



Curriculum Modification Reflects the Growth of Computer Systems Technology

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Outline of the talk

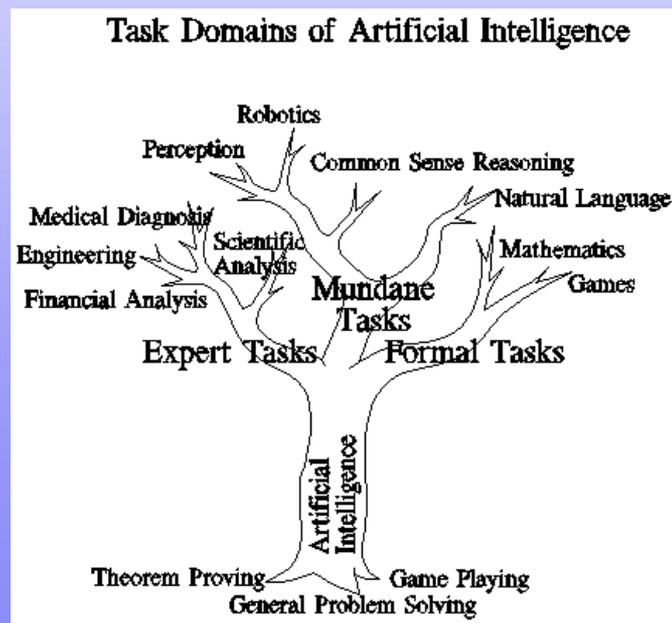
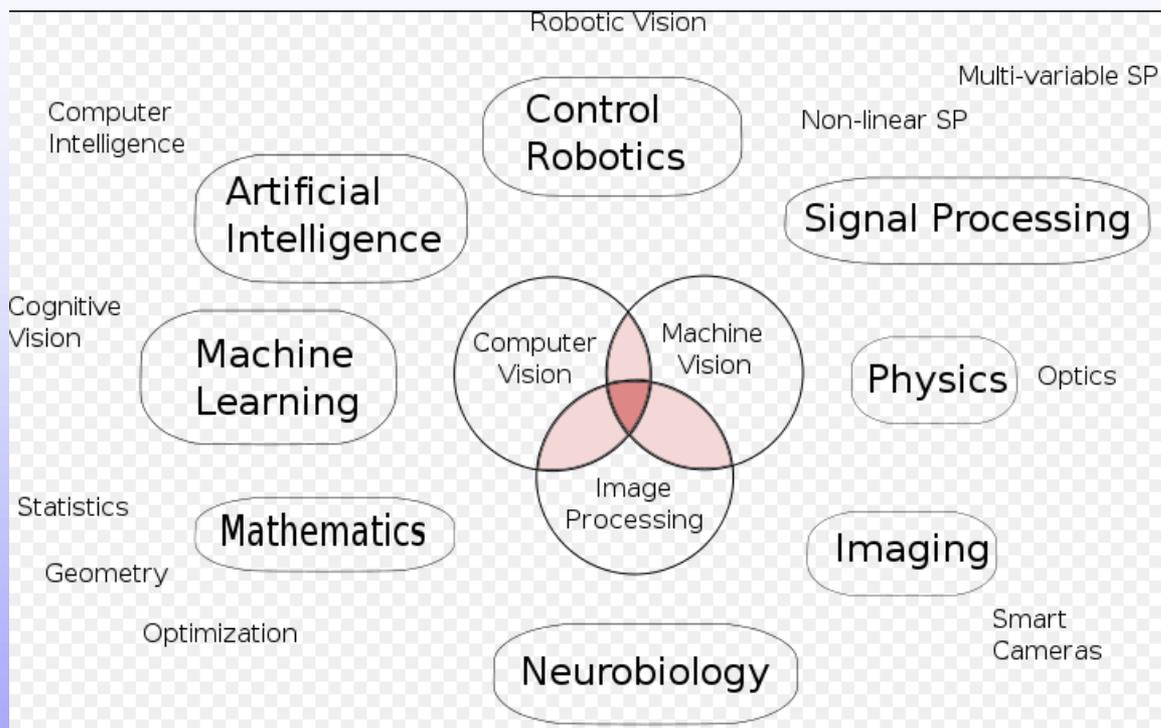
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Introduction

- ❑ Emergence of Information Technology as a discipline
 - The past four decades have seen the computing field expand dramatically.
- ❑ The technical changes that have driven the recent expansion of computing have direct implications on the engineering education curriculum.
- ❑ The curriculum must be flexible as there are a large number of careers that graduates from IT programs enter.
- ❑ The curriculum should therefore be designed in a way that gives an institution considerable freedom in tailoring the curriculum to the needs of its students and other institutional stakeholders

Emerging Interrelated Topics





Overview of New York City College of Technology's 2009 Curriculum

- ❑ The Computer Systems Technology (CST) department offers two degree programs, AAS in Computer Information Systems (CIS) and BTECH in Computer Systems (CIB).
- ❑ The CST department revamped the CIS curriculum in 2009 to reflect rapid changes in the IT industry.
- ❑ The computer courses offered in the current CIB program are organized in seven modules plus three additional courses with each module consisting of three sequential courses focusing on one specific area of computer systems. **Students are required to complete three of the seven modules.**



Curriculum 2009 Description

AAS Degree 60 Credits

Business and Liberal Art 26 Credits

Major requirement 34 credits distributed as follow:

CST4800 Project Management	3
CST4801 Special Topics	1
Workplace Component	
CST 4900 Internship or	
CST 4905 Information Systems Project	3

Local Area Network

CST 3507 Advanced Single-LAN Concepts	3
CST 3607 Introduction to LAN Connectivity	3
CST 4707 LAN-Internet Connection	3

Client/Server Technology

CST 3508 Design of Graphic User Interfaces	3
CST 3608 Distributed Application Processing	3
CST 4708 Client/Server Technologies	3

Database Systems Design

CST 3504 Design of Microcomputer Databases	3
CST 3604 Design of Distributed Databases	3
CST 4704 Data Warehousing	3

Students must complete all courses in any three of the following seven modules for 27 credits:

Programming Design and UNIX

CST 3513 Object-Oriented Programming in Java	3
CST 3613 Advanced Object-Oriented Programming	3
CST 4713 Application Architecture Using Java	3

Object-Oriented Systems Analysis and Design

CST 3506 Object-Oriented Systems Analysis	3
CST 3606 Object-Oriented Systems Design	3
CST 4706 Design of OO Distributed Systems	3

Internet Computing

CST 3519 XML Data Representation	3
CST 3619 Web Services Architecture	3
CST 4709 Installing and Maintaining Web Servers	3

Information Security

CST 3510 Computer Security	3
CST 3610 Network Security Fundamentals	3
CST 4710 Advanced Security Technologies	3



Concerns Raised about the Curriculum

Topics in the different modules are no longer independent and are more interrelated :

- ❑ **The topics in each module are no longer independent.**
 - For example, students taking the three courses in the Networking module will not be best prepared for network administration jobs if they do not take a network security course.

- ❑ **Computer programming is growing beyond the development of standalone applications that run on a single desktop computer.**
 - Students will need to learn how to write applications that run on the web, across different networks, and on mobile devices, etc.



Concerns Raised about the Curriculum

Three courses in one module may not be sufficient to cover the necessary topics in a specific areas of technology undergoing a rapid growth

- ❑ For example, for students who take the programming module, the three current courses are not sufficient to prepare them for an application developer job, or to pursue a graduate degree.
- ❑ With the rapid evolutions of software technology, a developer not only should have a solid understanding of object-oriented concepts, but also should grasp other programming skills such as database connectivity, internet programming, mobile device programming and game programming.



Concerns Raised about the Curriculum

Students might not select the best three modules to meet their goals.

- ❑ The above problems might not be critical when students properly elect the three modules to combine the skill set that will prepare them to achieve their goals.
- ❑ However, many students choose the three modules based on a limited knowledge of the modules, their personal schedules and their perception of the level of difficulty of the modules, sometimes without considering the required synergy between the three modules.
- ❑ As a result, their choices may not properly prepare them for the demanding workforce.



Concerns Raised about the Curriculum

The module structure limits the expansion of topics to cover new developments in technology.

- ❑ Each area of computer systems is facing challenges and changes. It is not possible to expand each module to allow us to introduce new technology developments in addition to the fundamental concepts.
- ❑ For example, Game programming has been around for a long time, but we could not add it to our current modular structure. Virtualization and Cloud computing are current trends in the IT industry that we found difficult to add to the current modular structure.



Modified Curriculum of Bachelor's Program

- ❑ The proposal is a re-organization of the modular structure curriculum into four tracks:
 - Database,
 - Networking and Security,
 - IT operation, and
 - Software Development.

- ❑ Each track includes 7-8 required courses and 1-2 elective courses.



Database

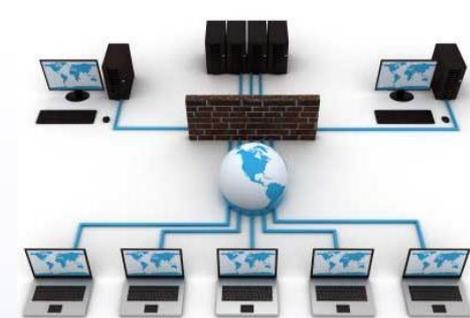


- The Database track covers the design of databases including single and distributed databases, database performance, database administration, programming applications, Business intelligence including data warehousing, the Semantic web and special topics in current database usage.
- A comprehensive understanding of the database domain includes an understanding of: analysis, design, performance, security, administration, programming, integration, and semantics.

Course Code and Title	Credits
CST3504 Database Design	3
CST3606 Object Oriented System Analysis & Design	3
CST3604 Quality Database Implementation	3
CST3613 Application Development with Databases	3
CST4704 Data Warehousing	3
CST4714 Database Administration	3
CST4724 Data On The Web	3
Two Electives**	6
Total	27



Networking and Security



- The Networking and Security track covers aspects of all types of networks including LANs and WANs, the Internet, and mobile networks, security considerations and principles in various domains (network, database, programming, physical and system administration).
- The goal is to prepare students to work in network administration, security administration, system operations, and technical support.

Course Code and Title	Credits
CST2405 or CST2415 System Administration	3
CST3507 Advanced Single-LAN Concepts	3
CST3607 Interconnectivity	3
CST3610 Network Security Fundamentals	3
CST4707 The LAN-Internet Connection	3
CST4710 Advanced Security Technologies	3
CST4715 Advanced Topics in System Admin	3
CST3523 Task Automation in System Admin	3
One Elective**	3
Total	27



IT Operations

- ❑ The IT Operation track was designed with reflection of the current changes in the IT operations, administration, and management fields.
- ❑ The IT field has been undergoing drastic changes and with that comes the need to revamp our program to better prepare students for IT careers. While for many years, the focus in IT infrastructures was on decentralization, today, the focus is shifting to centralization and consolidation with new technologies.

Course Code and Title	Credits
CST2405 or CST2415 System Administration	3
CST3507 Advanced Single-LAN Concepts	3
CST3610 Network Security Fundamentals	3
CST3605 Virtualization	3
CST3615 Enterprise Applications	3
CST4700 IT Service Management	3
CST4714 Database administration	3
CST4709 Installing and Maintaining Web Servers	3
One Elective**	3
Total	27

Software Development

- Students who choose to become software developers in today's environment, must gain solid understanding of object-oriented concepts, system analysis and software methodologies as well as gain expertise in programming with database, web based programming and mobile device programming.
- Includes Java technology, open source technology, Microsoft.Net framework, Internet Web based programming, Mobile device programming, and Game programming.

Course Code and Title	Credits
CST3513 Object-Oriented Programming	3
CST3519 Advanced Client Technology	3
CST3613 Application Development with Databases	3
CST3606 Object-Oriented Systems Analysis and Design	3
CST4708 .NET Framework	3
*CST2301 Mobile Device Programming	3
CST4713 Dynamic Web Development	3
Two Electives**	6
Total	27

Student Survey

- In order to make such a major change to the curriculum, we first had a student survey to find out what areas were interesting from the students perspective. We based our decisions of the modified curriculum on the responses to the questions in the student survey which were as follows:

7. If you choose the Database track, please check your courses of interest

- Semantic Web Databases Design and Retrieval
- Application Development with Database
- Database Administration

8. If you choose IT Operation track, please check your courses of interest

- Virtualization
- IT Service Management
- Enterprise Applications

9. If you choose Networking and Security track, please check your courses of interest

- Computer Forensics
- Task Automation in System Admin
- Advanced System Administration

10. If you choose Software Development track, please check your courses of interest.

- Game Programming
- Software Development Methodology
- Data Structure
- Application Development with Database



Conclusions

- ❑ Although we believe that the recommendations of this paper and the specific strategic suggestions in this paper will prove useful to a wide variety of institutions, every Information Technology program must adapt those recommendations and strategies to match the characteristics of the particular institution.
- ❑ It is important to evaluate and modify curricular programs on a regular basis to keep up with the rapid changes in the field.
- ❑ The Information Technology curricula in place today are the product of many years of experimentation and refinement by Information Technology educators in their own institutions.
- ❑ The curricula of the future will depend just as much on the creativity that follows in the wake of this report to build even better Information Technology programs for undergraduates throughout the world.



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