**EE 524 Homework #1 : Due THUR 10/4/2018 by 6:00 PM**

**READ** (see COURSE READINGS canvas page)

* OpenCL 2.0 API Specification – Sections 1, 3, 4, 5.1, 5.2, 5.8, 5.9
* OpenCL 2.0 C Language Specification – Sections 6.1, 6.2.1, 6.2.2. Skim 6.2, 6.3, 6.4
* Supplementary: *Heterogeneous Computing with OpenCL 2.0, 3e*. Ch 1-3.
  + Available online though [www.lib.washington.edu](http://www.lib.washington.edu)
* Suggested: Sutter and Olukotun articles

**CODE Problems:**

*GOAL*: Use the Code-Builder Kernel Development Framework (KDF) in Visual Studio to implement additional basic OpenCL kernels.

*Procedure*:

1. 2D and 3D versions of element-wise *vector addition* kernel and result verification using KDF
   1. Keep the index space small, e.g. (4,4,0), (4,4,3).
   2. Manually create CSV text files defining input buffer values and output buffer verification
2. 1D and 2D SAXPY kernels using OpenCL C and KDF
   1. SAXPY = single-precision (float) A**X** plus **Y**
      1. Where A is a scalar, and X, Y are vectors of length Nx1
      2. Where **A** is a (MxM) matrix and **X**, **Y** are matrices of size (MxN)
   2. Provide input/output CSV files for buffer values and verification.
   3. *Hint*: use simple whole numbers to avoid rounding and finite-precision problems.
3. *vec3dotproduct* and *vec3crossproduct* kernels, which implement a 3D dot-product and 3D cross-product operation, respectively, using input buffers of int4 vector data types.
   1. Use OpenCL C vector component accessor syntax to implement the kernels.
      1. See OpenCL C Language Specification Section 6.1.7
   2. Ignore the 4th component of the vectors for 3D problem (.w component)
      1. Set all .w = 0.
   3. Write result to output buffer of appropriate size/type and provide CSV verification file for KDF
      1. Keep input buffer sizes reasonably small to keep manageable.

*Expected Outputs*

* Kernel files \*.cl for each kernel implemented in OpenCL C which successfully compile/build.
  + Copies of input initialization and output validation reference CSV files.
* Screenshots of CodeBuilder KDF Run Results outputs showing expected input and output buffer values, and PASS verification buffers.