Using ARCHER2 Efficiently
Day 1: Tuesday 28/01 (times in GMT)

Start	Duration	Item
09:00	10	**Welcome, introduction to the course** *Course organisation.*
09:10	60	**Introduction to the HPE Cray Hardware** *Focus on the HPE Cray EX hardware architecture.*
10:10	30	**Introduction to the HPE Cray Programming Environment** *Focus on the HPE Cray EX software stack.* *Tutorial on the Cray module environment and compiler wrapper scripts.*
10:40	20	***Break***
11:00	20	**First steps for running on Cray EX Hardware** *Examples of using the Slurm Batch system, launching jobs on the front end and basic controls for job placement.*
11:20	40	**Exercises (session #1)**
12:00	80	***Lunch break***
13:20	60	**Overview of compilers and Parallel Programming Models** *An introduction to the compiler suites available, including examples of how to get additional information about the compilation process. Special attention is given the Cray Compilation Environment (CCE) noting options relevant to porting and performance.* *Description of the Parallel Programming models.*
14:20	30	**Exercises (session #2)**
14:50	10	***Break***
15:00	30	**Scientific Libraries** *Presentation of the Cray Scientific Libraries for CPU and GPU execution.*
15:30	30	**Exercises (session #3)**
16:00	45	**CPE GPU Offloading Models: directives and other approaches** *Using directive-based approaches for GPU offload execution with the Cray Compilation Environment. Using other languages.*
16:45	15	**Open Questions & Answers** Participants are encouraged to continue with exercises in case there should be no questions.
17:00		***End of the course day***

Day 2: Wednesday 29/01 (times in GMT)

Start	Duration	Item
09:00	45	**Advanced Application Placement** *More detailed treatment of Slurm binding tehnology and OpenMP controls.*
09:45	30	**Exercises (session #4)**
10:15	20	***Break***
10:35	45	**Debugging at Scale** *gd4hpc, valgrind4hpc, sanitizer4hpc, ATP, STAT.*
11:20	40	**Exercises (session #5)**
12:00	80	***Lunch break***
13:20	60	**Introduction to Perftools - Perftools-lite modules** *Overview of the Cray Performance and Analysis toolkit for profiling applications.* *Demo: Visualization of performance data with Apprentice2.*
14:20	35	**Exercises (session #6)**
14:55	10	***Break***
15:05	60	**Advanced performance analysis** *Automatic performance analysis and loop work estimated with perftools.* *Communication Imbalance, Hardware Counters, Perftools API, OpenMP.* *Compiler feedback and variable scoping with Reveal.*
16:05	40	**Exercises (session #7)**
16:45	15	**Open Questions & Answers** Participants are encouraged to continue with exercises in case there should be no questions.
17:00		***End of the course day***

Day 3: Thursday 30/01 (times in GMT)

Start	Duration	Item
09:00	60	**Understanding Cray MPI on Slingshot, rank reordering and MPMD launch** *High level overview of Cray MPI on Slingshot, useful environment variable controls.* *Rank reordering and MPMD application launch.*
10:00	30	**Exercises (session #8)**
10:30	20	***Break***
10:50	30	**Python topics on HPE Cray EX** **GPU application porting strategies**
11:20	20	**AMD Debugging**
11:40	30	**Exercises (session #9)**
12:10	75	***Lunch Break***
13:25	20	**Introduction to AMD Rocprof**
13:45	30	**Exercises (session #10)**
14:15	30	**Performance Optimization: improving single-core efficiency**
14:45	30	**Exercises (session #11)**
15:15	15	***Break***
15:30	60	**I/O Optimisation - Parallel I/O** *Introduction into the structure of the Lustre Parallel file system.* *Tips for optimising parallel bandwidth for a variety of parallel I/O schemes. Examples of using MPI-IO to improve overall application performance.* **Advanced Parallel I/O considerations** *Further considerations of parallel I/O and other APIs.* **Being nice to Lustre** *Consideration of how to avoid certain situations in I/O usage that don't specifically relate to data movement.*
16:30	30	**Exercises (session #12)**
17:00		***End of the course day***