



INTEL REQUEST FOR PROPOSALS (RFP)

SUBJECT

Intel's University Research & Collaboration Office (URC) requests proposals for academic curriculum development targeting *Heterogeneous Computing and Programming Heterogeneous Architectures with SYCL and oneAPI Libraries and Frameworks*.

KEY DATES

Proposal Submission Deadline (PIs): May 2nd, 2022

Response Date to Proposal (Intel): May 30th, 2022

OVERVIEW

Intel's University Research & Collaboration Office (URC) invites proposals from academic faculty to develop curriculum focused on emerging computing topics in the area of *Heterogeneous Computing and Programming Heterogeneous Architectures with SYCL and oneAPI Libraries and Frameworks*. The goals of this program are to: (1) partner with the academic community to develop curriculum content that embraces Intel technology to educate undergraduate computer science, computational science and electrical and computer engineering students on heterogeneous parallel computing concepts, and (2) develop a pipeline of capable students for the ecosystem who understand today's technology challenges and how Intel solutions can help solve those problems.

The objective is to raise awareness within the academic community of Intel technologies and their capabilities for teaching emerging computing concepts through partnering with faculty to augment or develop curriculum at universities

that expose students to challenges currently faced within the technology industry. This initiative aims to encourage a culture of faculty collaboration through sharing of curriculum content for incorporation into college and university course syllabuses throughout the broader academic community.

Specifically, this solicitation calls for the development of curriculum modules targeting undergraduate education with each module consisting of one to two lecture series with a laboratory or exercise component. Example topics of interest may include the following:

- Introduction to the heterogeneous parallel programming features of SYCL (e.g., unified shared memory, kernels, accessors, buffers)
- Migration of existing heterogeneous parallel code to SYCL
- oneAPI and SYCL for computer science, computational science, electrical and computer engineering
- Understanding the architectural interfaces and attributes of a heterogeneous compute system comprising of CPUs, GPUs, FPGAs, domain-specific accelerators, and the capacity, latency, and bandwidth attributes of the private and shared cache hierarchies and the memory architecture of the overall system
- Methodologies to perform early analysis of application algorithms, and their inherent instruction-, data-, and thread-level parallelism to enable efficient partitioning of the application among heterogeneous compute engines
- Heterogeneous parallel performance optimization (e.g., understanding the relative performance and power advantages of CPU, GPU, and FPGA architectures; determining the best architecture for different sections of a given workload; performance optimization, particularly techniques to reduce data movement between host and device memories; and using Intel® Advisor and Intel® VTune to perform iterative optimizations)
- AI training and inference using oneAPI libraries and frameworks (e.g., heterogeneity, asynchronous execution, optimization, and deployment; AI workload acceleration with the Intel® Distribution of OpenVINO™ toolkit)

This solicitation affords the proposer flexibility to utilize any suitable Intel technology to address teaching imperatives relevant to the topics of interest in the classroom setting. Faculty are encouraged to consider how laboratory components could be enabled by the [Intel® DevCloud for oneAPI](#), a cloud-based development

sandbox for heterogeneous parallel workloads, which provides free access to the latest Intel® hardware (e.g., CPUs (e.g., Intel Xeon processors), GPUs (e.g., Intel® Xeon® E-2176 P630 processors (with Intel® Graphics Technology), Intel® Iris® Xe MAX), and FPGAs (e.g., Intel® Arria® 10 FPGAs, Intel® Stratix® 10 FPGAs), software, frameworks, tools, and libraries for oneAPI development. Use of the Intel DevCloud is not a requirement for proposals. It is offered as a free and convenient option for accessing the latest Intel hardware and software. Funding recipients can also request early access to pre-release Intel discrete GPUs under NDA and Intel® Arc™ Graphics Family GPUs. Faculty are also encouraged to consider how teaching imperatives could be achieved using integrated graphics processors that are already available in most students' laptops.

PROGRAM SCOPE AND FUNDING

Intel URC intends to sponsor proposals lasting 6-12 months focused on the development of curriculum modules consisting of one to two lecture series with laboratory or exercise component.

The program targets curriculum for undergraduate students with a focus on courses devoted to problem analysis and performance towards emerging heterogeneous computing architecture and heterogeneous parallel programming topics.

- Curriculum should include a laboratory or exercise component that utilizes Intel technologies.
- Curriculum developed under this initiative should be piloted in a classroom setting at the college or university.
- Proposals have flexibility to identify the most appropriate course intercept for the targeted material based on course teaching imperatives and prerequisites. This RFP specifically targets undergraduate level computer science, computational science, and electrical and computer engineering courses.
- Proposals that target integration of one or more of the highlighted heterogeneous parallel programming concepts in the context of standard algorithms, data structures, and/or programming language courses are of considerable interest.

Curriculum developed under this initiative is intended to be provided to the academic community with open access for multiyear use:

- In funding this proposal, Intel requests that the content hosted on university or faculty websites allows access to the broader academic community to incorporate into their respective course syllabuses.
- Intel requests that faculty will allow Intel the right to host their course content link and associated course description on [Intel® Developer Zone](#) and university program websites.
- Proposals that have identified paths to disseminate curriculum within the broader academic community through workshops, conferences and other collaborative partnerships are of considerable interest.

The level of sponsorship is expected to be around \$25K to \$50K, depending on the availability of funds and the breadth and quality of the proposals. All proposals must justify the proposed budget in terms of the resources needed to carry out the proposed work.

PROPOSAL FORMAT

Individual proposals should be three to five pages and should follow the format provided in the attached Intel University Research & Collaboration Office Proposal Template. All proposals must elaborate on the faculty expertise in the relevant areas. Proposals will be competitively reviewed by an advisory committee.

EVALUATION CRITERIA

The evaluation criteria for this solicitation are as follows:

1. **Potential contribution and relevance to Intel and the broader industry:** The proposed curriculum should directly address teaching imperatives in the areas of heterogeneous computing and heterogeneous parallel programming and utilize the latest Intel technologies to address technology challenges relevant to Intel and the broader industry.
2. **Technical merit:** The extent to which the proposed curriculum is technically feasible to address the targeted teaching imperatives.
3. **Qualification of participating faculty:** The extent to which expertise and prior experience bear on the problem at hand. Please elaborate on

relevant experience in the targeted domain and any notable teaching recognitions.

4. **Potential for scalability:** Proposals that have identified paths to disseminate curriculum within the broader academic community through workshops, conferences and other collaborative partnerships will be given significant consideration (e.g., multiple course offerings, number of students impacted, adoption by other universities/organizations, online course offerings, participation in relevant education conferences/workshops).
5. **Potential for broader impact:** Intel supports the advancement of computing education and diverse participation in STEM. Proposals are encouraged to elaborate on how the proposed work is anticipated to impact student education on campus and/or the broader academic community. Proposals that support diverse participation in engineering education will be given significant consideration.

Note: As an industry leader, Intel pushes the boundaries of technology to make amazing experiences possible for every person on earth. From powering the latest devices and the cloud you depend on to driving policy, diversity, sustainability, and education, we create value for our stockholders, customers, and society. Intel expects suppliers in our supply chain to be strong partners in making Intel successful through support of Intel's goals and commitments to diversity, sustainability, and education.

In light of Intel's strong commitment to diversity and creating an inclusive environment, in your proposal please address: (a) your organization's commitment to diversity and inclusion with respect to race, national origin, gender, veterans, individuals with diverse abilities and LGBTQ, (b) a summary of your performance in this area and any initiatives you are pursuing, and (c) the diverse team you propose for this project, including leadership, support, and any subcontracting you propose (such as to minority- or women-owned businesses).

ELIGIBILITY

This RFP is open only to faculty from academic institutions that have been specifically invited to participate in the proposal process. Any questions regarding eligibility should be directed to Melissa Cowan (contact info below).

POINT OF CONTACT FOR INQUIRIES AND SUBMISSIONS

Proposal submissions (and related inquiries) should be directed to: Melissa Cowan, Program Manager (melissa.a.cowan@intel.com).

This RFP is administered by the Intel Lab's University Research & Collaboration Office. Staff overseeing this program include Melissa Cowan and Scott Buck.