# EM 222
# Engineering Statics
## Winter 2015

**LECTURES:**        M-F, 8:00 am – 11:20 am

**PROFESSOR:**     Shane M. Palmquist, Ph.D., P.E.

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**OFFICE:**          EBS 2126

**OFFICE HOURS:**  M-F, 11:20 am – 12:15 pm

**PREREQUISITES:**  MATH 136 (Calculus I)

**COREQUISITES:**    MATH[+] 137 Calculus II and PHYS[+] 255 University Physics I
[+]**Course is a prerequisite for the Winter Term - Engineering Statics Course (EM 222).**

**TEXTBOOKS:**      *Vector Mechanics for Engineers - Statics,* 10th Edition, 2013, by Beer, Johnston and Mazurek, ISBN 978-0-007-740228-0.
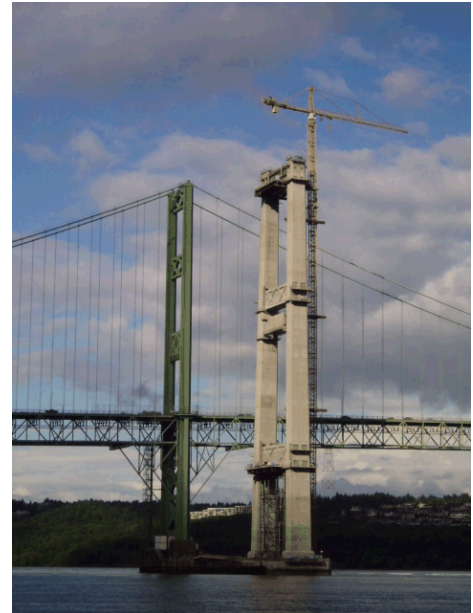
## COURSE DESCRIPTION:

EM222, Cr. 3. Vector algebra;  study of the forces on bodies at rest;  study of force systems;  equivalent force systems;  distributed forces;  internal forces;  principles of equilibrium;  application to trusses, frames and beams;  friction.

## CONCEPTS TO BE INTRODUCED:

Vector components and vector operations
Position vector, force vector and resultant
Rectangular components and direction cosines
Dot and cross product
Moment of a force and couple
Distributed loading and equivalent force systems
Free body diagrams, Newton's Laws and equilibrium
Beams, trusses and frames
Internal forces, shear force and bending moment diagrams

Friction
Center of gravity and centroids, moment of inertia
**COURSE OUTCOMES:**

1. Perform vector operations
2. Identify and draw appropriate free body diagrams
3. Determine moment of a force about a point or line and moment of a couple
4. Write appropriate equilibrium equations and solve for unknowns
5. Determine resultants of force-couple systems and distributed loadings
6. Analyze (as a whole or in separate pieces) truss and frame structures
7. Identify and calculate internal forces in structural members
8. Draw shear force and bending moment diagrams
9. Solve problems involving dry friction
10. Determine first moments of area and volume
11. Locate center of gravity and centroid of a body
12. Determine second moment of area and moment of inertia for an area

**COURSE GRADE:**

| Component | Weight |
|---|---|
| *Component* | *Weight* |
| Homework* | 15 % |
| Exams ($1^{st}$ exam: 25%, and $2^{nd}$ exam: 30%) | 55 % |
| Final Exam | 30 % |

*If two of the homework assignments are not completed, the homework grade will automatically be a zero (0). Make sure to do your homework.

Final class grades will be assigned based on a weighted average of the levels of performance demonstrated through-out the semester. Scores for work will be based on the following rubric:

| Letter Grade | Numeric Equivalent | Qualitative Description (Typical) |
|---|---|---|
| A | > 90% | Exemplar; no to minor mistakes. |
| B | > 80% | Proficient; several minor mistakes; almost no conceptual mistakes. |
| C | > 70% | Apprentice; several mistakes, some major; conceptual mistakes. |
| D | > 60% | Novice; many significant mistakes and conceptual errors. |
| F | < 60% | Non-response or completely incorrect response. |

**ASSIGNMENTS:**

Assignments will be assigned in class most days. **Assignments are due in class at the beginning of the next meeting** or as stated otherwise with the assignment. **Late homework will not be accepted.**

Quizzes will consist of one problem (equivalent to a homework problem).

Exams: Tentative dates are shown below on the schedule. However, these may be shifted if we are ahead or behind schedule. This will be announced in class.

In order to receive full credit: all answers must have the proper units and vector notation must be shown in order to distinguish vectors from scalars.

**A grade of zero will be given for all unexcused absences from quizzes and exams and for homework not turned in on time. If you have a legitimate excuse, let me know in advance ia e-mail or phone. No make-up work will be given except as required by University Policy. See the instructor prior to any anticipated absence or problems.**

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**ATTENDANCE:**

A **single** (**1**) unexcused absence will result in a lowering of the final letter grade by two (2) full letter grades. Thus, if the final letter grade in the class is an A and the student has one unexcused absence, the final letter grade in the course will be a C.

**Two** (**2**) unexcused absences will result in an F in the course, irregardless of the final letter grade earned in the course.

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**ASSIGNMENT FORMAT:**

To promote good engineering problem solving skills, the format for all homework assignments is as follows:
1. A cover page must be included with each assignment. The cover page must include: **name**, **date**, **course number**, and **homework assignment number**.
2. Problem solutions are to be written on one-side of the paper only. All pages must be **STAPLED**.
3. Each page should contain the prepare's **name**, **date**, **course number**, **homework assignment number**, and **page number**. The page number should be written in the form of a fraction, with the numerator being the current page and the denominator being the total number of pages in the set not counting the cover page.
4. Work must be done in **pencil**. All drawing are to be done with the aid of a straight edge.
5. A maximum of **two** (**2**) homework problems may be written on a single page.
6. For each homework problem, state clearly the problem and list all other information provided or needed.
7. Each homework solution shall be **legible and easy to follow**.
8. Numerical solutions should be clearly labeled with **ANS:** and a box or circle around the answer.
9. Significant figures: Three is sufficient but never more than four.

**Assignments not meeting these standards may not receive credit.** If the grader feels that the problem is not clearly organized and does not follow a logical path or if the solution is incomplete, no points will be awarded.

**PROFESSIONAL CONDUCT:**

It is expected that all students be present in each lesson, will be courteous of others' ideas, and otherwise will conduct themselves in a professional manner in accordance with the WKU Student Handbook. Conduct determined to be unacceptable may result in the loss of points. **Notify the instructor in advance of any absence for in- or out-of-class activities.** Use of any form of tobacco or alcohol in the classroom is considered inappropriate for this classroom. Cell phones and other devices should be turned off or otherwise left at home. If you need to answer your phone during class, you need to leave the room; re-admittance may or may not be permitted. Other activity that diminishes the professional quality of the class-room will not be tolerated.

**CLASSROOM CONDUCT POLICY:**

In an effort to create and foster a better learning environment in the classroom, the following policies have been adopted:

1. All cell phones are to be turned off during class.
2. All unnecessary classroom disturbances such as trips to the bathroom getting a drink at the water fountain and so forth are prohibited unless it is an emergency situation.
3. Use of computers during class is strictly limited to course related activities.

Do not get up and leave the classroom during a lecture. Other activities that diminish the professional quality of the classroom will not be tolerated. Failure to comply with the policies and procedures above will result in a two (2) point deduction from the student's final grade in the course.

**CHEATING:**

Cheating and/or plagiarism on graded materials will not be tolerated and will be prosecuted to the maximum according to STUDENT RIGHTS AND RESPONSIBILITIES as per the Undergraduate Catalog.

**STUDENT DISABILITY SERVICES:**

In compliance with university policy, students with disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Office for Student Disability Services in DUC A-200 of the Student Success Center in Downing University Center. The phone number is 745-5004.

Please DO NOT request accommodations directly from the professor or instructor without a letter of accommodation from the Office for Student Disability Services.

# EM222 WKU-STATICS

# WINTER 2015 SESSION

### Preliminary Schedule
(Subject to Change)

| Day | Date | Lessons | Material |
|---|---|---|---|
| 1: M | Jan. 5th | 1 and 2 | Introduction, Forces, and Vectors |
| 2: T | Jan. 6th | 3, 4 and 5 | Particle Equilibrium |
| 3: W | Jan. 7th | 6 and 7 | Rigid Bodies, Cross Products, and Dot Products |
| 4: Th | Jan. 8th | 8, 9 and 10 | Force Couples, Moment, & Rigid Body Equilibrium |
| 5: F | Jan. 9th | 11 and **Exam #1** | Determinant and Indeterminant Structures |
| 6: M | Jan. 12th | 12 and 13 | Support Reactions, Connections, & Hinge Problems |
| 7: T | Jan. 13th | 14 and 15 | Centroids |
| 8: W | Jan. 14th | 16 and 17 | Trusses, Method of Joints, and Method of Sections |
| 9: Th | Jan. 15th | 18 and 19 | Truss Examples, and Beams |
| 10: F | Jan. 16th | 20 and **Exam #2** | Shear and Moment Diagrams |
| **-: M** | **Jan. 19th** | **No Class: Martin Luther King Day** | |
| 11: T | Jan. 20st | 21, 22 and 23 | Load-Shear-Moment Relationships, and Friction |
| 12: W | Jan. 21nd | 24 | Moments of Inertia |
| 13: Th | Jan. 22rd | 25 | Polar Moment of Inertia, and Radius of Gyration |
| **14: F** | **Jan. 23th** | **Final Exam*** | |

**\*\*\*Final Exam is <u>cumulative</u>** (know your stuff)**.**