

oneAPI Academic Programs

Arti Gupta

We are committed to a Vibrant Open Ecosystem for Developers



Open.



Choice.



Trust.

Focus on making our ecosystem successful:

- 1 Enable developer productivity on high performance open platforms
- 2 Foster choice and interoperability of software platforms and ecosystems for our industry
- 3 Built on a confidential computing platform you can trust

20

Years of Investment
Across hundreds
of independent projects

#1

Linux Kernel
Corporate Contributor
since 2007¹

22

Centers of Excellence
With top universities worldwide²

#1

Winner HPCwire Readers Choice
Award for Best HPC Programming Tool or Technology³

700+

GitHub Projects

CHROME OS

Leading Contributor

1- Source: https://www.linuxfoundation.org/wp-content/uploads/2020_kernel_history_report_082720.pdf

2- <https://www.intel.com/content/www/us/en/developer/tools/oneapi/training/academic-program.html>

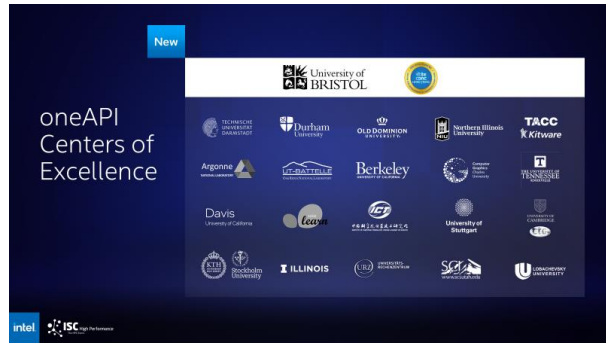
3- <https://www.hpcwire.com/off-the-wire/hpcwire-reveals-winners-of-the-2021-readers-and-editors-choice-awards-during-sc21/>

Additional Resources: [Intel.com/SoftwareFirst](https://www.intel.com/SoftwareFirst)

Other names and brands may be claimed as the property of others.

oneAPI Academic programs

Centers of Excellence



Top Universities/Labs

Innovators



Professors and developers, technology enthusiasts

Student Ambassadors



Undergrad, Grad, PHD students

Professor Program



Univ faculty teaching oneAPI

Intel Engineering Support | Early access to latest Intel hardware
Intel PR and events to promote research papers, speakerships | Influence the industry direction

Enhance leadership/community reputation in industry and academia

New



oneAPI Centers of Excellence



Davis



University of California

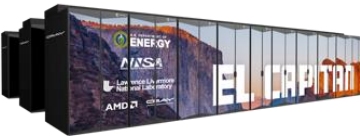


oneAPI Innovator Program

Professors and developers, technology enthusiasts



Intel® Professor Program for oneAPI



"Next-generation supercomputers are largely heterogeneous"
- Prof. Simon McIntosh-Smith, University of Bristol

The compute world is moving to a higher diversity in workloads that in turn require a diverse set of architectures (CPU, GPU, FPGA, and other accelerators), whether for the cloud-to-the-edge or for HPC to robotics.

Future developers will require to simplify development by using standard-based, open specifications, cross architecture programming models.

Prepare your students for heterogeneous programming, the next generation in computing

[Intel® Professor Program for oneAPI](#)

Program Pillars

Out of the box instruction via Modular Teacher Kits

DevCloud: cluster of XPU's w/oneAPI sw stack for assignments & labs

WW Academic Community

Platform for showcasing work

Participating Universities



Teacher Kits

- An easy-to-access bundle of teaching materials to help educators achieve the goals of their curriculum.
- For a best-in-class experience, our content package includes:
 - Syllabus
 - Lecture Slides
 - Speaker Notes
 - Instructions for teachers
 - Lecture Videos
 - Hands-on Exercises & Code Samples
 - Datasets & Licensing
 - Sample Student Tests & Solutions
 - Hardware/Software Access

SYCL Programming for Accelerated Computing Teacher Kit

Machine Learning Teacher Kit

SYCL Programming for Accelerated Computing

This course covers challenges of Heterogeneous Computing. Learn about SYCL Programming for Heterogeneous Computing and how it can target different types of accelerator devices like CPUs, GPUs and FPGAs across any vendor.

- Motivation
- Learning Objectives
- Target Audience
- Prerequisites
- Course Syllabus
- Resources

Motivation

- SYCL is open standard, cross-architecture and cross-vendor programming solution to High Performance Computing.
- SYCL enables heterogeneous computing and code reuse across architectures (CPUs, GPUs, FPGAs) and across vendors.
- SYCL breaks the Chains of Proprietary Lock-in and gives freedom to make your best choice, choose the best accelerated technology the software doesn't decide for you.

Learning Objectives

At the end of this course you will be able to:

- Understand the challenges of Heterogeneous Computing.
- Write a SYCL program that offloads computation to accelerator devices like CPUs, GPUs or FPGAs from any vendor.
- Perform analysis and profile the SYCL code using Intel oneAPI tools to find performance bottle necks.

Target Audience

Senior undergrad and graduate students

- Computer Science
- Engineering
- Science and Mathematics

Prerequisites

- C++ Programming

Syllabus

- 11 Modules (18 hours)
- 10 Lab Exercises
- 10 Quizzes

Modules	Description	Duration
Challenges in Heterogeneous Computing	• Introduction and Motivation for SYCL • SYCL Hello World • Compiling SYCL and DevCloud Usage	60 min
SYCL Program Structure	• SYCL Classes: device, device_selector, queue, basic_kernels and ND-Range kernels, Buffer-Accessor memory model • SYCL Code Anatomy • Implicit Dependency with Accessors, Synchronization with Host Accessor and Buffer Destruction • Creating Custom Device Selector • Lab Exercise: Vector Increment to Vector Add	120 min
SYCL Unified Shared Memory	• What is Unified Shared Memory (USM) and Motivation • Implicit and Explicit USM code example • Handling data dependency using depends_on() and ordered queues • Lab Exercise: Unified Shared Memory	90 min
SYCL Sub-Groups	• What is Sub-Groups and Motivation • Querying for sub-group info • Sub-group shuffle algorithms • Sub-group group algorithms • Lab Exercise: Sub-Groups	90 min
SYCL Kernel Reductions	• What are Reductions • Challenges with parallelizing reductions • sycl::reduce, over_group function for sub-groups and work-groups • sycl::reduction object in parallel, for • Lab Exercise: Kernel Reductions	90 min
SYCL Buffers and Accessors in depth	• Buffers and Accessors • Buffer properties and usecases • Create Sub-buffers • Host accessors and usecases • Lab Exercise: Buffers and Accessors	120 min
SYCL Task Scheduling and Data Dependencies	• Different types of data dependencies • Execution of graph scheduling • modes of dependencies in Graphs scheduling • Lab Exercise: Task Scheduling	120 min
Intel® oneAPI DPC++ Library (oneDPL)	• Introduction to Intel oneAPI DPC++ Library (oneDPL) • Lab Exercise: Gamma Correction with oneDPL	120 min
Intel® Advisor	• Offload Advisor Tool usage and command-line options • Lab Exercise: Generate Offload Advisor Report • Runtime Analysis and command-line options • Lab Exercise: Generate Runtime Report	120 min
Intel® VTune Profiler	• Intel VTune® Profiler usage in Intel DevCloud environment using command-line options • Lab Exercise: VTune Profiling by collecting gprof hotspots for sample application.	60 min
Intel® Distribution for GDB on DevCloud	• Use the Intel® Distribution for GDB to debug kernels running on GPUs.	60 min

Resources

- SYCL Programming Course GitHub
- SYCL Specification
- Intel oneAPI Toolkits Installation Guide
- Intel DevCloud Quick Guide

SYCL Programming Course GitHub

Videos

Videos for Teaching SYC...



Simplified Cross-Architecture Programming

Videos: DPC++ Program Structures

25m 17s

22 days ago

2 views | 10m 50s



Simplified Cross-Architecture Programming

Videos: DPC++ New Features


25m 17s

22 days ago

2 views | 10m 50s

Presentations with Instructor Notes

Presentations for...




PPT: DPC++ Program Structure (with Speaker Notes)

Karthik Subramaniam

16 views

14 days ago



PPT: DPC++ New Features (with Speaker Notes)


Karthik Subramaniam

14 views

14 days ago

Assignments and Solutions

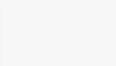
Assignments and...



Jupyter: SYCL Assignments and Solutions

Divya Ganes

9 days ago



Archive

9 days ago

Focus your time on teaching by integrating what you need

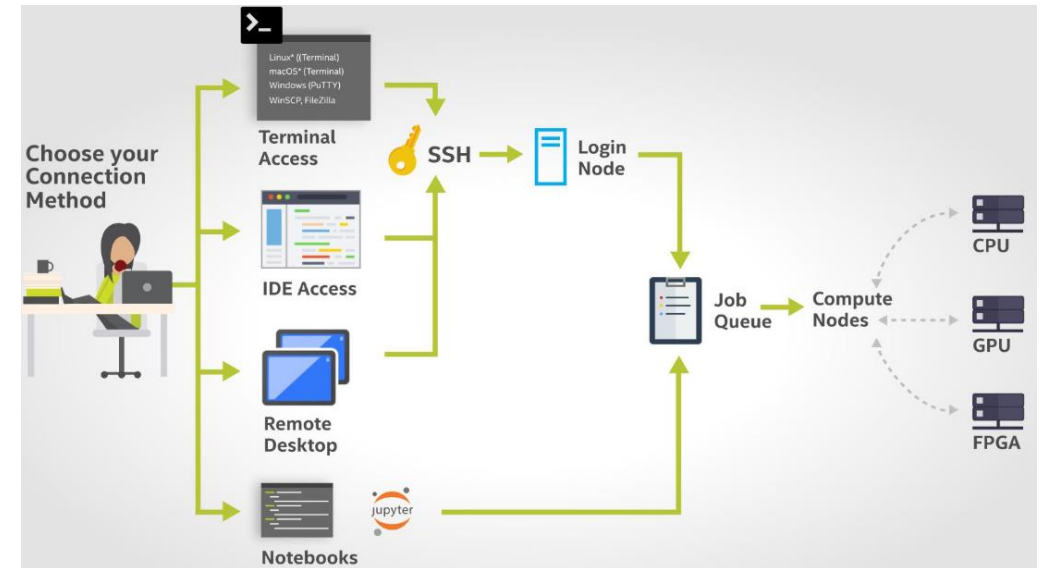
Professor & Student access to Intel® DevCloud for oneAPI

FREE Access to cutting-edge Intel hardware and software

- A cluster of cutting-edge Intel CPUs, GPUs, FPGAs
- Pre-installed Intel® oneAPI Toolkits – includes tools, frameworks and libraries

Run assignments, workshops and research projects from anywhere in your own private & secure directory

- A shared resource with your own home directory (not visible to others)
- Connect via a SSH Client or Jupyter Notebook to connect to DevCloud



Teach foundational programming concepts on latest technology

FREE Access to test code & workloads on a variety of Intel hardware with pre-installed software

Student Ambassador Program

Overview

A program targeted at software undergraduate and graduate students to skill them on oneAPI technologies, so that students graduate with experience on heterogeneous platforms

Benefits of being a SA



Recognition by Intel as oneAPI expert



Connect with Intel experts, other students and professors working on oneAPI projects



Extended access to DevCloud



Opportunity to showcase oneAPI projects at Industry and Intel sponsored events



Stipend from Intel for participation in accepted conferences/events



Support from Intel to organize local events such as watch parties/workshops to grow oneAPI community



Opportunity to learn about the latest technology developments under NDA



Opportunity to get an internship at Intel

What can you do next?

[Centers of Excellence](#) : Top HPC, Rendering and AI codes being enabled on oneAPI

[Innovators](#) : Rockstar developers and professors enabling codes on oneAPI

[Students](#) : undergrad, Grad and PhD students enabling codes on oneAPI, training other students on campus, advocating their work in the community

[Teaching](#) : Professors teaching oneAPI curriculum in their undergrad classrooms

Link to request access to teacher kits :

<https://learning.intel.com/Developer/pages/45/intelr-oneapi-programs>

[DevMesh](#) : Showcase of projects created by our community



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