

# Statics - TAM 210 & TAM 211

Spring 2017

# Course websites

## MAIN PAGE

<https://courses.engr.illinois.edu/tam210/index.html>

**TAM 210/11: Statics**

Home Policies Info People Schedule

Welcome! This is the official course website for TAM 210/11 at UIUC in Fall 2015.

**NOTE: This page is still under construction!!** Feel free to peruse, wander, and learn a bit about what's coming up this Fall, but dates/times/assignments etc. are subject to change as we finalize plans. If you have any questions, feel free to drop us a line at the discussion forum on Piazza (see link below).

As well as the pages on this website, this course uses:

- [Online homework via Mastering Engineering](#)
- [Discussion forum on Piazza](#)
- [Recorded lectures](#)
- [Gradebook on Compass](#)
- [Computerized Testing Facility sign-up](#)

More website links here

# Discussion group activity – 8% of grade

- Work in groups of 3-4 students
- Goals:
  - **Gain experience in team-work**
  - **Apply engineering concepts learned in lecture to real-world problems or hands-on activities**
- Be prompt: if you are more than 5 minutes late, you will not be allowed to complete the activity
- You need to attend the discussion in which you are registered, otherwise, your assignment will not be graded



dubishere.com

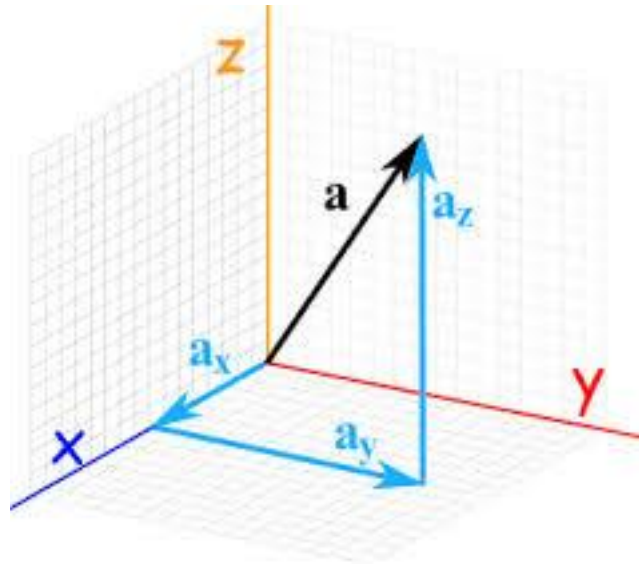
- **Matlab clinic**

- Jan 23-27
- MEL 1001
- Available slots marked in green
- Course website has a Matlab help document (see schedule page)

	Monday	Tuesday	Wednesday	Thursday	Friday
	1/23	1/24	1/25	1/26	1/27
9:00 AM					
10:00 AM					
11:00 AM					
12:00 PM					
1:00 PM					
2:00 PM					
3:00 PM					
4:00 PM					
5:00 PM					

# Forces are vectors

- Vectors have direction and magnitude



<https://www.mathsisfun.com>

- We will use the following operations with forces
  - Adding
  - Subtracting
  - Calculating the resultant
  - Taking the dot product
  - Taking the cross product with moment arm vectors

# Why use Matlab to do these operations?

- It will make our life easier!
- Avoid rounding errors
  - 1% rule for Prairie Learn and MasteringEngineering
- Faster than doing the calculations by hand, especially useful for timed quizzes and exams

# What is MATLAB

- High level language for technical computing
- Stands for **MAT**rix **LAB**oratory
- Everything is a matrix - easy to do linear algebra

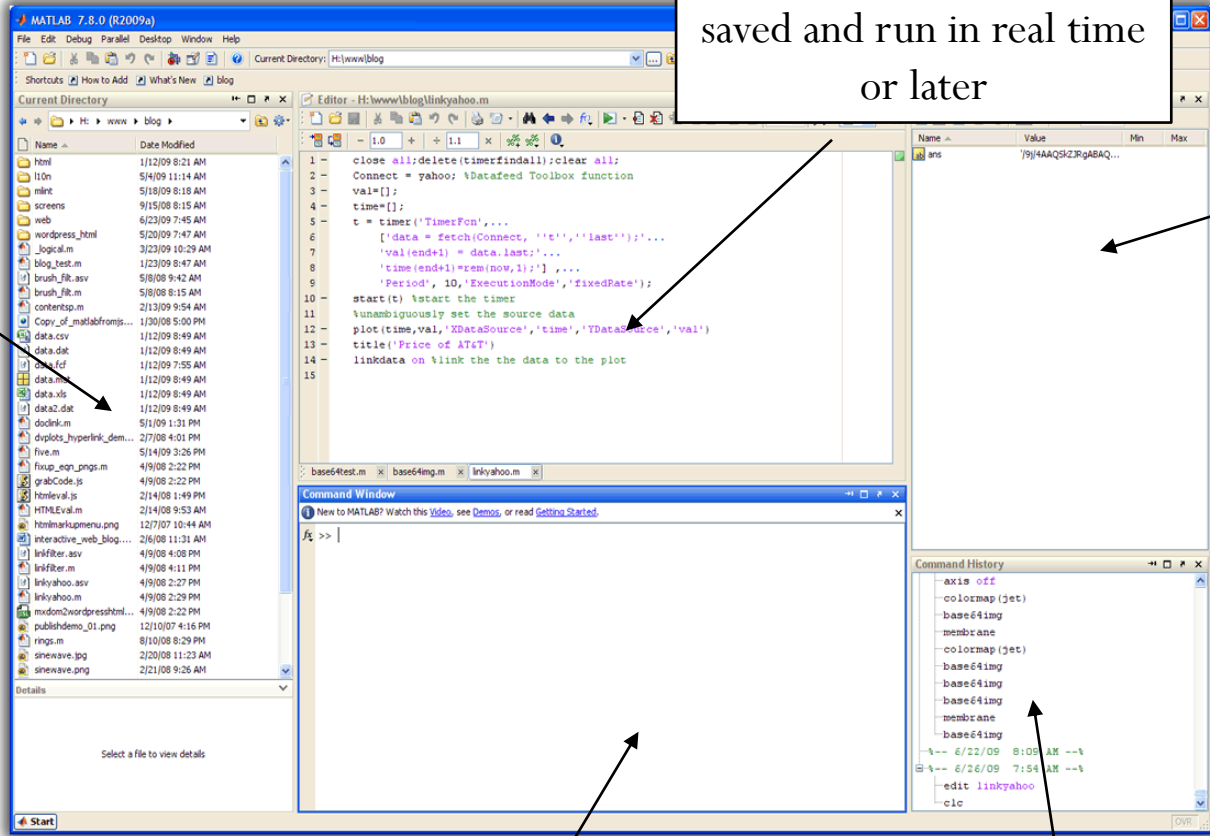
<http://www.mathworks.com/help/>

# MATLAB Desktop

Current Directory: A window that shows which folder you are in and all the files that are in it

Editor: A place to write commands that can be saved and run in real time or later

Workspace: Variables you define are displayed here



Command Window: A place to write commands, perform calculations

Command History: What you type in the box to the left of this one is saved here



# Workspace

- Matlab remembers old commands
- **And** variables as well
- Each Function maintains its own scope
- The keyword `clear` removes all variables from workspace
- The keyword `who` lists the variables

# Matrices & Vectors

- All (almost) entities in MATLAB are matrices
- Easy to define:
- Order of Matrix -
  - $m$ =no. of rows,  $n$ =no. of columns
- Use ‘,’ or ‘ ’ to separate row elements -- use ‘;’ to separate rows

```
>> A = [16 3; 5 10]
A =
    16     3
     5    10
```

```
>> A = [-5 1 -8]
A =
    -5     1    -8
```

# Defining vectors in Matlab

```
>> A = [-5 1 -8]
```

- $A \rightarrow$  variable name
- How many rows are in  $A$ ?
- How many columns are in  $A$ ?
  
- $A(1,1) = -5$        $A(1,2) = 1$        $A(1,3) = ??$
  
- How do we edit a vector?

# Adding vectors in Matlab

```
>> A = [-5 1 -8]
```

```
>> B = [6 -3 4]
```

- To add
  - Define vector 1
  - Define vector 2
  - $C = A + B$ ;  $C = ???$  (always define your solution as a variable, in case you need it in a later step)
- To subtract....

# Dot and cross product, determinant

- `det (D)` : determinant of a square matrix
- `dot (A, B)` : dot product of two vectors
- `cross (A, B)` : cross product of two vectors

# Useful trig functions

- Trigonometric and their inverse
  - $\cos(x)$   $\quad$   $\text{acos}(x)$
  - $\sin(x)$   $\quad$   $\text{asin}(x)$
  - $\tan(x)$   $\quad$   $\text{atan}(x)$
  - $\cot(x)$   $\quad$   $\text{acot}(x)$
  - $\csc(x)$   $\quad$   $\text{acsc}(x)$
  - $\sec(x)$   $\quad$   $\text{asec}(x)$
  - $\text{atan2}(x,y)$

Note that all of these are in radians

$\text{Cosd} = \text{cosine}(\# \text{ in degrees})$

OR

Convert from radians to degrees

$\text{rad2deg}$

$\text{Deg2rad}$

Do the math itself, pi is predefined in Matlab as “pi”