

# Innovative Computing Curricula and the CC2020 Project

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## I. BACKGROUND

This summary is an extension of a paper presented at the IEEE EduNine 2018 conference [1]. That paper contains much more detail than the content presented here.

In 2015, the Association for Computing Machinery (ACM) began explorations for the update of the broadly influential document: *Computing Curricula 2005*, tagged CC2005 [2]. ACM, the Association for Information Systems (AIS), and the IEEE Computer Society (IEEE-CS) were co-sponsors of the 2005 document. In 2016, ACM decided to go forward with the new project. It established an exploratory committee to ascertain the need for a new report; it invited AIS and IEEE-CS to join in its development and it called the project Computing Curricula CC2020 (CC2020). Funding is now in place and the project is moving forward with zest and determination.

ACM and IEEE-CS became the principal sponsors of the CC2020 project. Other professional organizations have joined in the effort with additional co-sponsorship; these include the Association for Information Systems (AIS), the Association for Information Technology Professionals Education Special Interest Group (AITP/EDSIG), the ACM Special Interest Group for Computer Human Interaction (SIGCHI), the Information Processing Society of Japan (IPSJ), the Information-Technology Promotion Agency (IPA) of Japan, the Chinese Computing Federation (CCF), the Latin-American Conference on Informatics (Conferencia Latinoamericana de Informática - CLEI), and Computer Society of India (CSI). CC2020 supports a task force of thirty-six academic, industry, and governments professionals from around the world. A subset of this task force forms a steering committee of up to fifteen members. Currently, the task force represents sixteen countries from six continents.

## II. SPECIAL SESSION GOALS AND DESCRIPTION

The CC2020 project plans to examine the current state of curricular guidelines for academic programs granting baccalaureate degrees in computing. The project also provides a vision for the future of computing. A goal of the initiative is to produce a comprehensive report that contrasts curricular guidelines and to contextualize them in the landscape of computing education based on a framework of competency-based educational guidelines. Published curricular guidelines (i.e., computer engineering, computer science, cybersecurity, information systems, information technology, and software

engineering) and emerging curricular models (e.g., data science) comprise CC2020's central domain of interest.

### A. Session Goals

The audience for this special session includes academic and industry professionals interested in undergraduate education for computing-related fields. This special session informs participants on the goals of the CC2020 project. It also provides the audience an opportunity to learn more about the details of the project structure and to participate formally as contributors in the development of the project in both content and in scope.

A goal of this special session is to inform the audience on the accomplishments of the CC2020 project and to enable them and the organizers to explore attributes that would reflect modern computing education for the 2020s. Another goal of the session is to seek guidance and feedback as well as to encourage participants to contribute either directly or indirectly toward the tenets of the project.

### B. Session Description

The CC2020 project is responsive to the needs of the global educational community. Part of the description includes an overview of the entire project, addressing its purpose, its contents, and the various ways of using the project outcomes by identifying stakeholders who use the fruits of the project for quality improvement in existing programs and by providing a benchmark for future computing programs.

The special session also provides a methodology that focuses on organization, procedures, and practice. Among the areas to consider are the conceptual framework for describing some of the relationships between competencies, bodies of knowledge, professional profiles, educational contexts, and degree programs. Ultimately, future computing degree programs must meet the growing demands of a changing technological world.

Part of the special session addresses competency models that focus on the meaning and use of competencies in an educational framework. It defines high-level competencies to show how they differ from knowledge and it indicates ways to formulate competencies and illustrate their structure. This concept leads to a mentioning of a comparison tool having open access features to assist in understanding computing fields and competencies within them so that computing educators, educational

authorities, current and future computing students, industry employers, and recruiters wishing to complement their business models. The session also includes the future use of structured taxonomies of computing programs through classification and nomenclature through visual and textual characterizations of each discipline as a composite.

### C. Innovative Activities

The session begins with a high-level summary of the CC2005 report and summarize the aspirations of the CC2020 project. The organizers plan to solicit audience suggestions for project attributes with the promise of sharing results with professional communities. One innovative differentiator that makes this special session unique is the availability of pathways for participants to become contributors to the project and receive recognition in the final report. Another innovation is to have opportunities for participants to become involved from the very beginning of the special session rather than being involved only after the organizers make their presentations. Participants have an opportunity to analyze the current scope and dimensions of the six current and one future sub discipline of computing that contributes to the final report and the interactive tool that is under development.

## III. SESSION PARTICIPATION AND AGENDA

Audience interaction and participation is critical for the success of this special session. The following discussion outlines how the session unfolds.

### A. Participant Interaction

The current accomplishments of the CC2020 task force as conveyed by the organizers serve as a backdrop for audience debate. Audience engagement in discussions occur early in the session to enhance the competency-based nature of the project and to initiate an exploration of ways the computing education community can become a viable contributor to the CC2020 project. The organizers expect lively audience input and viewpoints throughout session with the promise of having vigorous dialogue among the participants and the organizers. High levels of interaction are the hallmark of this special session.

### B. Session Agenda

The following agenda assumes that the special session lasts approximately eighty minutes. Audience and organizers interact throughout the session.

#### Time    Activity

00–15: Overview of CC2020 and CC2005 reports  
15–25: Discussion of currently established competencies  
25–35: Discussion of conceptual comparison tool  
35–45: Discussion of strategies, methodologies and taxonomies  
45–75: Open discussion focused on the three preceding areas  
75–80: Final thoughts

## IV. SPECIAL SESSION ORGANIZERS

The special session organizers, together with their brief backgrounds, are as follows.

*John Impagliazzo* (Hofstra University) is a steering committee member of the CC2020 project. He was chair of the committee that produced the computer engineering curricular report (CE2016) [3] and was a principal co-author of the committee that produced the CE2004 [4] report. He was an active member of the CC2005 project, allowing him to be a valued resource and contributor to the CC2020 project. He was also a member of the executive committee of a parallel project for information technology (IT2017) [5]. Impagliazzo is an IEEE Fellow, an IEEE Life Member, an ACM Distinguished Educator, and a CSAB Fellow; he serves as the moderator for the special session.

*Allen Parrish* (Mississippi State University) is a steering committee member and co-chair of the CC2020 project. Parrish is Associate Vice President for Research and Professor of Computer Science and Engineering at Mississippi State University. In 2014-2017, Parrish co-chaired the first major revision to the ABET computing accreditation criteria since 2000, which included the development of cybersecurity accreditation criteria. Parrish was also a member of the CSEC2017 task force on undergraduate cybersecurity education. Parrish is an ABET and CSAB Fellow.

*Alison Clear* (Eastern Institute of Technology) is a steering committee member and co-chair of the CC2020 project. She was the technical program co-chair of FIE 2017 and has also been chair and program chair of many international conferences in computing education. She is a past vice chair and member of the SIGCSE board. She is a life member of the New Zealand Institute of IT Professionals and the Computing and Information Technology Research and Education of New Zealand.

## REFERENCES

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