A Hands-On Overview Course for Computer Science and Modern Information Technologies

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Outline

- What is New in Computing Application Environment?
- What are the New Challenges in Computing?
- What are the Recurring Great Ideas?
- What are Major Challenges to Computing Education?
- Solution Methodology
- Pace’s Broad-Based Course: Concepts and Structures in Internet Computing
- Experimental Results
- Conclusion
What is New in **Computing Application Environment**?

- Global networked computing
- Integration of heterogeneous technologies
- Specialized service-oriented computing
What are the Main Challenges in Computing?

- How to control the extra complexity of computing due to:
  - Networking
  - Event-driven computing
  - Multi-threaded computing
  - Computing on heterogeneous systems
  - Server scalability and security
What are the Recurring Great Ideas?

- Abstraction + divide-and-conquer
  - Objects -> components -> services
  - Socket-level networking -> software-framework-based networking
  - Tiered Web architecture: presentation + business logic + data persistency
  - Proxy design pattern
  - Design business data structures with XML
What are Major Challenges to Computing Education?

- How to update the computing curriculum to reflect the new reality?
- How can the academics provide leadership in innovations?
- How can we motivate students with exciting applications?
- **ACM Computing Curriculum 2001** is not enough?
  - Knowledge gap
  - Waterfall teaching model
Solution Methodology

- Iterative teaching model
  - **Iteration 1**: CS1, CS2, Proposed In-Depth CS Program Overview Course
  - **Iteration 2**: Traditional core and elective courses with more depth and flexible offering order
  - **Iteration 3**: Capstone projects
Solution Methodology ...

- Hands-on problem-solving
- Scaled-down sample projects for real technologies
- Virtual machine based labs: portable course labs
Pace’s Broad-Based Course: Concepts and Structures in Internet Computing

- **Introduction**: challenges to enterprise computing
- **Object-Oriented Computing Paradigm**: OO review, multithreading
- **Client-server computing and the Internet**
- **Event-Driven Computing Paradigm and Human-Computer Interaction**: concepts and GUI basics
- **Component-Based Software Engineering**: SE basics, software frameworks, components and component container
Pace’s Broad-Based Course: Concepts and Structures in Internet Computing

- Data Persistency: database basics
- Data Integration: XML, XSD, SAX/DOM, XSLT
- Web Computing: HTTP, session management, servlet/JSP; application server
- Web Services and System Integration
- Distributed and Parallel Computing: grid and cloud computing
- Conclusion
Experimental Results

- Over the last four years, over 80 CS and IS/IT students have successfully taken this course.
- Students can complete course projects like “Logic Design of an RSS News Feeds Framework”.
- Students who have completed this course perform significantly better than those who have not.
Conclusion

- Pace has developed a new hands-on CS program overview course for students who just know basic programming
- Experiments show that this course can
  - motivate students early with power concepts and advanced technologies
  - shorten course prerequisite chains to support more flexible or interdisciplinary programs
  - support richer hands-on projects in follow-up courses
- Pace is ready to share this experience and courseware