Curriculum for Undergraduate Degree Program in Information Technology

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Topics

- Job market prospects
- Examples of some of the types of high-tech careers available
- ACM Curriculum Guidelines for Undergraduate Degree Programs in Information Technology
- Example of an Undergraduate Degree Programs in Information Technology

Job market prospects

Fortune Magazine: "*16 Fastest Growing Professional Jobs*"

Profession	Increase %	High Tech	IT	University degree Required	Recom.
Environmental Engineers	54.3%	X		X	
Network systems and data communications analysts	41.9%	X	X	X	
Personal financial advisors	36.3%				
Database administrators	33.1%	X	X		X
Software engineers	27.8%	X	X	X	
Emergency management specialists	27.8%				
Biomedical engineers	27.8%	X		X	
Public relations specialists	27.8%				
Computer and IT managers	25.6%	X	X	X	
Compensation, benefits and job analysts	25.6%				
Systems analysts	24.9%	X	X	X	
Network and systems administrators	24.9%	X	X		X
Training and development specialists	22.3%				
Medical scientists	22.1%	X		X	
Marketing and sales managers	21.3%				
Computer specialists	20.8%	X	X		X

Source: *Fortune Magazine, March 21, 2005, p. 131*

Examples of some IT careers

Software Developer / Software Engineer

- Perform all aspects of software development: requirements, design, programming and quality assurance
- Suitable degrees:
  - ***Computer Science***
  - ***Software Engineering***

Programs teach

- Mathematics knowledge to ensure students can do proper analysis and abstraction
- Programming knowledge (they learn some languages and can easily learn others)
- Design knowledge
- Knowledge of special techniques and technologies

Examples of some IT careers

Systems Analyst / Software Architect

- Focuses on the high level needs of an application or a business
- Suitable degrees:
  - ***Computer Science***
  - ***Software Engineering***

Examples of some IT careers

Computer Engineer / Hardware Developer

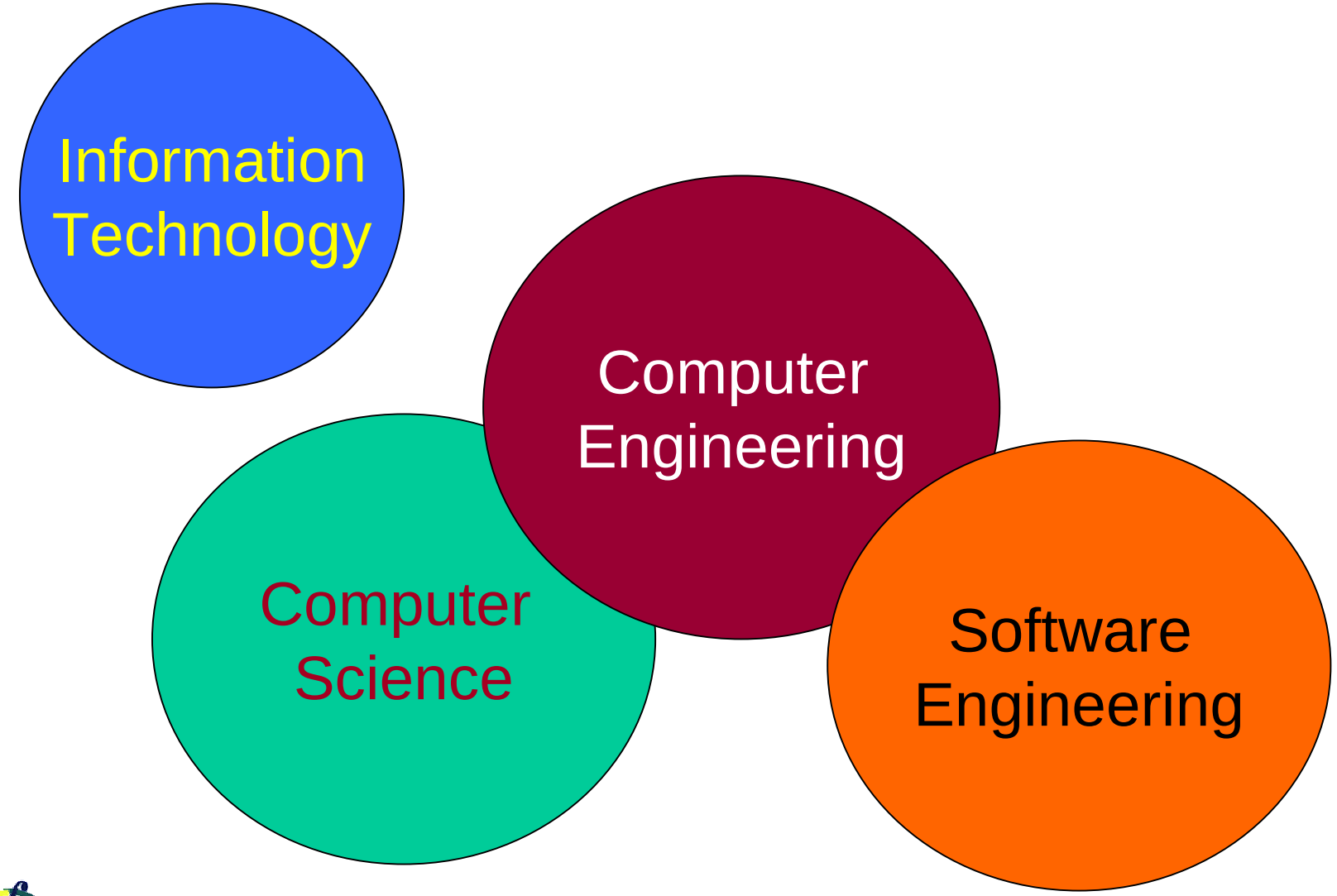
- Designs some of the following:
  - Computers and devices with embedded computers
    - Could include robots, cell phones, vehicles, etc.
    - More and more electronic devices have embedded computers
  - Software to run on embedded computers
  - Computer networks
- Suitable degrees:
  - ***Computer Engineering***
  - ***Software Engineering*** (for some embedded applications)

Examples of some IT careers

IT Manager / CIO

- Has a deep understanding of
  - the technology
  - business
- Suitable degrees
  - ***Computer science*** *with* ***IMS option***
  - ***Software engineering*** *with* ***management and entrepreneurship option***
  - ***Computer engineering*** *with* ***management and entrepreneurship option*** (For hardware-intensive environments)
- Also required
  - Experience in the previous 3 jobs
- MBA suggested for the most senior positions

Differences between CS, CE & SE



Differences between CS, CE & SE

Computer Science: For students who want to develop applications and underlying technologies

Software Engineering: For students who want to focus on large software system requirements, design and architecture, plus project management

Computer Engineering: For students more interested in hardware issues and low-level software

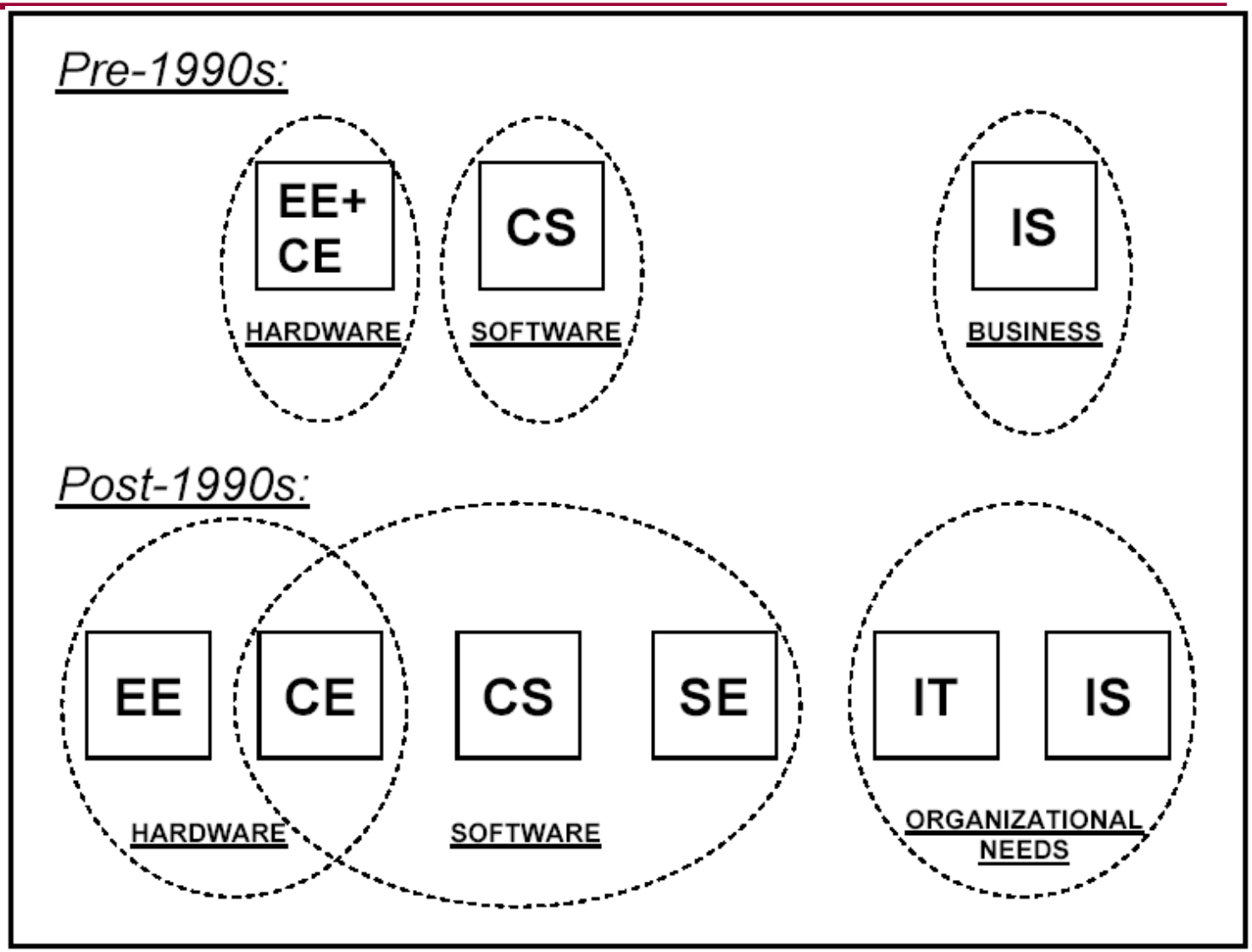
Computing Curriculum 2005

The Guide to Undergraduate
Degree Programs in Computing

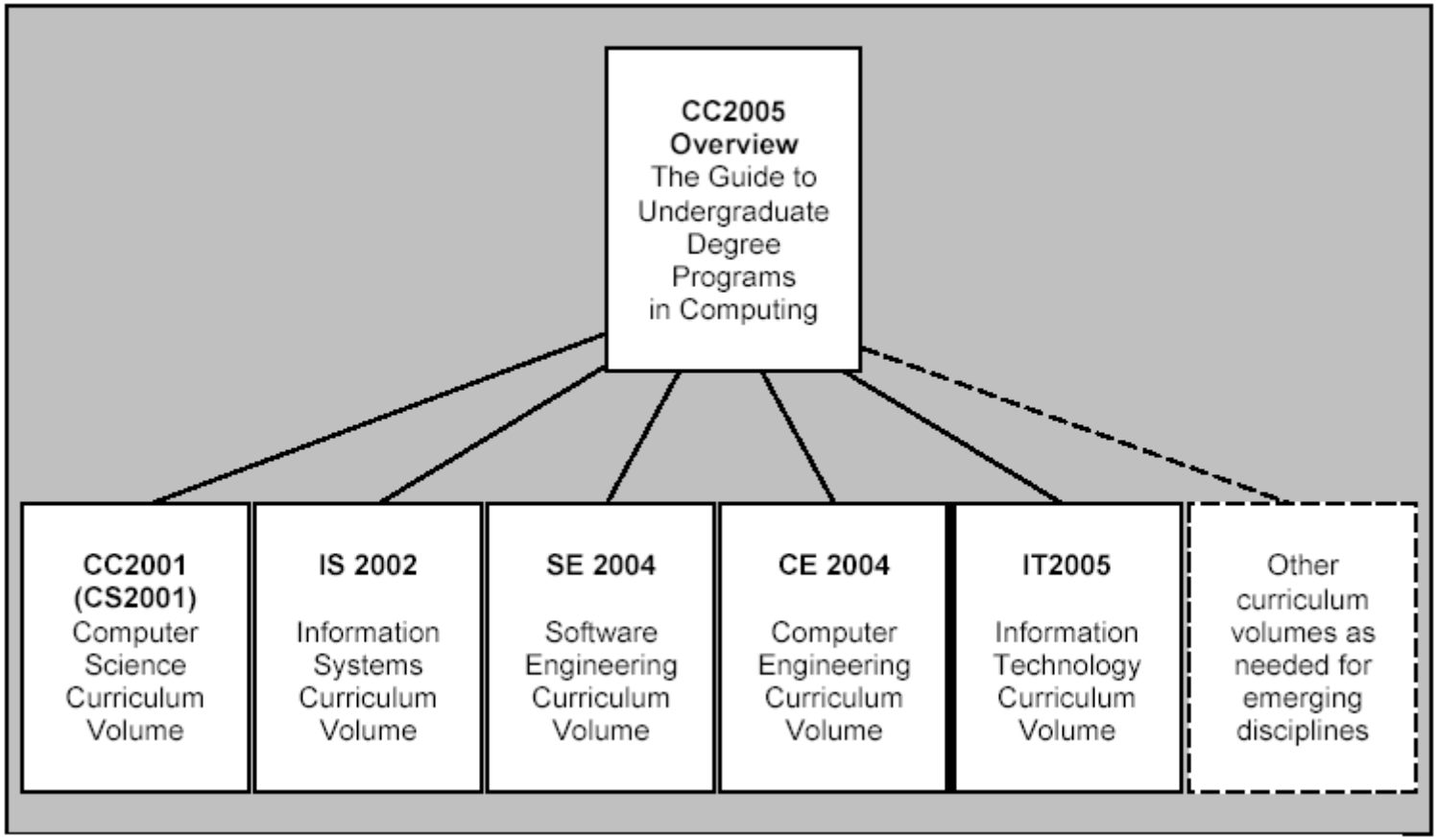
for undergraduate degree programs in
Computer Engineering
Computer Science
Information Systems
Information Technology
Software Engineering

The Association for Computing (ACM)
The Association for Information Systems (AIS)
The Computer Society (IEEE-CS)

Landscape of computing disciplines



Computing Curriculum 2005



Description of Computer Eng.

Computer engineering is concerned with the design and construction of computers and computer-based systems. It involves the study of hardware, software, communications, and the interaction among them.

Its curriculum focuses on the theories, principles, and practices of traditional electrical engineering and mathematics, and applies them to the problems of designing computers and computer-based devices.

Currently, a dominant area within computing engineering is embedded systems, the development of devices that have software components embedded in hardware.

Description of Computer Science

Computer science spans a wide range, from its theoretical and algorithmic foundations to cutting-edge developments in robotics, computer vision, intelligent systems, bioinformatics, and other exciting areas.

Computer scientists design and implement software. They take on challenging programming jobs.

They devise new ways to use computers. Progress in the CS areas of networking, database, and human-computer-interface enabled the development of the World Wide Web.

They develop effective ways to solve computing problems.

Description of Info. System

Information systems specialists focus on integrating information technology solutions and business processes to meet the information needs of businesses and other enterprises, enabling them to achieve their objectives in an effective, efficient way.

Professionals in this discipline are primarily concerned with the information that computer systems can provide to aid an enterprise in defining and achieving its goals, and the processes that an enterprise can implement and improve using information technology.

Description of Info. Technology

Information technology is a label that has two meanings. In the broadest sense, the term “information technology” is often used to refer to all of computing. In academia, it refers to undergraduate degree programs that prepare students to meet the technology needs of business, government, healthcare, schools, and other kinds of organizations.

IT programs exist to produce graduates who possess the right combination of knowledge and practical, hands-on expertise to take care of both an organization’s information technology infrastructure and the people who use it.

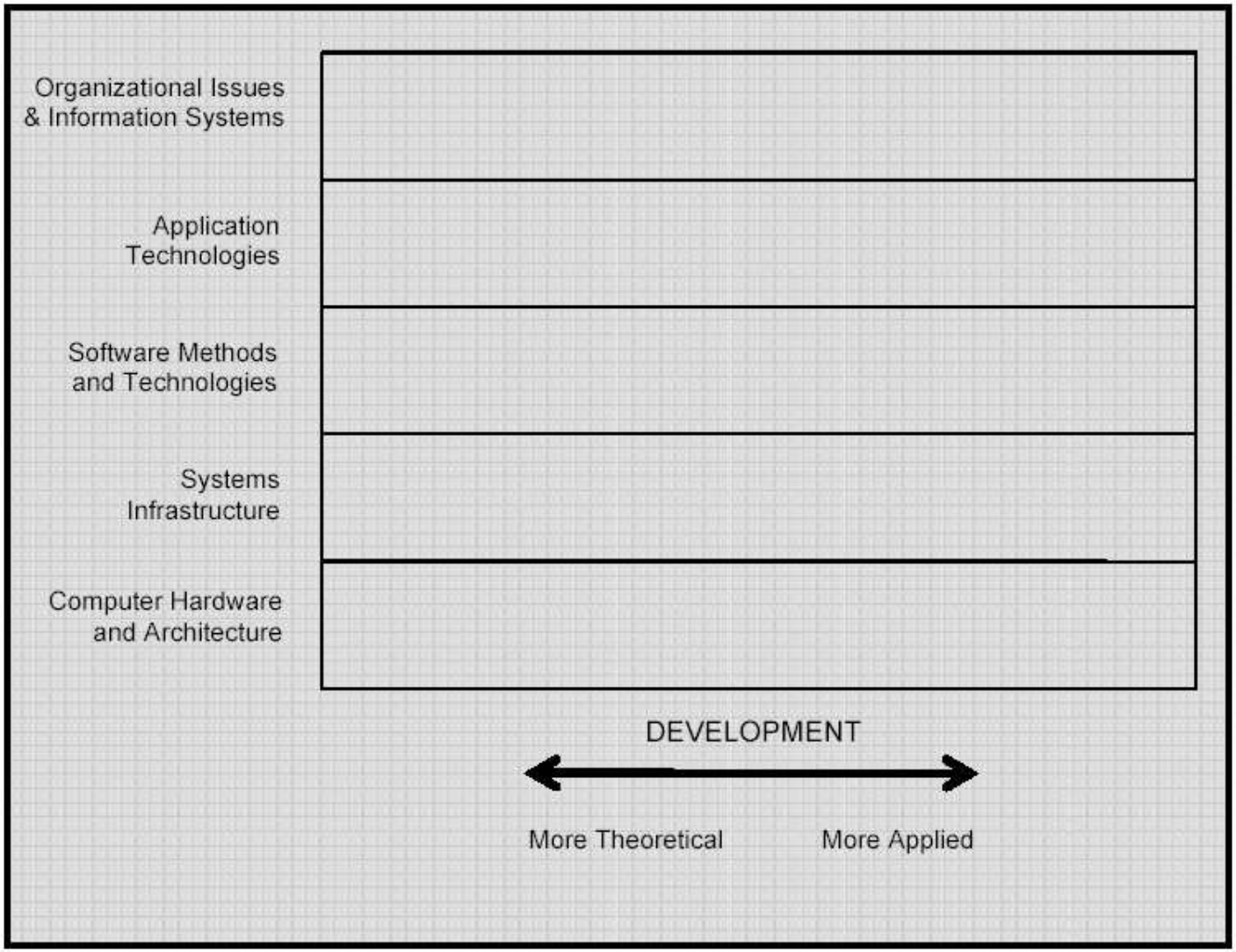
Description of Software Eng.

Software engineering is the discipline of developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain.

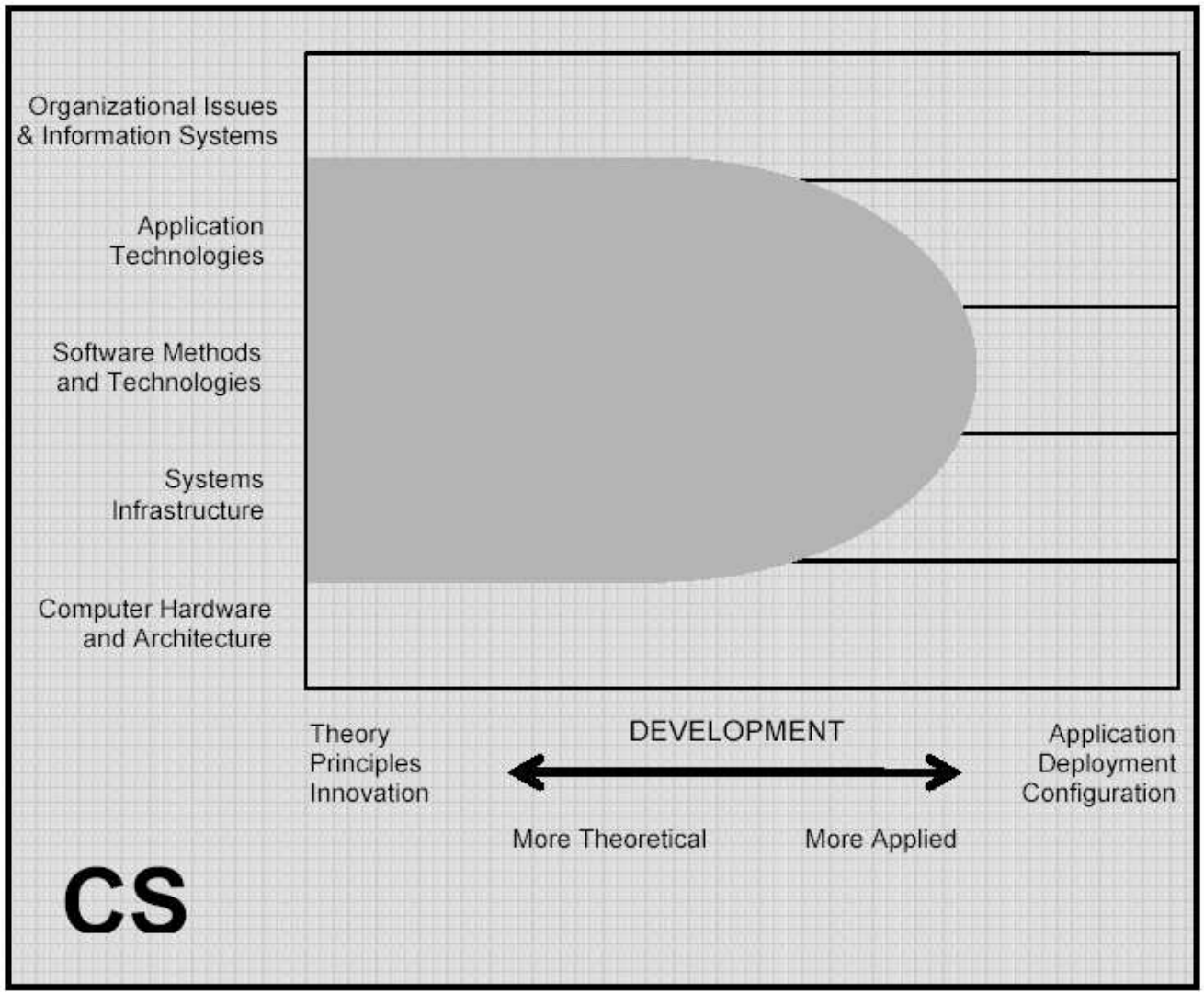
IT programs exist to produce graduates who possess the right combination of knowledge and practical, hands-on expertise to take care of both an organization's IT infrastructure and the people who use it.

Degree programs in computer science and in software engineering have many courses in common. Software engineering students learn more about software reliability and maintenance and focus more on techniques for developing and maintaining software that is correct from its inception. While CS students are likely to have heard of the importance of such techniques, the engineering knowledge and experience provided in SE programs goes beyond what CS programs can provide.

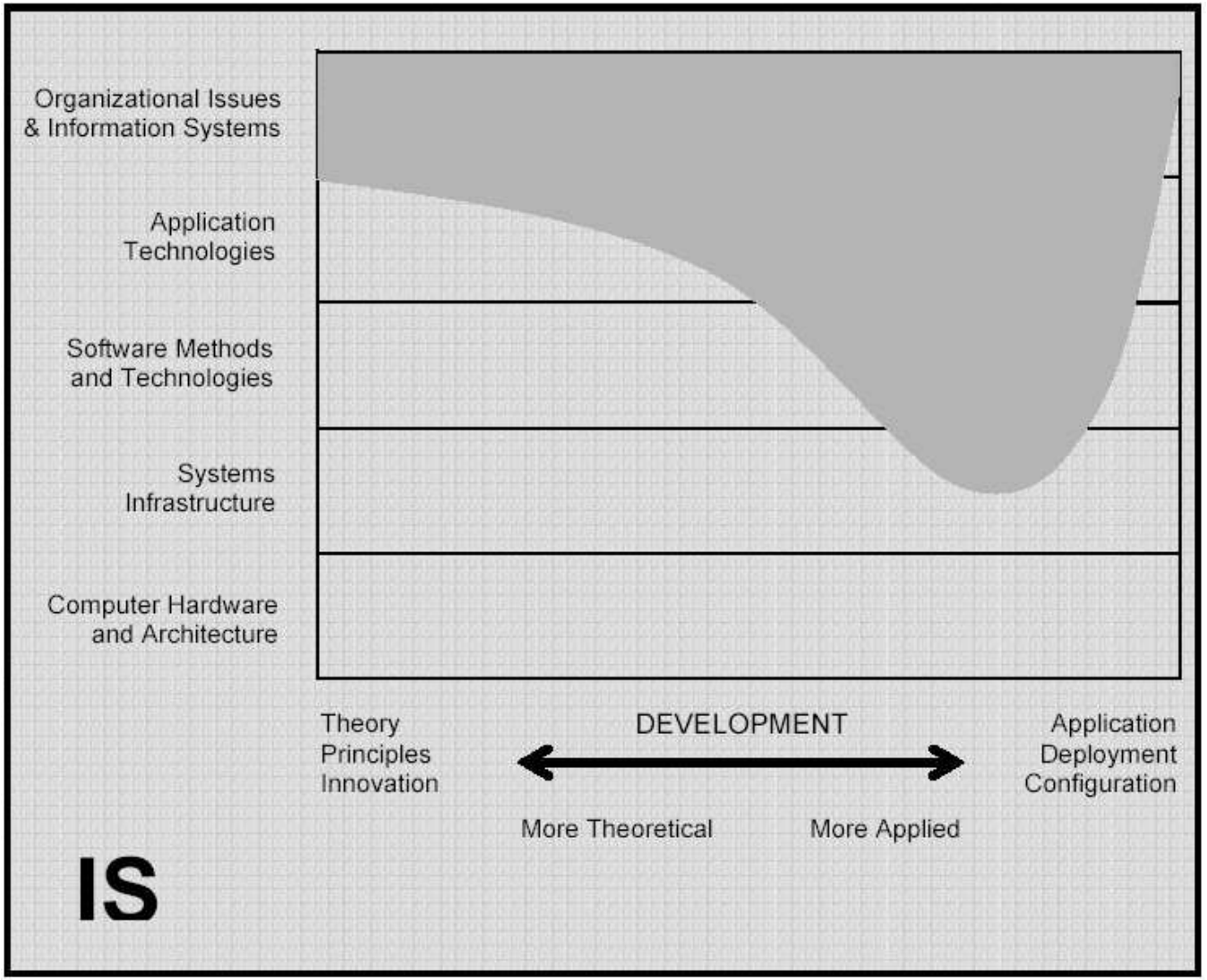
The problem space of computing



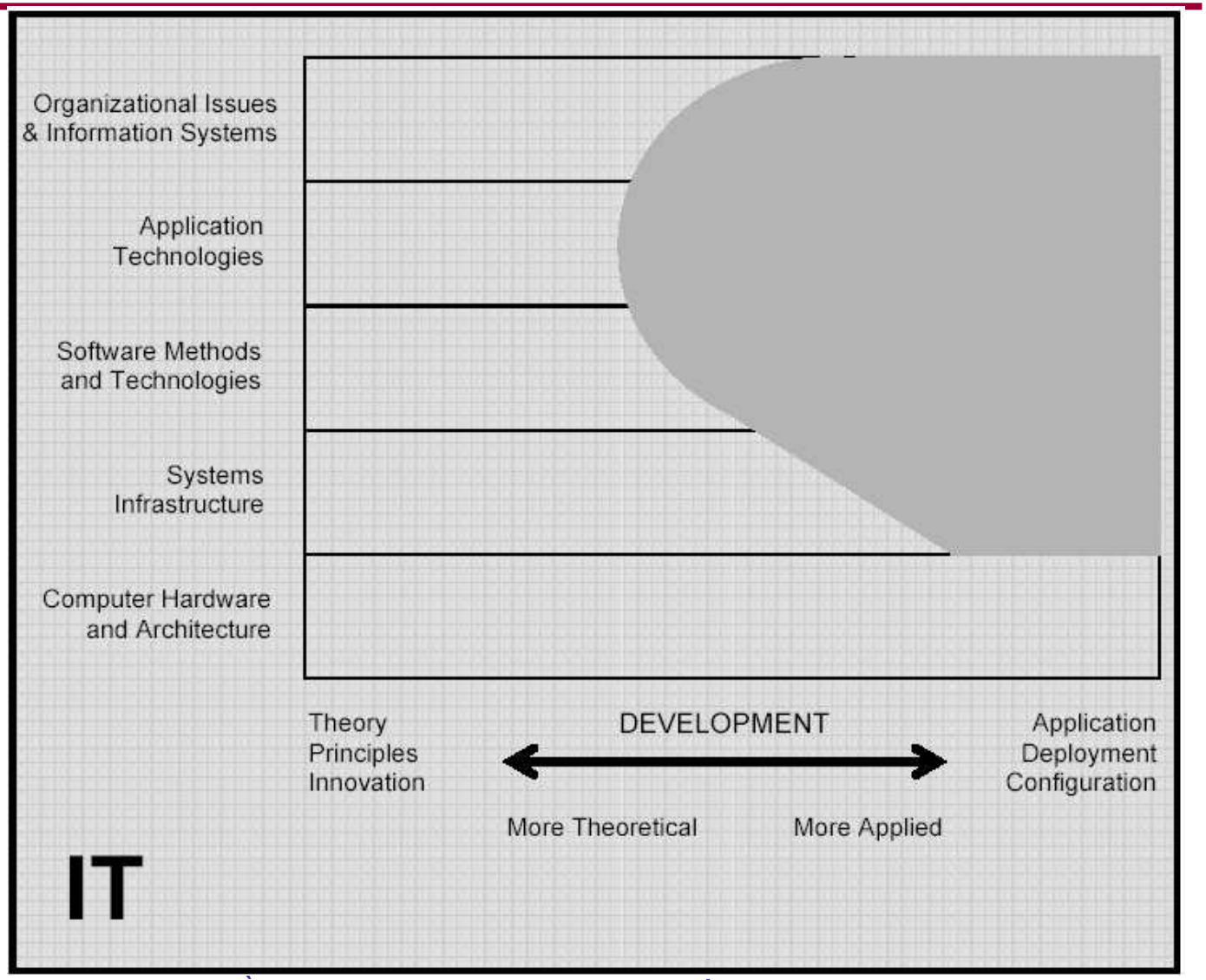
Computer Science



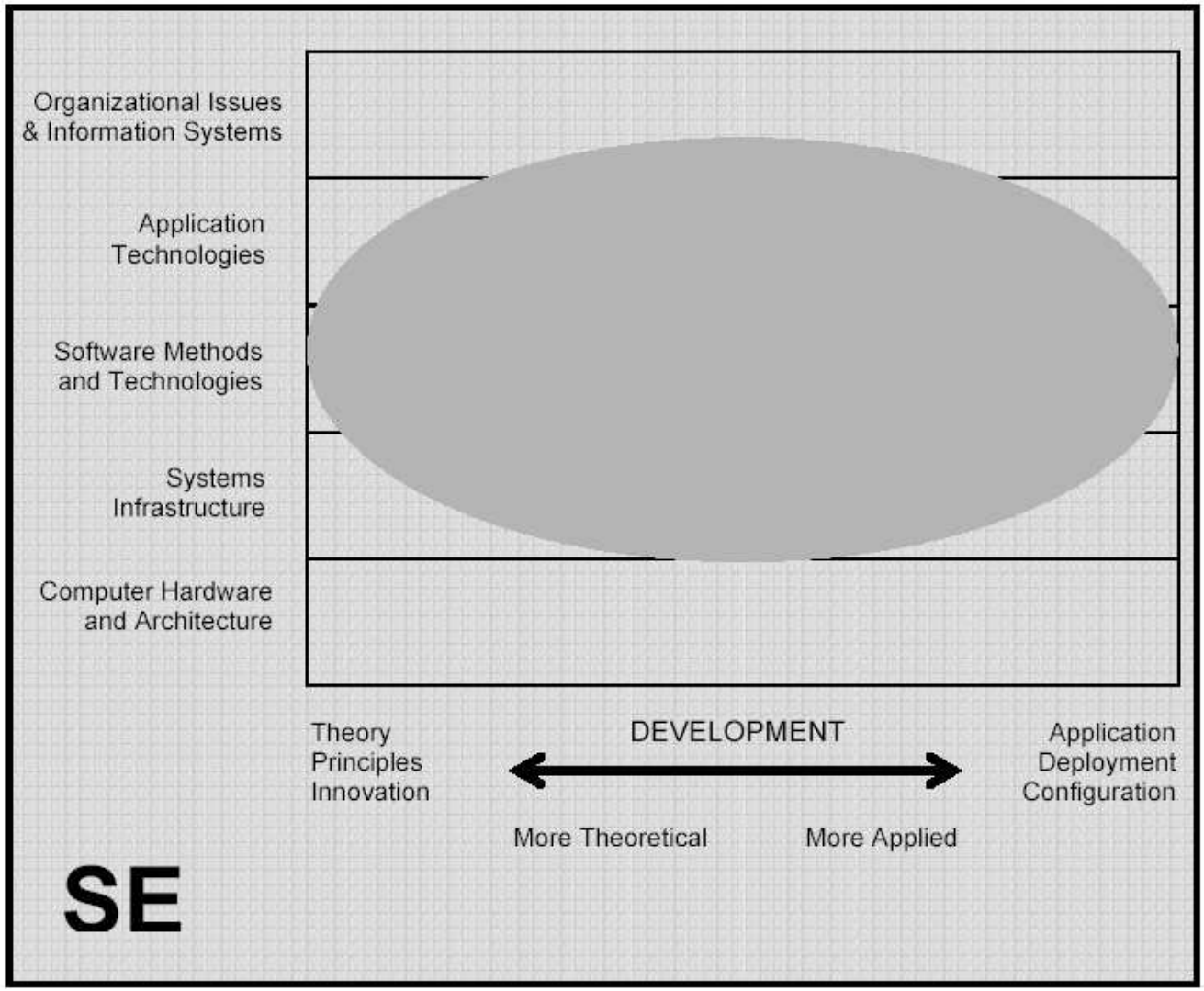
Information System



Information Technology



Software Engineering



Degree outcomes

Computer engineers should be able to design and implement systems that involve the integration of software and hardware devices.

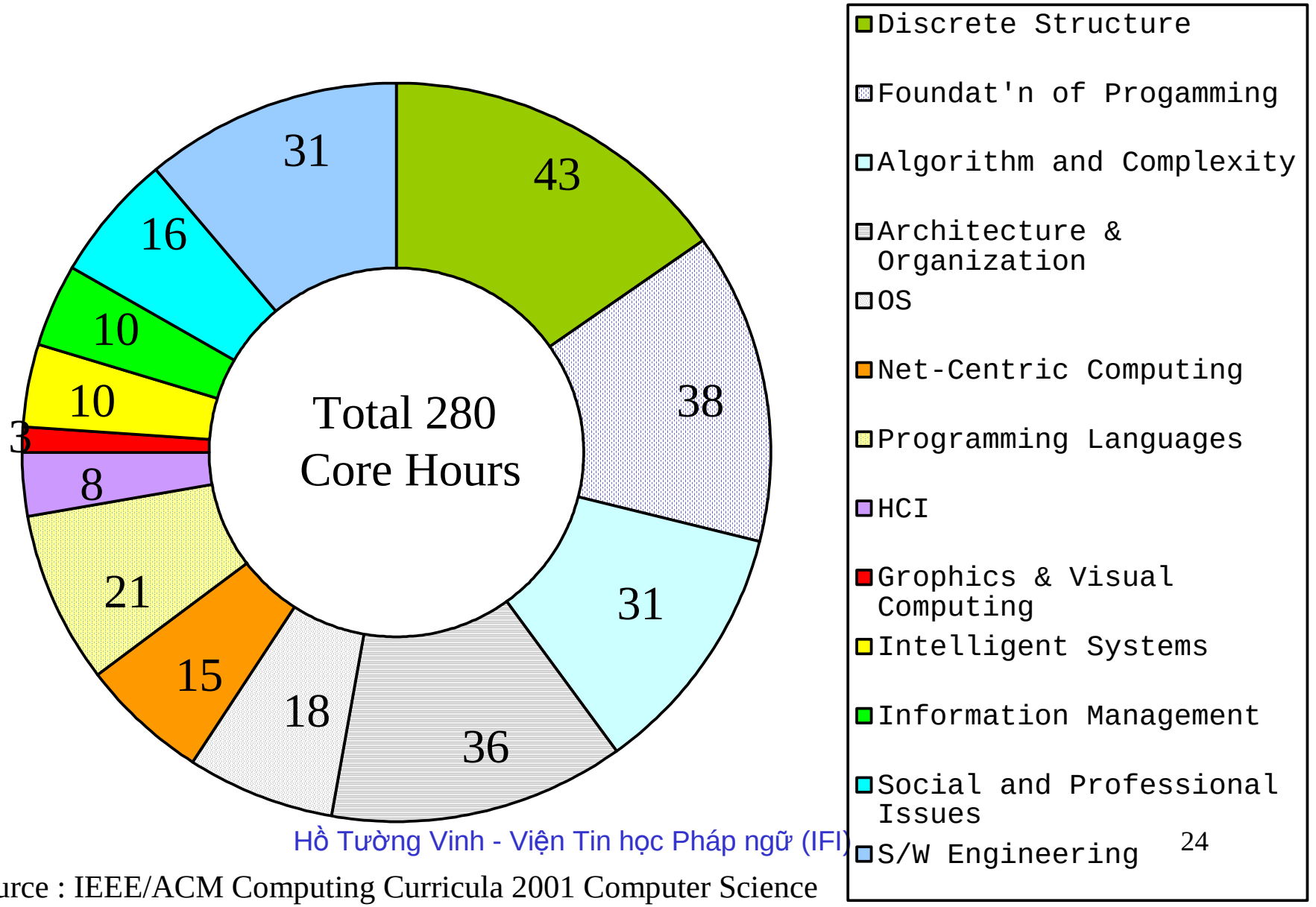
Computer scientists face expectations that range from theoretical work to software development.

Information systems specialists should be able to analyze information requirements and business processes and be able specify and design systems that are aligned with organizational goals.

Information technology specialists face high expectations with respect to the planning, implementation, configuration, and maintenance of an organization's computing infrastructure.

Software engineers should be able to properly design and properly implement large-scale software systems

Computer Science Body of Knowledge



Source : IEEE/ACM Computing Curricula 2001 Computer Science

Computer Science Body of Knowledge

Knowledge Unit	1991		2001		Core Topics
	Hr	%	Hr	%	
Algorithms & Data Structure	47	16.4	43	15.4	Discrete structure
			31	11.1	Algorithm and Complexity
Architecture	59	20.6	36	12.9	Computer Architecture & Organization
Operating Systems	31	10.8	18	6.4	Operating Systems
			15	5.4	Net-Centric Computing
Introduction to a Programming Language	12	4.2	38	13.6	Programming Fundamentals
Programming Languages	46	16.0	21	7.5	Programming Languages
Software Methodology & Engineering	44	15.3	31	11.1	Software Engineering
Human-Computer Communication	12	4.2	8	2.9	Human-Computer Interaction
			3	1,1	Graphics and Visual Computing
AI& Robotics	9	3.1	10	3.6	Intelligent Systems
Database & Information Retrieval	9	3.1	10	3.6	Information Management
Social, Ethical and Professional Issues	11	3.8	16	5.7	Social and Professional Issues
Numerical and Symbolic Computing	7	2.4	0	0	Computational Science

Curriculum of Information Technology

Definition of Information Technology as an academic discipline

Information Technology (IT) in its broadest sense encompasses all aspects of computing technology.

IT, as an academic discipline, focuses on meeting the needs of users within an organizational and societal context through the **selection, creation, application, integration and administration** of computing technologies.

Broad goals of an IT program

A student must be able to:

1. Explain and apply appropriate information technologies and employ appropriate methodologies to help an individual or organization achieve its goals and objectives;
2. Manage the information technology resources of an individual or organization;
3. Anticipate the changing direction of information technology and evaluate and communicate the likely utility of new technologies to an individual or organization;
4. Understand and for some to contribute to the scientific, mathematical and theoretical foundations on which information technologies are built;
5. Live and work as a contributing, well-rounded member of society.

IT Program outcomes: skills

a) Use and apply current technical concepts and practices in the core information technologies;

b) Analyze, identify and define the requirements that must be satisfied to address problems or

c) opportunities faced by organizations or individuals;

d) Design effective and usable IT-based solutions and integrate them into the user environment

e) Assist in the creation of an effective project plan;

f) Identify and evaluate current and emerging technologies and assess their applicability to address the users' needs;

g) Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues;

h) Demonstrate an understanding of best practices and standards and their application;

i) Demonstrate independent critical thinking and problem solving skills;

j) Collaborate in teams to accomplish a common goal by integrating personal initiative and

k) group cooperation;

l) Communicate effectively and efficiently with clients, users and peers both verbally and in

m) writing, using appropriate terminology;

n) Recognize the need for continued learning throughout their career.

Overview of the IT Body of Knowledge

Knowledge areas:

ITF Information Technology Fundamentals

HCI Human Computer Interaction

IAS Information Assurance and Security

IM Information Management

IPT Integrative Programming & Technologies

NET Networking

PF Programming Fundamentals

PT Platform Technologies

SA Systems Administration and Maintenance

SIA System Integration & Architecture

SP Social and Professional Issues

WS Web Systems and Technologies

Structure of the body of knowledge

The IT body of knowledge is organized hierarchically into three levels.

The highest level of the hierarchy is the **knowledge area**, which represents a particular disciplinary subfield. Each knowledge area is identified by a two-letter or three-letter abbreviation, such as PF for *programming fundamentals* or SIA for *system integration & Architecture*.

The knowledge areas are broken down into smaller divisions called **units**, which represent individual thematic modules within an area. Each unit is identified by adding a numeric suffix to the area name; as an example, **NET2** is a unit on *Routing and Switching*.

Each unit is further subdivided into a set of **topics**, which are the lowest level of the hierarchy.

Core and elective outcomes

Core leaning outcomes describe skills for which there is a broad consensus that anyone obtaining a baccalaureate degree in the field must acquire.

Elective learning outcomes are typically skills that must be acquired by students specializing in the knowledge area with which that unit is associated.

The core is not a complete curriculum. Because the core is defined as minimal, it does not, by itself, constitute a complete baccalaureate curriculum.

The core must be supplemented by additional material. Every baccalaureate program must include material relevant to additional elective learning outcomes from the body of knowledge.

Assessing the time required to cover a unit

Time is expressed in **hours,** corresponding to the in-class time required to present the material in a traditional lecture-oriented format.

The hours specified do not include time spent outside of class. The time assigned to a unit does not include the instructor's preparation time or the time students spend outside of class. The amount of out-of-class work is approximately three times the in-class time. Thus, a unit that is listed as requiring 3 hours will typically entail a total of 12 hours (3 in class and 9 outside).

The hours listed for a unit represent a minimum level of coverage.

Summary of the IT body of knowledge

ITF. Information Technology Fundamentals (33 core hours)
- ITF1. Pervasive Themes in IT (17)
- ITF2. Organizational Issues (6)
- ITF3. History of IT (3)
- ITF4. IT and Its Related and Informing Disciplines (3)
- ITF5. Application Domains (2)
- ITF6. Applications of Math and Statistics to IT (2)

HCI. Human Computer Interaction (20 core hours)
- HCI1. Human Factors (6)
- HCI2. HCI Aspects of Application Domains (3)
- HCI3. Human-Centered Evaluation (3)
- HCI4. Developing Effective Interfaces (3)
- HCI5. Accessibility (2)
- HCI6. Emerging Technologies (2)
- HCI7. Human-Centered Software Development (1)

IAS. Information Assurance and Security (23 core hours)
- IAS1. Fundamental Aspects (3)
- IAS2. Security Mechanisms (Countermeasures) (5)
- IAS3. Operational Issues (3)
- IAS4. Policy (3)
- IAS5. Attacks (2)
- IAS6. Security Domains (2)
- IAS7. Forensics (1)
- IAS8. Information States (1)
- IAS9. Security Services (1)
- IAS10. Threat Analysis Model (1)
- IAS11. Vulnerabilities (1)

PT. Platform Technologies (14 core hours)
- PT1. Operating Systems (10)
- PT2. Architecture and Organization (3)
- PT3. Computing infrastructures (1)
- PT4. Enterprise Deployment Software
- PT5. Firmware
- PT6. Hardware

SA. System Administration and Maintenance (11 core hours)
- SA1. Operating Systems (4)
- SA2. Applications (3)
- SA3. Administrative Activities (2)
- SA4. Administrative Domains (2)

SIA. System Integration and Architecture (21 core hours)
- SIA1. Requirements (6)
- SIA2. Acquisition/Sourcing (4)
- SIA3. Integration (3)
- SIA4. Project Management (3)
- SIA5. Testing and QA (3)
- SIA6. Organizational Context (1)
- SIA7. Architecture (1)

SP. Social and Professional Issues (23 core hours)
- SP1. Professional Communications (5)
- SP2. History of Computing (3)
- SP3. Social Context of Computing (3)
- SP4. Teamwork Concepts and Issues (3)
- SP5. Intellectual Properties (2)

Summary of the IT body of knowledge

IM. Information Management (34 core hours)

IM1. IM Concepts and Fundamentals (8)
IM2. Database Query Languages (9)
IM3. Data Organization Architecture (7)
IM4. Data Modeling (6)
IM5. Managing the Database Environment (3)
IM6. Special-Purpose Databases (1)

IPT. Integrative Programming & Technologies (23 core hours)

IPT1. Intersystems Communications (5)
IPT2. Data Mapping and Exchange (4)
IPT3. Integrative Coding (4)
IPT4. Scripting Techniques (4)
IPT5. Software Security Practices (4)
IPT6. Miscellaneous Issues (1)
IPT7. Overview of programming languages (1)

NET. Networking (20 core hours)

NET1. Foundations of Networking (3)
NET2. Routing and Switching (8)
NET3. Physical Layer (6)
NET4. Security (2)
NET5. Application Areas (1)
NET6. Network Management

PF. Programming Fundamentals (38 core hours)

PF1. Fundamental Data Structures (10)
PF2. Fundamental Programming Constructs (9)
PF3. Object-Oriented Programming (9)
PF4. Algorithms and Problem-Solving (6)
PF5. Event-Driven Programming (3)
PF6. Recursion (1)

SP6. Legal Issues in Computing (2)
SP7. Organizational Context (2)
SP8. Professional and Ethical Issues and Responsibilities (2)
SP9. Privacy and Civil Liberties (1)

WS. Web Systems and Technologies (21 core hours)

WS1. Web Technologies (10)
WS2. Information Architecture (4)
WS3. Digital Media (3)
WS4. Web Development (3)
WS5. Vulnerabilities (1)
WS6. Social Software

Total Hours: 281

Notes:
1. Order of Knowledge Areas: Fundamentals first, then ordered alphabetically.
2. Order of Units under each Knowledge Area: Fundamentals first (if present), then ordered by number of core hours.

Implementation of Core Material

Assume that a **course** meets three times a week over the course of a 15-week semester and that the individual class meetings run somewhere between 50 minutes and an hour.

This schedule is typical for a 3-credit semester course in the United States.

Given that some of the available time will be taken up with examinations and other activities, we have assumed that 40 hours of lecture are available over the semester.

In addition, students are expected to devote three hours of time outside of class for each in-class hour, which means that the total time that each student is expected to invest 160 hours in each course.

Other countries use different metrics for expressing the expected level of work.

Introductory Courses

Course #	Title	Description	Prerequisites	KAs Covered	Units Covered	Program Outcomes
IT 101	IT Fundamentals	Introduces students to the academic discipline of IT. Pervasive IT themes; IT history; Organizational issues; Relationship of IT to other computing disciplines	None	ITF: 1(17), 2(6), 3(3), 4(3), 5(2), 6(2); SP: 2(1), 3(2)	Pervasive themes in IT; Organizational issues; History of IT; IT and its Related and Informing Disciplines; Application Domains; Applications of Math and Statistics to IT	a; b; f; k
IT/CS 130	Programming Fundamentals	Introduces students to the basics of programming, including data structures, programming constructs, object-oriented programming, algorithms and problem solving, event-driven programming, and recursion.	None	PF: 1(10), 2(9), 3(9), 4(6), 5(3), 6(1)	Fundamental data structures and programming constructs; Object-oriented programming; Algorithms and problem solving; Event-driven programming; Recursion; Overview of programming languages	a; c; g; h
IT/CS 150	Computer Architecture	Principles of computer hardware and low-level software, including logic circuits, assembly language, I/O, storage, program execution	IT 101; IT 130	PT: 2(3), 3(1); SP: 2(1)	Architecture and organization; Computing infrastructures	a; c; e; g; h
IT/CS 160	Operating Systems	Basics of computer operating systems, including configuration, file systems, security, administration, interfacing, multitasking, performance analysis	IT 101; IT 130	PT: 1(10); SA: 1(3); SP: 2(1), 3(1)	Operating systems	a; b; c; e; g; h

Intermediate Courses

Course #	Title	Description	Prerequisites	KAs Covered	Units Covered	Program Outcomes
IT 210	IT Systems	Introduction to the basic components of IT systems, including networking, web systems, databases, scripting, system administration and maintenance, and system integration	IT 101; IT 130	HCI: 1(2), 2(1), 3(1), 4(1), 5(1); IAS: 1(1), 2(1), 5(1), 6(1), 7(1), 8(1), 9(1), 10(1); IM: 1(1), 2(4), 3(1), 4(2); IPG: 1(3), 2(3), 3(1), 4(1), 6(1); NET: 1(1), 2(1), 3(1), 5(1); PF: 5(1); PT: 1(2), 2(1); SA: 1(1); SIA:3(2); WS: 1(6), 2(2), 3(3), 4(3). (Total Hours=56)	Foundations of networking; Database systems; Data administration; Database administration; Web technologies; Scripting techniques; Integrative coding; Applications; Integration; History of computing	a; b; c; e; f; g; h; k
IT 250	Web Systems	Introduction to web technologies and systems, including hypertext, self-descriptive text, web page design, web navigational systems, and digital media	IT 210	WS: 1(4), 2(2), 3(1), 4(1), 5(1)	Web technologies; Information architecture; Digital media; Web development; Vulnerabilities	a; b; c; e; f; g; h; i; j
IT 330	Networking	Builds a deeper understanding of how networks work, including the topics of LANs, WANs, service providers, packets, hubs, routers, switches, Internet protocols	IT 210	NET: 1(7), 2(5), 3(2), 4(2)	Routing and switching; Physical layer; Security; Application Areas	a; b; c; e; f; g; h
IT 350	Databases	Builds a deeper understanding of how databases work, including the topics of database theory and architecture, data modeling, normalization, query languages, security, and Web applications	IT 210	IM: 1(8), 2(6), 3(6), 4(1), 5(1), 6(1)	Data organization and retrieval; Data modeling; Database query languages; Database systems; Information models and systems; Properties of data; Specification of data requirements; Data and database administration	a; b; c; e; f; g; h; i; j
IT 370	Human-Computer Interaction	Introduction to the basic concepts of human-computer interaction, including human factors, performance analysis, cognitive processing, usability studies, environment, and training	IT 210	HCI: 1(4), 2(2), 3(2), 4(2), 5(1), 6(1), 7(2)	Human factors; HCI aspects of application domains; Human-centered evaluation; Developing effective interfaces; Emerging technologies; Human-centered software; Accessibility	a; b; c; e; f; g; h; i; j
ENGL 310	Professional Communication	Introduction to written and oral technical and professional communication, including proposals, reports, presentations, formal papers	College English	SP: 1(25)	Professional Communications	j; k

Advanced Courses

Course #	Title	Description	Prerequisites	KAs Covered	Units Covered	Program Outcomes
IT 410	Information Assurance & Security	Introduction to the concepts of data security, including policies, attacks, vulnerabilities, encryption, information states, and forensics	IT 330, IT 350, IT 250	IAS: 1(4), 2(2), 3(3), 4(3), 5(1), 6(1), 7(1), 8(1), 9(1), 10(1), 11(1)	Security mechanisms; Fundamental aspects; Security services; Information states; Threat analysis model; Vulnerabilities; Attacks; Policy; Operational issues; Forensics; Security domains	a; b; c; e; f; g; h;
IT 480	IT Capstone I	IT senior project-first semester, including project proposal, feasibility studies, intellectual property, teamwork, budgets, schedule management	IT 330, IT 350, IT 370	SIA: 1(6), 2(4), 3(1), 4(2), 6(1), 7(1); SP: 1(2), 4(3), 5(2), 6(2), 7(2), 8(2), 9(1)	Requirements; Acquisition/ sourcing; Integration; Project management; Architecture; Teamwork concepts and issues; Intellectual properties; Organizational context	a; b; c; d; e; f; g; h; i; j; k
IT 481	IT Capstone II	IT senior project-second semester, including teamwork, professional communications (reports and presentations), design implementation, testing	IT 480	SA: 2(3), 3(2), 4(2); SIA: 3(2), 4(1), 5(3); SP: 1(3), 4(1)	Testing and QA; Organizational context; Professional communications; Teamwork concepts and issues;	a; b; c; d; e; f; g; h; i; j; k
IT 490	Professional Ethics	Covers all the areas of ethics in the computing profession	IT 330, IT 350, IT 370	SP: 8(2)	Professional and Ethical Issues and Responsibilities; Privacy and Civil Liberties	b; f

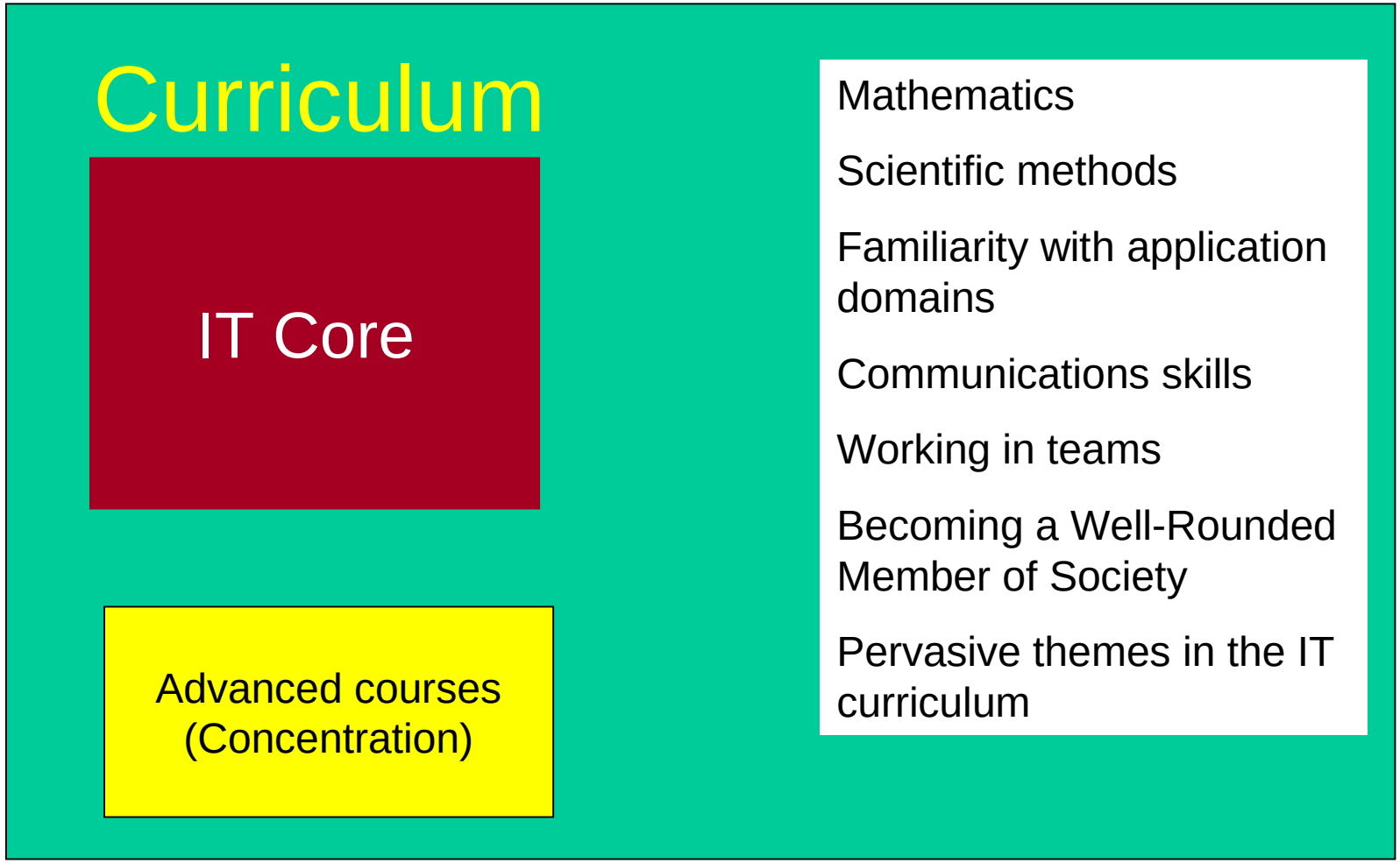
Blue=All KA Covered
Red=All Unit Covered

Completing the curriculum

The Information Technology core does not in itself constitute a complete curriculum.

To complete the curriculum, IT programs must also ensure that students have the background knowledge and skills they need to succeed as well as the chance to do advanced work that goes beyond the boundaries of the core.

Completing the curriculum



Completing the curriculum

Mathematics

Discrete mathematics. All students need exposure to the tools of discrete mathematics. While additional courses are available, it is essential that IT students to receive adequate exposure in this area.

Statistics. Students should take at least one course in statistics so that they can be familiar with the terms and methods of statistical analysis. We also believe they would benefit greatly from learning about statistical probability.

Completing the curriculum

Scientific method

The process of abstraction (data collection, hypothesis formation and testing, experimentation, analysis) represents a vital component of logical thought within the field of computing.

To develop a firm understanding of the scientific method, students must have direct hands-on experience with hypothesis formulation, experimental design, hypothesis testing, and data analysis. While a curriculum may provide this experience in various ways, it is vital that students must "do science" -- not just "read about science."

Completing the curriculum

Familiarity with application domains

Due to the broad range of application domains for computing in today's society, IT students must be able to work effectively with people from other disciplines.

To this end, the SIGITE Curriculum Committee recommends that all computer science students should engage in an in-depth study of some subject that uses computing in a substantive way.

Completing the curriculum

Communications skills

At a minimum, an IT curriculum should require:

- Course work that emphasizes the mechanics and process of writing
- At least two formal oral presentations to a group
- The opportunity to critique at least two oral presentations

Completing the curriculum

Working in teams

Opportunities to work in teams beginning relatively early in the curriculum.

A significant project that involves a complex implementation task in which both the design and implementation are undertaken by a small student team.

This project is often scheduled for the last year of undergraduate study, where it can serve as a capstone for the undergraduate experience.

Completing the curriculum

Becoming a Well-Rounded Member of Society

Regardless of the depth or focus of one's technical background, each person is expected to operate effectively and amicably in society.

This includes accepting and valuing and the diverse opinions and perspectives of others, keeping abreast of social and political developments, and contributing in a positive way to their neighborhood and community.

Completing the curriculum

Pervasive themes in the IT curriculum

user centeredness and advocacy

information assurance and security

the ability to manage complexity through: abstraction & modeling, best practices, patterns, standards, and the use of appropriate tools

a deep understanding of information and communication technologies and their associated tools adaptability

professionalism (life-long learning, professional development, ethics, responsibility)

interpersonal skills

Completing the curriculum

Advanced courses (Concentration courses)

The term *advanced course* to mean courses whose content is substantially beyond the material of the core.

The units in the body of knowledge give testimony to the rich set of possibilities that exist for such courses, but few if any institutions will be able to offer courses covering every unit in detail.

Institutions will wish to orient such courses to their own areas of expertise, guided by the needs of students, the expertise of faculty members, and the needs of the wider community.

Completing the curriculum

Advanced courses (Concentration courses)

Human-Computer Interaction (HCI)
- IT301. Human-Centered Design and Evaluation
- IT302. Graphical User Interfaces
- IT303. Multimedia Systems Development
- IT304. Interactive Systems Development
- IT305. Computer-Supported Cooperative Work
- IT306. Human Cognitive Skills

Information Assurance and Security (IAS)
- IT311. Cryptography
- IT312. Forensics and Incident Response
- IT313. Biometrics
- IT314. Security Policies and Procedures

Information Management (IM)
- IT320. Advanced Databases
- IT321. Database Design
- IT322. Transaction Processing
- IT323. Distributed and Object Databases
- IT324. Data Mining
- IT325. Data Warehousing
- IT326. Multimedia Information Systems
- IT327. Digital Libraries

Platform Technologies (PT)
- IT360. Advanced Computer Architecture
- IT361. Parallel Architectures
- IT362. VLSI Development & Technologies
- IT363. Advanced Computing Techniques

System Administration and Maintenance (SA)
- IT370. Network Management
- IT371. Technical Support
- IT372. Database Administration

System Integration and Architecture (SIA)
- IT410. Software Acquisition and Implementation
- IT411. System Needs Assessment
- IT412. Software Economics
- IT413. Enterprise Systems
- IT414. Knowledge Management
- IT415. Computing Economics

Social and Professional Issues (SP)
- IT420. Professional Practice
- IT421. Social Context of Computing
- IT422. Computers and Ethics

Completing the curriculum

Advanced courses (Concentration courses)

Integrative Programming & Technologies (IPG)
- IT330. Fundamentals of n-Tier Architectures
- IT331. Implementing n-Tier Architectures

Networking (NET)
- IT340. Advanced Computer Networks
- IT341. Distributed Systems
- IT342. Wireless and Mobile Computing
- IT343. Cluster Computing
- IT344. Data Compression
- IT345. Network Security
- IT346. Enterprise Networking
- IT347. Digital Communications

Programming Fundamentals (PF)
- IT350. Object-Oriented Programming
- IT351. Event-Driven Programming
- IT352. Functional Programming
- IT353. Logic Programming

- IT423. IT and Economic Development
- IT424. Computer Law
- IT425. Intellectual Property
- IT426. Privacy and Civil Liberties

Web Systems and Technologies (WS)
- IT390. Programming for the WWW
- IT391. E-commerce
- IT392. Data-Driven Websites
- IT393. Web Software Tools

Example of an Undergraduate Degree Programs in Information Technology

New Jersey Institute of Technology University

Brochure

Chương trình khung của Viet Nam

Hệ thống thông tin

Khoa học máy tính

Kỹ thuật máy tính

Kỹ thuật phần mềm

Mạng máy tính và truyền thông

Không có chương trình khung cho ngành CNTT ?????

Câu hỏi cho các nhà giáo dục

Nếu chỉ nhìn vào chương trình đào tạo, các trường đại học của Việt nam đều có nội dung tương đương với các chương trình ở nước ngoài.

Nhưng tại sao chất lượng đầu ra lại kém xa ?

References

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   Timothy C. Lethbridge, University of Ottawa

2 Draft of Computing 2005
   http://www.acm.org/education/curricula.html#CC2005