

**Massachusetts Institute of Technology**  
**Sloan School of Management**

**15.564 Information Technology I**  
**How IT All Works, Under the Hood**  
**Spring 2003 Syllabus**

---

**COURSE DESCRIPTION**

Information Technology I helps students understand technical concepts underlying current and future developments in information technology. There will be a special emphasis on networks and distributed computing. Students will also gain some hands-on exposure to powerful, high-level tools for making computers do amazing things, without the need for conventional programming languages.

**TEACHING STAFF**

Instructor:	Prof. Chris Dellarocas	(E53-315, 258-8115, <a href="mailto:dell@mit.edu">dell@mit.edu</a> <a href="http://ccs.mit.edu/dell/">http://ccs.mit.edu/dell/</a> )
Teaching Assistants:	Christopher Vinckier Tanaz Sowdagar	( <a href="mailto:cvinckie@sloan.mit.edu">cvinckie@sloan.mit.edu</a> ) ( <a href="mailto:tanaz@sloan.mit.edu">tanaz@sloan.mit.edu</a> )
Secretary:	Anna Piccolo	(E53-390, 253-6605, <a href="mailto:apiccolo@mit.edu">apiccolo@mit.edu</a> )

**AUDIENCE AND PREREQUISITES**

15.564 is an introductory course. It is assumed that students know how to use Macintosh or IBM PC word processors and spreadsheets. No knowledge of how computers work or are programmed is assumed. Students who have recently completed courses in computer architecture, operating systems, and telecommunications probably should not take this course, because most of the course consists of highlights of those topics. Student backgrounds vary considerably, however. Students with some background in electrical engineering or programming will breeze through certain topics, though it is hoped that the discussion of current eBusiness application classes as well as the term project (see below) will benefit them as well. Those with no background will have to work harder, but mastery of this material is within reach of every MIT student regardless of background.

Talk to the instructor if you're not sure whether your background is appropriate.

## LOGISTICS

- 1) Lectures. Tuesday and Thursday 2:30-4 PM in E56-270
  - 2) Recitation. Friday 10-11 AM in E51-335. The purpose of recitation is to:
    - a) review material covered in class during the week;
    - b) provide additional examples and exercises that aid understanding;
    - c) cover **additional topics** related to the material of the week.
- Due to the intense pace of this course, we strongly recommend that you try to attend as many recitations as possible!**
- 3) TAs' office hours. To be determined.
  - 4) Professor's office hours. Tuesdays 4-5 PM. Other times by appointment. Email is strongly encouraged!

## READINGS, LECTURE NOTES AND TEXTBOOKS

One of the unusual aspects of this course is the diversity of student objectives, backgrounds and previous exposure to the subject matter. To accommodate this diversity we propose that each student select his or her individualized sets of supplementary study materials from the list below. We will describe the recommended study materials and the strategy for choosing between them in the first session of the course. Please feel free to send us email if you have questions related to the best study materials for you.

### Required materials

Lecture notes are preprints of Powerpoint slides used by the instructor during lectures. They are fairly detailed and comprehensive (typically between 20-30 slides per lecture). In the past, most students found that the slides were the primary resource they used for reviewing the class material. Suggested study strategy: skim the lecture notes before class, then read carefully after class. We will be distributing lecture notes in class at the beginning of each lecture. **Alternatively, lecture slides can be downloaded from the class web page (see below).**

Xeroxed readings contain textbook chapters and magazine articles whose main purpose is to supplement the lecture notes and serve as a reference for the topics covered in class. Since this is a new course, we will be distributing readings in class as we go.

### Recommended materials

There are two recommended textbooks:

- *PriceWaterhouseCooper's Technology Forecast: 2002-2004: Volume I* is available at the MIT Coop. In addition to a concise technical introduction to the various topics covered, it provides excellent surveys of the marketplace, including pointers to leading vendors and products, as well as assessments of trends and directions. Our recommendation: Students with no previous exposure in IT might find this a bit heavy. On the other hand, students who have had some previous IT exposure and especially **graduate students** who are interested in connecting the technological principles we will learn in the lectures with the marketplace will find this an excellent reference.
- Ron White, et. al. HOW COMPUTERS WORK (6<sup>th</sup> Edition), Que (2001) . Good introductory text on the internals of computer hardware and system software. Recommended if you don't have a background

in science or engineering. Science and engineering majors might find this book too elementary. You may purchase this book from Amazon.com.

- The PC Webopedia (<http://www.pcwebopedia.com>) is a Web site that serves as an encyclopedia of Information Technology terms. It provides excellent explanations of Information Technology terms, together with links to additional web pages related to them. For each lecture, the course Web page contains pointers to the relevant category of the PC Webopedia. We strongly encourage you to use this valuable resource to clarify unanswered questions and to go beyond the material covered in class, according to your own personal interests.

Finally, for students who would like to learn Microsoft Access in depth, the following is a **recommended** textbook (you may choose either):

- John L. Viescas. RUNNING MICROSOFT ACCESS 2000, Microsoft Press (1999).  
One of the best and most detailed "bibles" on Microsoft Access. Coverage is way beyond what will be covered in this course. This is an excellent reference book for students who are interested in becoming Microsoft Access experts. If you are looking for something more concise, you may consider the Byrne textbook.

## **ASSIGNMENTS, EXAMS, AND GRADING**

The course assignments consist of 5 problem sets, two in-class exams and a term project. Grades will be determined on the following basis:

Problem sets	35%
Midterm exam	20%
Final exam	20%
Term project	20%
Class contribution	5%

**Assignments are due in class during the due dates.** In special circumstances (e.g., illness, religious holidays) we'll try to be accommodating, if you make arrangements with us in advance. Late assignments will be penalized by 10% per 24 hours if you have not made arrangements in advance, and will not be accepted at all 48 hours after the time due.

**There are several ways to earn "Class Contribution" points.** First and foremost is to come prepared for class, ask questions that other students want to know the answer to, and give clear, brief answers to questions I ask. Second is to locate magazine or newspaper articles that are relevant to the class and to bring a photocopy to me for distribution to the entire class. Third is to do follow-up research in order to answer an interesting question that comes up in class. In short, if you help other students learn, you get class contribution points.

## **CLASS WEB PAGE**

The 15.564 class Web page is located at Sloanspace:  
<http://sloanspace.mit.edu> -> navigate to 15.564

*MIT Students:* If you have not yet registered at Sloanspace, please do so by following the instructions for new users at <http://sloanspace.mit.edu> and then join the 15.564 class.

*Out-of-MIT Students:* Please send us your e-mails and you will be added to the Sloanspace.

*How to join the 15.564 class on the Sloanspace after registering?* Login to the Sloanspace, then click on a link entitled something like “Join/Drop a Class or Community Group”, then click on the class 15.564, making sure to join the 2003 version (not 2002!). Once you join the class, it will be listed as a hyperlink in your MySpace page (select MySpace via the top menu).

The 15.564 Web page will contain a wealth of information related to the course, such as the course syllabus, downloadable copies of the lecture notes, problem sets and various course-related announcements. For some sessions, it also provides links to additional (optional) reading material found on the Web. Our web page will be updated frequently during the term. You are required to join the Sloanspace and encouraged to visit it often!

## **COMPUTER FACILITIES**

This is a course about Information Technology and several assignments require use of a PC. Students can use either their own PC or the facilities of the Sloan School Computer Center. If you do not have a Sloan lab account, we will provide one after the first week of classes. You are responsible for getting your own email account (everybody in the MIT community is entitled to an Athena email account).

## **COLLABORATION POLICY**

You are encouraged to discuss material from the class with other students, including material related to problem sets. You must, however, write solutions independently. The time to stop collaborating is when you start writing. In addition, you must write on your problem sets and machine problems the name of anyone with whom you collaborated.

Do: discuss general concepts and techniques for performing the hands-on assignments; compare and discuss answers after you get the problem sets back.

Don't: copy or compare answers before you turn them in; debug each others' programs; sit together while you are writing up your solutions.

Consequences: If you copy or allow copying in violation of these rules, both parties get 0 on the entire assignment. If you do it again, you go to a discipline committee.

**Finally, it is strictly forbidden to consult and/or copy your answers from solution sets of past terms. Students who violate this rule will be asked to drop the class.**

If you're stuck on a particular problem and need help that would violate the collaboration policy, contact the TAs or the instructor. We'll help.

**SCHEDULE OF CLASSES**

#	Day	Date	Topic	Assignments	
				Issued	Due
<b>1</b>	Tu	Feb 4	<b>The Basics: Hardware, OS, and Software</b> Introduction: Course Overview; Inside the CPU	PS1 out	
<b>2</b>	Th	Feb 6	Computer Architecture: Processing, Memory and I/O		
	Fr	Feb 7	<i>Recitation: Little Man Computer</i>		
<b>3</b>	Tu	Feb 11	Computer Representations; Compression		
<b>4</b>	Th	Feb 13	Operating Systems		
	Fr	Feb 14	<i>Recitation: Computer hardware and Operating Systems</i>		
	Tu	Feb 18	NO CLASS – Monday schedule for classes		
<b>5</b>	Th	Feb 20	Software Development		
	Fr	Feb 21	<i>Recitation: Software Development</i>		
			<b>Databases</b>		
<b>6</b>	Tu	Feb 25	Relational Databases; Database queries using SQL	PS2 out	PS1 due
<b>7</b>	Th	Feb 27	An Introduction to Microsoft Access		
	Fr	Feb 28	<i>Recitation: SQL queries</i>		
<b>8</b>	Tu	Mar 4	Relational database design	PS3 out	
<b>9</b>	Th	Mar 6	Intro to User Interface Building with Access Examples		
	Fr	Mar 7	<i>Recitation: Database Design</i>		
			<b>Networks and Telecommunications</b>		
<b>10</b>	Tu	Mar 11	Telecommunication Concepts; Data Transmission		
<b>11</b>	Th	Mar 13	Local Area Networks; Ethernet; Packet-switched Networks		PS2 due
	Fr	Mar 14	<i>Recitation: Midterm Exam Review</i>		
<b>12</b>	Tu	Mar 18	Midterm exam – In Class		
	Th	Mar 20	NO CLASS – Sloan Spring Vacation		
	Tu	Mar 25	NO CLASS – MIT Spring Vacation		
	Th	Mar 27	NO CLASS – MIT Spring Vacation		
<b>13</b>	Tu	Apr 1	Wide Area Networks; The Internet		
<b>14</b>	Th	Apr 3	Wireless Network Technologies		PS3 due
	Fr	Apr 4	<i>Recitation: Network Technologies</i>		Project teams due
			<b>Distributed Computing and Web Technologies</b>		
<b>15</b>	Tu	Apr 8	Client/Server, Peer-to-Peer and the WWW	PS4 out	
<b>16</b>	Th	Apr 10	Security I: Public Key Cryptography		
	Fr	Apr 11	<i>Recitation: Using pgp</i>		
	Tu	Apr 15	Security II: Digital Signatures; Network Security		
<b>17</b>	Th	Apr 17	Evolution of Web Technologies		
	Fr	Apr 18	<i>Recitation: Network Security</i>		
			<b>eBusiness Applications</b>		
<b>18</b>	Tu	Apr 22	NO CLASS – MIT Holiday (Patriots Day)		
<b>19</b>	Th	Apr 24	Under the hood of a commercial Web site	PS5 out	Project topics due
	Fr	Apr 25	<i>Recitation: Microsoft Frontpage</i>		
<b>20</b>	Tu	Apr 29	Data Mining, Data Warehousing		PS4 due
<b>21</b>	Th	May 1	Other advanced topic: TBD		Project summaries due
	Fr	May 2	<i>Recitation: TBD</i>		
<b>22</b>	Tu	May 6	Student Presentations I		
<b>23</b>	Th	May 8	Student Presentations II		PS5 due
	Fr	May 9	<i>Recitation: Final Exam Review</i>		
<b>24</b>	Tu	May 13	Trends in eBusiness technology; Course wrap-up		
<b>25</b>	Th	May 15	Final Exam – In Class		

## **PROBLEM SETS**

PS 1: Computer Fundamentals

PS 2: Relational Databases

PS 3: Graphical User Interfaces

PS 4: Networks and Computer Security

PS 5: Database-driven Web Sites

## **READINGS**

*The following readings are required unless otherwise noted. Additional readings may be announced during the semester. The PC Webopedia links are optional, but highly recommended. The class web page will contain links to additional (optional) reading materials found on the Web.*

Session 1: Introduction

Stuart Madnick. Little Man Computer

Session 2: Computer architecture

Optional: How Computers Work: Parts 1-5.

PC Webopedia – Hardware category page ([http://www.pcwebopedia.com/Hardware\\_cat.html](http://www.pcwebopedia.com/Hardware_cat.html))

PC Webopedia – PC definition and links (<http://www.pcwebopedia.com/PC.htm>)

Session 3: Computer representations

Optional: Introduction to Data Compression.

<http://www.cs.cmu.edu/afs/cs/project/pscico-guyb/realworld/www/compression.pdf>

PC Webopedia – Data formats category page

([http://www.pcwebopedia.com/Data\\_Formats\\_cat.html](http://www.pcwebopedia.com/Data_Formats_cat.html))

Terms to look up: binary, floating-point numbers, character set, ASCII, HTML, bitmap, Postscript, PDF, data compression, MPEG

Session 4: Operating systems

Optional: An Operating Systems Tutorial (part of The Linux Tutorial)

<http://www.linux-tutorial.info/cgi-bin/display.pl?1&0&224&0&3>

PC Webopedia – Operating Systems category page

([http://www.pcwebopedia.com/Operating\\_Systems\\_cat.html](http://www.pcwebopedia.com/Operating_Systems_cat.html))

Terms to look up: operating systems, multitasking, virtual memory, file management system, file allocation table, Windows, Linux

Session 5: Software development; Programming languages

W. W. Gibbs. Software's Chronic Crisis, Scientific American, Sept. 1994, pp. 86-95

PC Webopedia – Programming Languages category page

([http://www.pcwebopedia.com/Programming\\_Languages\\_cat.html](http://www.pcwebopedia.com/Programming_Languages_cat.html))

Terms to look up: programming language, compiler, interpreter, Java

Session 6: Relational databases; SQL

Elmasri and Navathe. Fundamentals of Database Systems, Benjamin/Cummings, 1989, Chapter 7 (plus pp. 143-144)

PC Webopedia – Databases category page ([http://www.pcwebopedia.com/Databases\\_cat.html](http://www.pcwebopedia.com/Databases_cat.html))

Session 7: Microsoft Access

Recommended textbooks: “Running Microsoft Access”

Session 8: Relational database design

Karen Watterson. Visual Basic Database Programming, Addison-Wesley, 1994, pp. 12-43.

Session 9: User Interface Building with Access

Recommended textbooks: “Running Microsoft Access”

Session 10: Data communications

Fitzgerald and Dennis. Business Data Communications and Networking (6<sup>th</sup> Edition), Wiley, 1999, pp. 83-92, 107-129

Optional: Basic Telecom Concepts, Chapter 1 from The Essential Guide to Telecommunications by Annabel Z. Dodd, Prentice Hall, 1999. Available from <http://www.privateline.com/PCS/dodd.pdf>

PC Webopedia – Networks category page ([http://www.pcwebopedia.com/Networks\\_cat.html](http://www.pcwebopedia.com/Networks_cat.html))

Session 11: LANs; Ethernet

Fitzgerald and Dennis. Business Data Communications and Networking (6<sup>th</sup> Edition), Wiley, 1999, pp. 192-216.

Session 13: WANs; OSI protocols and the Internet

Fitzgerald and Dennis. Business Data Communications and Networking (6<sup>th</sup> Edition), Wiley, 1999, pp. 30-33, 164-189.

Optional: An introductory (but fun!) tutorial on how the Internet works is available at <http://www.howstuffworks.com/internet-infrastructure.htm>. The same site contains lots of interesting tutorials on related concepts as well.

Session 14: Wireless Network Technologies

Fundamentals. Wireless Telephone Service, Chapter 9 from Introduction to Telephones and Telephone Systems (Artech House Telecommunications Library) by A. Michael Noll, 3<sup>rd</sup> edition 1999. Available from <http://www.privateline.com/Cellbasics/nol-ch09.pdf>

Session 15: Client/Server Systems, P2P and the WWW

R. Orfali et.al. Client/Server Survival Guide (3<sup>rd</sup> edition), Wiley, 1999, Chapters 2-3.

Client/Server Software Architectures--An Overview

([http://www.sei.cmu.edu/str/descriptions/clientserver\\_body.html](http://www.sei.cmu.edu/str/descriptions/clientserver_body.html))

Optional: Peer-to-Peer computing

(<http://www.hpl.hp.com/techreports/2002/HPL-2002-57.pdf>)

PC Webopedia – Client/Server Computing category page

([http://www.pcwebopedia.com/Client\\_Server\\_Computing\\_cat.html](http://www.pcwebopedia.com/Client_Server_Computing_cat.html))

Terms to look up: client/server architecture, fat client, thin client, two-tier, three-tier, middleware

Session 16: Security I

Phil Zimmerman. An Introduction to Cryptography (Included in freeware PGP documentation, which is downloadable from <http://web.mit.edu/network/pgp.html>)

R. Behar. Who's reading your e-mail. Fortune, February 3, 1997, pp. 57-70.

PC Webopedia – Security category page ([http://www.pcwebopedia.com/Security\\_cat.html](http://www.pcwebopedia.com/Security_cat.html))

Terms to look up: biometrics, virus, macro virus, antivirus program

PC Webopedia – Encryption category page

([http://www.pcwebopedia.com/Encryption\\_cat.html](http://www.pcwebopedia.com/Encryption_cat.html))

Terms to look up: symmetric-key cryptography, DES, public-key encryption, RSA, Pretty Good Privacy

Session 17: Security II

Phil Zimmerman. An Introduction to Cryptography (included in PGP documentation), pages 11-36 (also skim Part 2).

Introduction to SSL. Available on the Web from

<http://docs.ipplanet.com/docs/manuals/security/sslin/index.htm>

PC Webopedia – Encryption category page

([http://www.pcwebopedia.com/Encryption\\_cat.html](http://www.pcwebopedia.com/Encryption_cat.html))

Terms to look up: authentication, digital signature, digital certificate, PKI, SSL, digital cash, smart card

Session 18: Evolution of World Wide Web Technologies

R. Orfali et. al. Client/Server Survival Guide (3<sup>rd</sup> Edition), Wiley, 1999. Chapters 26-27.

Optional: R. Wright. The Man Who Invented the Web. Time, May 19, 1997.

Optional: Technology Forecast: pages 545-592

PC Webopedia – World Wide Web category page

([http://www.pcwebopedia.com/World\\_Wide\\_Web\\_cat.html](http://www.pcwebopedia.com/World_Wide_Web_cat.html))

Session 19: Under the hood of a commercial Web site

How it Works, Business 2.0, February 2000, pp. 112-140.

Optional: Technology Forecast, pp. 357-472

Recitation: Introduction to Microsoft FrontPage

Online tutorial: <http://www.actden.com/fp2000/java/>

Session 20: Data warehousing, Data mining

Two Crows Corporation. Introduction to Data Mining and Knowledge Discovery

Optional: Technology Forecast: pages 253-310

Session 21 and 24: Readings TBA