**Instructor Guide**

**Concept Name: Numerical Linear Algebra  
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**Slide #s: 1-8**

**Allotted time: 10 minutes**

**Major Topics to be covered:**

1. Representation of integers in binary

**Demo (MATLAB):**

**When to launch the demo:**  
After slide 8

What to do:

Make some variables of different integer types and then show them with whos. Also demo bin2dec or dec2bin to demonstrate converting between decimal and binary. With an advanced audience, can demonstrate overflow behavior with integer types.

Time:

5 minutes

Key Takeaway:

How to convert binary to decimal.

**Slide #s: 9-11**

**Allotted time: 5 minutes**

**Major Topics to be covered:**

1. Twos complement representation of integers

**Demo (MATLAB):**

**When to launch the demo:**  
After slide 11

What to do:

Demonstrate intmax and/or intmin for a couple of the datatypes (like uint64)

Time:

5 minutes

Key Takeaways:

* Representing signed integers is not straight-forward.
* int8 and int16 are pretty limited in their range, int32 can cover up to about a billion, and int64 is huge.

**Slide #s: 12-15**

**Allotted time: 5 minutes**

**Major Topics to be covered:**

1. Definition of fixed point datatypes

2. Drawbacks of fixed point datatypes

**Slide #s: 16-22**

**Allotted time: 10 minutes**

**Major Topics to be covered:**

1. Definition of double-precision

2. Double precision helper functions (eps, realmax, etc)

**Demo (MATLAB):**

**When to launch the demo:**  
After slide 22

What to do:

Run tstb.utils.ieee754bits(…) on a couple of different values and discuss how they are represented. Good examples are 1, 2, .75, pi, realmax, realmin, eps(0), Inf, NaN.

Time:

10-15 minutes

Key Takeaways:

* Double precision gives about 16 decimal places of accuracy regardless of the magnitude of the number
* Floating point datatypes can also represent certain non-numeric values (Inf, NaN).

**Slide #s: 23-24**

**Allotted time: 5 minutes**

**Major Topics to be covered:**

1. Complex matrices

2. Sparse matrices

Key Takeaway:

* Sparse and complex matrices are other types of matrices to be aware of.

**Interactivity (MATLAB):**

**When to launch the interactivity:**  
After last slide

What to do:

Follow the workbook