Every field of study has some fundamental concepts that recur in various forms throughout the field. For example, binary trees and recursive decomposition express themselves in the computing field in hardware, software/algorithms, modeling and analysis. Systematically tying together such manifestations of each key concept across multiple courses in a curriculum could improve understanding and retention of the key concepts.

**Workshop Focus:** The 2016 Workshop on Connecting Concepts across the Curriculum aims to identify

(a) Fundamental (and difficult to understand) concepts that recur across the area, and
(b) Devise approaches to tying these concepts across courses.

To provide more focus, the emphasis of the 2016 workshop will be to identify concepts in *parallel and distributed computing* in the setting of three course clusters broadly called

- Digital logic,
- Computer organization and architecture
- Networking and embedded systems.
- Programming and Algorithms

The approach is to introduce a concept (for example, recurrence relations/prefix computations) early on, say in the first digital logic course in the context of carry look-ahead adders, then build on this to explore the concept in detail in a later course (for instance, computer organization). The key point is that introduction of the concept in digital logic should take very little instruction time and, ideally, enhance the understanding of the digital logic topic itself. At the other end, the later course should tie the detailed explanation of recurrences to the carry look-ahead adder context that students have seen before.

We expect participation of about 30 faculty members invited from a range of university/college settings and with experience/interest in teaching in the above course clusters.

**The Role of Participants:** Prior to the workshop, each participant will be asked to suggest a set of 5-10 important and difficult to understand topics in one of the course clusters; these topics will be the starting point for the workshop. During the workshop, these topics will be revised as needed and tied across the course clusters to develop a set of “concept threads.” We will also aim to identify methods that can be used to implement these threads across courses in the clusters.

It is expected that participants will consider implementation of these ideas in their courses.
The course "Introduction to Computer Systems" at Carnegie Mellon University presents the underlying principles by which programs are executed on a computer. It provides broad coverage of processor operation, compilers, operating systems, and networking. Whereas most systems courses present material from the perspective of one who designs or implements part of the system, our course presents the view of a system visible to application programmers. Students learn that, by understanding aspects of the underlying system, they can make their programs faster and more reliable. This approach provides immediate benefits for all computer science and engineering students and also prepares them for more advanced systems courses. We have taught this course every semester since Fall, 1998 with enthusiastic responses by the students, the instructors, and the instructors of subsequent systems courses.

As a way to spread this style of course to other schools, we have published the textbook "Computer Systems: A Programmer's Perspective," now in its third edition. The book is now in use at over 280 universities worldwide. More information can be found at [http://csapp.cs.cmu.edu/](http://csapp.cs.cmu.edu/).

About the Speaker: Randal E. Bryant is a University Professor in the Computer Science Department at Carnegie Mellon University. He has been on the faculty at Carnegie Mellon since 1984, starting as an Assistant Professor and progressing to his current rank of University Professor of Computer Science. He also holds a courtesy appointment in the Electrical and Computer Engineering Department. He served as Dean of the School of Computer Science from 2004 to 2014.

Dr. Bryant teaches courses in computer systems. Along with David R. O'Hallaron, he developed a novel approach to teaching about the hardware, networking, and system software that comprise a system from the perspective of an advanced programmer, rather than from those of the system designers. Their textbook "Computer Systems: A Programmer's Perspective," now in its third edition, is in use at over 250 universities worldwide, with translations into Chinese, Korean, Macedonian, and Russian.

Dr. Bryant received his B.S. in Applied Mathematics from the University of Michigan in 1973, and his PhD from MIT in 1981. He was an assistant professor at Caltech from 1981 to 1984.