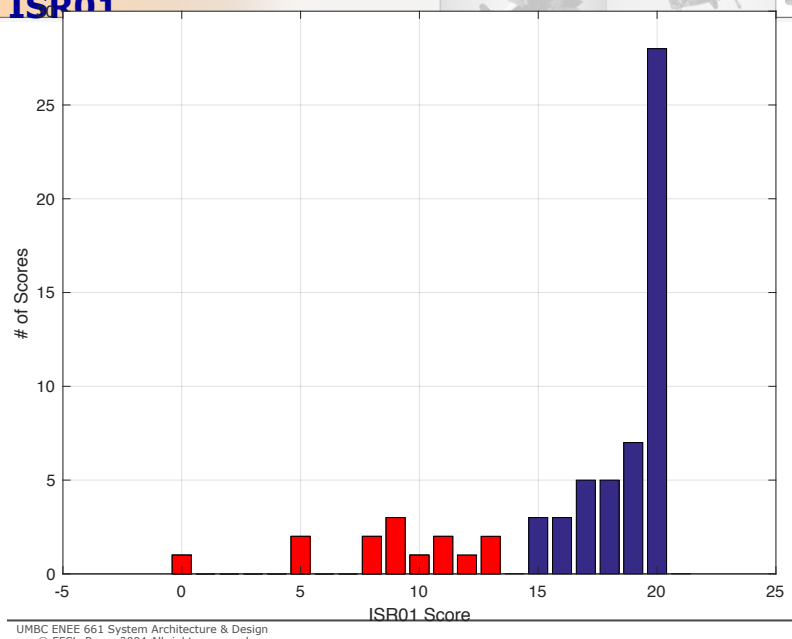
ISR01



Main problems

- Failure to explicitly address any of the Code of Ethics
- Fractured English
  - English structure
  - Tense agreement
- Lack of proofreading
- Strange and convoluted logic; digressions about things that weren't related to the problem.

Writing Math Well in Documents and Presentations

Math *is* the language of engineering

- **Statics:** $\sum_n \mathbf{F}_n = 0$
- **Dynamics** $\sum_n \mathbf{F}_n = m\mathbf{a}$
- **Heat Transfer (conduction):** $q_x = -kA\frac{\delta T}{\delta x}$
- **Maxwell's Equations:**

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\delta \mathbf{B}}{\delta t}$$

$$\nabla \times \mathbf{B} = \mu_0\left(\mathbf{J} + \varepsilon_0\frac{\delta \mathbf{E}}{\delta t}\right)$$

- **Fourier Transform** $X(\omega) = \int_{-\infty}^{\infty} x(t)e^{-j\omega t}\,dt$
- **Laplace Transform** $H(s) = \int_{-\infty}^{\infty} h(t)e^{-st}\,dt$
- **Z-transform** $X(z^{-1}) = \sum_{k=-\infty}^{\infty} x_k z^{-k}$
- **Differential Equations**

$$\sum_{k=0}^{N} a_k \frac{d^k y(t)}{dt^k} = \sum_{k=0}^{M} b_k \frac{d^k x(t)}{dt^k}, \quad \frac{d^0 y(t)}{dx^0} \triangleq y(t)$$

- **...and on and on.**
- **Math is the languager of engineering.**

Some text mistakes to avoid

- ***Solve*** **does not mean** ***Evaluate***

  $x = y - 5$. Solving at $y = 3$, we have $x = -2$.

  $x^2 = 4$. Evaluating, we have $x = \pm 2$

- **These are wrong! Swap Solve and Evaluate to correct!**
- **The terms *equation* and *function* are not synonomous**
- **In math, *arbitrary* does not mean *at random*.**

Use standard math expressions

- Written math is not the same as programmed math
- …so while
  - `x = A*exp(-j*2*pi/T*k*t)` is valid MATLAB
  - $x = Ae^{-j\frac{2\pi kt}{T}}$ or $x = A\exp\left(-j\frac{2\pi kt}{T}\right)$ is proper math!
  - `PSD = (V^2/2)*sinc(frequency*tau).^2` is valid MATLAB
  - $S = \left(\frac{V^2}{2}\right)\mathrm{sinc}^2\left(f\tau\right)$
- Keep the equals sign out of non-formula text
  - d = the distance between two points
  - Is fine for a MATLAB comment, but not for text or presentation

Writing (Typing) math

- Do not try to just change the font to a symbol font!
  - $Y=mx+b$
- Use an Equation Editor to create good math statements
  - Most industrial writing is done in Word, so this means Equation Editor or the MathType add in (which is what Dr. LaBerge uses!)
  - http://www.dessci.com/en/products/mathtype/
  - Most academic writing is not done in Word, so this means LaTex (which is also useful in MATLAB plots!)
  - $\mathcal{F}\left(\int_{-\infty}^{t} x(t)\,dt\right) = \frac{X(f)}{j2\pi f} + \frac{1}{2}X(0)\delta(f)$ would be nasty
  - …if you tried to do it by hand

Writing Good Math

- Good math follows a set of logical steps
- Make sure that in your writing or presentations the steps are clear
- …and the logic is solid
- CMPEs study logic in CMSC203 and CMPE212
- It doesn't apply only to hardware and software…
- …you need to apply logic to your writing as well.

Other things

- Include your units, Define your terms!!

For RRC filtering and intermodulation orders m and k such that $m,k \geq 2$, we can approximate the voltage spectral density $V_m(f)$ and $V_k(f)$ by Gaussian functions

$$V_m(f) = a_m e^{-\frac{f^2}{2m\sigma^2}} \quad (1)$$

and

$$V_k(f) = a_k e^{-\frac{f^2}{2k\sigma^2}} \quad (2)$$

where σ^2 is the mean-square bandwidth of the RRC function $H(f)$, as derived in the previous section. The $(m+k)-$th IM product is the convolution of these functions. In (13) and (14), a_m and a_k are the maximum amplitudes of the m-th and k-th order Gaussian, respectively. The units of the a_k are Volts^k/Hz.

Writing Math Well

- Be precise with your wording
- Define your terms
- Use an Equation Editor of some kind
- Be logical (with valid logic)
- Use standard forms
- Be neat!