thermodynamics
13. Kinetic theory of gases

OSC015 – ALGEBRA-BASED PHYSICS II (w/labs)
4-5 Semester Hours/8-10 Quarter Hours

Co-requisites: College Algebra and Pre-calculus.

Related TAGs: Chemistry, Civil/Construction Engineering Technology, Electrical Engineering Technology, Mechanical Engineering Technology

Understanding and/application of the following topics using algebra concepts and methods where appropriate:

1. Electric field, potential, forces
2. Current, magnetic field integration over continuous charge/current distribution
3. Quantum physics
4. Atomic physics
5. Nuclear physics
6. Induction and Inductance
7. Resistance
8. Capacitance
9. Basic circuit analysis
10. Electric power
11. EMF
12. Electromagnetic waves
13. Kirchhoff's Law
14. R-L-C circuits
15. Faraday's Law
16. Conductivity
17. Geometric optics
18. Diffraction
19. Interference
20. Polarization

MECHANICAL ENGINEERING TAG – FACULTY PARTICIPANTS

Name	Institution
Shane Bendele	Columbus State Community College
Dan Burklo	Northwest State Community College
Casey Guthridge	Stark State Community College
Kent Hall	Washington State Community College
Thomas Looker	Edison Community College
Thomas Lukach	Lakeland Community College
Bill Lutz	Terra Community College
Sundaram Narayanan	Wright State University