

## INDUSTRIAL ENGINEERING TRANSFER ASSURANCE GUIDE (TAG) January 2, 2008

<b>Ohio Transfer Module:</b>		
<b>Ohio Transfer Module (OTM) Requirements:</b> 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 to ensure maximum transferability and application of credits.		
<b>Required Disciplines</b>	<b>Minimum Required Hours</b>	<b>Recommended Courses</b>
Area I. English Composition	3 sem. / 5-6 qtr.	Full year sequence of Calculus I & II for Science/Engineering Majors  College Physics I & II (Calculus-based)
Area II. Mathematics	3 sem. / 3 qtr.	
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.	
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).		
<b>Advising Note:</b> 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.		
<b>Major Courses– Hours/courses listed below that count toward the major or pre-major requirements.</b>		
<b>a. Introduction to Engineering – OES001</b>	Credits: 1 semester hours / 2 quarter hours	
Advising Notes:		
<b>b. Engineering Statistics – OES004</b>	Credits: 2 semester hours / 3-4 quarter hours	
Advising Notes:		
<b>c. Engineering Economics – OES005</b>	Credits: 2-3 semester hours / 3-4 quarter hours	
Advising Notes:		
<b>Transfer Assurance Guides Total Guaranteed Credits (Range)</b>		
• Ohio Transfer Module	36 – 40 sem.	54 – 60 qtr.
• Pre-major / Major	0 – 5 to 7 sem.	0 – 12 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.

## **OES001 - INTRODUCTION TO ENGINEERING**

**1 Semester Hour/2 Quarter Hours**

**Related TAGs:** Aerospace, Agriculture, Civil, Mechanical Engineering, Biomedical Engineering, Chemical Engineering, Computer/Electrical Engineering, Industrial Engineering

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

- 1. Be able to understand and solve open-ended problems related to engineering.\***
- 2. Develop hand-on skills related to applications of engineering.\***
- 3. Be able to function on a team in an academic environment.\***
- 4. Have knowledge of various disciplinary and career areas within engineering.\***
5. Ethics in engineering practice
6. Introduction to computer tools for engineering analysis and design

Example Courses:

ENG 181, Introduction to Engineering I, at Ohio State University

ESC 120, Introduction to Engineering Design, at Cleveland State University

20ENFD100, Introduction to Engineering, plus disciplinary courses at the University of Cincinnati

EGR 190, Fundamentals of Engineering I, at Wright State University

## **OES004 – ENGINEERING STATISTICS**

**2 Semester Hours/3-4 Quarter Hours**

**Related TAGs:** Industrial Engineering

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

- 1. Know how to calculate measures of central tendency and dispersion.\***
- 2. Know probability axioms and rules.\***
- 3. Be able to describe the shape, mean, and variance of standard discrete distributions.\***
- 4. Be able to describe the shape, mean, and variance of standard continuous distributions.\***
- 5. Know how to estimate point and confidence interval parametric values.\***
- 6. Be able to explain and apply the central limit theorem.\***
- 7. Know sampling distributions.\***
- 8. Know how to conduct hypothesis testing for one-sample and two-sample means and proportions.\***
- 9. Understand relationships between two random variables including dependence and joint distributions.\***
10. Perform correlation analysis.
11. Perform simple linear regression.

Example Course: ISE 301-4 Statistical Methods for Testing, Development and Manufacturing -I at Wright State University

**OES005 - ENGINEERING ECONOMICS**  
**2-3 Semester Hours/3-4 Quarter Hours**

**Related TAGs:** Industrial Engineering

**Learning Outcomes:**

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

- 1. Develop an introductory understanding of economic decision making\***
- 2. Know how to perform cash flow analysis \***
- 3. Demonstrate the ability to form alternatives and derive valid cost and benefit estimations from available data\***
- 4. Demonstrate the ability to handle time-value-of-money equivalence conversions, including amounts before and after inflation\***
- 5. Know how to handle replacement and timing decisions, comparisons of alternatives having unequal economic lives, and effects of decision horizons\***
- 6. Know to perform after-tax analysis including depreciation schedules, and gain appreciation for the effects of taxes and inflation on engineering decisions\***
- 7. Understand the impact of uncertainty on decision making and be able to perform risk analysis. \***
8. Know how to do costing in engineering projects

Example Course: ISE 481-4 Engineering Economy at Wright State University

**OMT017 – CALCULUS I & II SEQUENCE**  
**8-10 Semester Hours/15 Quarter Hours**

**Related TAGs:** Aerospace, Agriculture, Civil, Mechanical Engineering, Bioengineering, Chemical Engineering, Chemistry, Electrical Engineering, Industrial Engineering, Mathematics, Physics

This sequence OAN is a combination of the outcomes in OMT005 and OMT006

**OMT005 -CALCULUS I**  
**4-5 Semester Hours/8-10 Quarter Hours**

**Related TAGs:** AACM Engineering, Biology, Bioengineering, Chemical Engineering, Chemistry, Economics, Electrical Engineering, Industrial Engineering, Math, Physics

The successful Calculus I student should be able to:

1. Determine the existence of, estimate numerically and graphically and find analytically the limits of functions.
2. Determine the continuity of functions at a point or on intervals and to distinguish between the types of discontinuities at a point.
3. Recognize and determine infinite limits and the relationship to vertical asymptotes.
4. Determine the derivative of a function using the limit definition and derivative theorems and to understand the correlation of the derivative to finding tangent lines to a graph, finding the slope of a graph at a point and finding the rate of change of a dependent variable with respect to an independent variable.
5. Demonstrate the ability to determine the derivative and higher order derivatives of a function explicitly and implicitly and to solve related rates problems.
6. Determine absolute extrema on a closed interval for continuous functions and to use the first and second derivatives to analyze and sketch the graph of a function, including determining intervals on which the graph is increasing, decreasing, constant, concave up or concave down and any relative extrema or inflection points.
7. Recognize and determine limits at infinity and the relationship to horizontal asymptotes.
8. Determine when the Mean Value Theorem can be applied and use it to solve theoretical and applied problems.
9. Solve applied optimization problems.
10. Use differentials and linear approximations to analyze applied problems.

11. Demonstrate the ability to determine indefinite and definite integrals, use definite integrals to find areas of planar regions, use the Fundamental Theorems of Calculus, and integrate by substitution.
12. Apply the competencies above to a wide range of functions, including polynomial, rational, algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, hyperbolic and inverse hyperbolic.

## **OMT006 - CALCULUS II**

### **4-5 Semester Hours/8-10 Quarter Hours**

**Related TAGs:** Aerospace, Agriculture, Civil, Mechanical Engineering, Bioengineering, Chemical Engineering, Chemistry, Electrical Engineering, Industrial Engineering, Mathematics, Physics

The successful Calculus II student should be able to:

13. Use antiderivatives to evaluate definite integrals, including applications such as determining area, volume of solids of revolution, arc length, area of surfaces of revolution, centroids, work, and fluid forces.
14. Approximate a definite integral by the Trapezoidal Rule and Simpson's Rule.
15. Employ a variety of integration techniques to evaluate special types of integrals, including integration by parts, trigonometric integrals and substitutions, and partial fraction decomposition.
16. Evaluate limits that result in indeterminate forms, including the application of L'Hôpital's Rule to evaluate certain types of indeterminate forms.
17. Evaluate improper integrals, including integrals over infinite intervals, as well as integrals in which the integrand becomes infinite within the interval of integration.
18. Find, graph, and apply the equations of conics, including conics where the principal axes are not parallel to the coordinate axes.
19. Determine whether a sequence or series converges or diverges.
20. Determine the sum of convergent geometric series.
21. Find the  $n$ th Taylor polynomial at a specified center for a function.
22. Find, differentiate and integrate a power series for a function.
23. Analyze curves given parametrically (e.g., eliminate the parameter and differentiate parametric equations).
24. Graph polar equations and find the area of polar regions.
25. Perform vector operations in the plane and space.
26. Calculate and apply the dot and cross product of vectors.

**OSC022 - COLLEGE PHYSICS SEQUENCE**  
**8-10 Semester Hours/12-15 Quarter Hours**

**This is a combination of OSC016 and OSC017, Calculus-based Physics I and II.**

**OSC016 - PHYSICS I – CALCULUS BASED PHYSICS FOR THE MAJOR (W/LABS)**  
**4-5 Semester Hours/8-10 Quarter Hours**  
**Co-requisites:** Calculus I.

**Related TAGs:** Bioengineering, Biology, Chemistry, Computer/Electrical Engineering, Geology, Industrial Engineering, Math, Physics

Understanding and/application of the following topics using calculus 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

**OSC017 - PHYSICS II – CALCULUS BASED PHYSICS FOR THE MAJOR (W/LABS)**  
**4-5 Semester Hours/8-10 Quarter Hours**

**Related TAGs:** Bioengineering, Chemistry, Computer/Electrical Engineering, Industrial Engineering, Math, Physics

14. Electric field, potential, forces
15. Current, magnetic field integration over continuous charge/current distribution
16. Quantum physics
17. Atomic physics
18. Nuclear physics
19. Induction and Inductance
20. Resistance
21. Capacitance
22. Basic circuit analysis
23. Electric power
24. Energy stored fields
25. EMF
26. Electromagnetic waves
27. Gauss Law
28. Kirchhoff's Law
29. R-L-C circuits
30. Ampere's Law
31. Faraday's Law
32. Conductivity
33. Geometric optics
34. Diffraction
35. Interference
36. Polarization

## INDUSTRIAL ENGINEERING TAG - FACULTY PARTICIPANTS

<b>Faculty</b>	<b>Institution</b>
Charles Onasch	Bowling Green State University
Burghart, James	Cleveland State University
Dick Bickerstaff	Columbus State Community College
Trent Gages	Cuyahoga Community College
Peter Ross	Cuyahoga Community College
Brown, David	James A. Rhodes State College
Paul Sampson	Kent State University
Donald Anthan	Lakeland Community College
Delisio, Diane	Miami University
Robert Speckert	Miami University
Dale Doty	North Central State College
Robert Gustafson	Ohio State University
Mark Durivage	Owens Community College
Nerur Satish	Owens Community College
Carl Hilgarth	Shawnee State University
Karen Blake	Sinclair Community College
Jana Lehman	Sinclair Community College
Terry Flum	Southern State Community College
Peter Kropp	Stark State College of Tech
Craig Stinchcomb	Terra Community College
Daniel Solarek	University of Toledo
Donald Laconi	University of Akron
Joseph Nevin	University of Cincinnati
Scott Segalewitz	University of Dayton
Brian Randolph	University of Toledo
Mark Nutter	Washington State Community College
Dean Hirschi	Washington State Community College
Linda Roesch	Washington State Community College

Sundaram Narayanan  
David Reynolds  
Cynthia Hirtzel  
Charles Singler

Wright State University  
Wright State University  
Youngstown State University  
Youngstown State University