

COURSE SYLLABUS
635.411 Foundations of Networking and Telecommunications
Spring 2002 Johns Hopkins University

Instructor: Mr. John E. Boon, Jr.

GENERAL SCHEDULE PARAMETERS SPRING 2002
NOT AVAILABLE DURING BOLD & UNDERLINED PERIODS

Monday	Tuesday	Wednesday	Thursday	Friday
<u>08:00-12:00</u> <u>14:00-17:00</u> <u>18:00-22:00</u>	RAND or Consulting <u>15:30-20:00</u>	RAND or Consulting	RAND or Consulting	RAND or Consulting

Mr. John E. Boon, Jr. is the course instructor for these class meetings. He is an Operations Researcher for RAND, and is a Lecturer in the Whiting School Part-Time Programs In Engineering and Applied Science Johns Hopkins University and University of Maryland, University College. Mr. Boon was previously an Associate Professor of Computer Science and Chairperson, Department of Mathematics and Computer Science, Hood College. Mr. Boon also continues to maintain a consulting practice in operations research and computer science.

You are encouraged at any time to phone my cell number or home office. You may fax information to my home office. I encourage you to contact me if you have any questions at all. I may be able to clarify requirements as well as suggest additional resources and strategies for a given problem. Be sure to (1) state your name, (2) state what I may do for you, (3) state your phone number twice, (4) state the hours during which I may return your call if you leave a voice message.

My complete list of contact information follows:

My e-mail addresses: <mailto:jboonjr@apl.jhu.edu>
WWW Home Pages: <http://www.apl.jhu.edu/Notes/Boon/635411/>
(see also <http://www.apl.jhu.edu/Courses/cs/> or
<http://www.apl.jhu.edu/Classes/Classes.html>)
Home Office phone: (301) 371-5411 (voice and facsimile)
Cell: (301) 606-4115

Course Description:

The course delivers comprehensive presentation of data and computer-to-computer (C2C) communications. The course covers analog and digital voice, data, imaging, and video communications fundamentals. It also provides the basics of communication techniques, applications technology, and C2C networking, including circuit-switched, packet-switched, and their use in local/wide area network systems. The course includes basics of LAN and WAN networks requirements and examines communications protocols and implementations. It addresses the open systems interconnection (OSI) model communication standards. This course is not open to computer science majors.

Prerequisites:

Working knowledge of data structures and Java, C++, or C. Students should be familiar with networking and the Internet from a user's perspective.

Computer Requirement:

Students must have an email address and must make that address known to the course instructor as soon as practical after the start of the course. Students may use their own computing resources (hardware/software tools) or may arrange to access the necessary tools through the student services entities of JHU. Students must have access to the Internet, have a web browser, and the Acrobat Reader application.

Instructional Objectives:

Specific instructional objectives in telecommunications and connectivity are to:

1. become familiar with the range of interactions facilitated by telecommunications and networking,
2. become familiar with research and standard-making organizations influencing telecommunications and networking,
3. understand the fundamental nature of signals and signal transmission and the mechanisms developed to support signal transmission and reception through various transmission media,
4. understand mechanisms for obtaining maximum utilization of scarce resources in telecommunications and connectivity,
5. understand architectures enabling LANs, MANs, and WANs,
6. understand QOS and mechanisms used to deliver specific levels of QOS,
7. understand the OSI protocol stack and its influence on telecommunications and networking,
8. understand message transfer modes used in telecommunications and networking,
9. understand the range of service provided by telephone network providers and wireless network providers,
10. understand the key advantages and disadvantages of each IEEE LAN protocol
11. understand the Internet's architecture and supporting infrastructure,
12. understand the key advantages and disadvantages of enterprise network protocols,
13. become familiar with issues in network security control, encryption and encryption standards, and digital signatures,
14. continue to practice effective writing, presentation, and evaluation skills.

Required Text:

E. Bryan Carne. *Telecommunications Primer: Data, Voice and Video Communications, Second Edition*. Prentice Hall PTR, 1999.

Other Texts Referred To During Lectures:

Barlow, R. and Proschan, F. Statistical Theory of Reliability and Life Testing: Probability Models. (New York, Holt, Rinehart, and Winston, 1974).

Black, U., Data Networks: Concepts Theory, and Practice. (New Jersey; Prentice-Hall, 1989).

Black, U., OSI: A Model for Computer Communications Standards. (New Jersey; Prentice-Hall, 1991).

Black, U., X.25 and Related Protocols. (California; IEEE Computer Society Press, 1991).

Comer, D., Internetworking with TCP/IP, Volume I: Principles, Protocols, and Architecture, Fourth Edition. (New Jersey; Prentice Hall, 2000).

Comer, D. and Stevens, D., Internetworking with TCP/IP, Volume II: ANSI C Version: Design Implementation, and Internals, Third Edition. (New Jersey; Prentice Hall, 1999).

Comer, D. and Stevens, D., Internetworking with TCP/IP, Volume III: Client-Server Programming and Applications -- BSD Socket Version, Second Edition. (New Jersey; Prentice Hall, 1996).

Cormen, Leiserson, and Rivest. Introduction to Algorithms. (The MIT Press, 1992).

Halsall, F., Data Communications, Computer Networks, and Open Systems, Fourth Edition. (Massachusetts, Addison-Wesley, 1996).

Keshav, S., An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network. (Massachusetts, Addison-Wesley, 1997).

Mann, N., Schafer, R., and Singpurwalla, N., Methods for Statistical Analysis of Reliability and Life Data. (New York, Wiley, 1974).

Schwartz, Mischa, Telecommunication Networks: Protocols, Modeling and Analysis. (Massachusetts, Addison-Wesley, Reprinted with corrections November, 1988).

Sharma, Roshan, Network Topology Optimization: The Art and Science of Network Design. (New York, Van Nostrand Reinhold, 1990).

Shier, D., Network Reliability and Algebraic Structures. (New York, Oxford University Press, 1991).

Stair III, H. and Powers, Jr., J., Megabit Data Communications: A Guide for Professionals. (New Jersey, Prentice Hall, 1990).

Stallings, W., Data and Computer Communications, Fourth Edition. (New York; Macmillan, 1994).

Tanenbaum, A., Computer Networks, Third Edition. (New Jersey; Prentice-Hall, 1996).

Tarjan, R., Data Structures and Network Algorithms (Fourth Printing). (Pennsylvania, SIAM, CBMS-NSF Regional Conference Series in Applied Mathematics, 1986).

Internet Resources, Library Reserve Texts, Information, Articles, and Videos:

It is your responsibility to check the class WWW pages at <http://www.apl.jhu.edu/Notes/Boon/635411/> no later than Noon the day of class for class updates and class information. Please note weekly changes to the class WWW page for posted links and special resources related to the course as it progresses. I tend to post extensive class information on my class pages (important news items about the upcoming class, items important to the upcoming class lecture, notes, links, problems, solutions, projects, programming resources). I promise to have the page updated by Noon the day of class for any information you may need to bring with you to class that day.

You are encouraged to obtain a JCARD for accessing the JHU library. This will then grant you access through JHU RAUL (Remote Access to University Libraries) to otherwise restricted JHU library resources (see <http://proxy.hcf.jhu.edu/>). You should also become familiar with the JHU libraries, some of which you need to access via RAUL or at a JHU campus facility (http://webapps.jhu.edu/jhuniverse/libraries_and_computing/). If you are interested in searching for journal articles, please consult **UnCover** at <http://www.ingenta.com/>. Many resources for these courses can be located at <http://www.computer.org> and <http://www.acm.org>. These are the sites for the IEEE Computer Society and Association for Computing Machinery, respectively. Student members can gain full access to the on-line .pdf and .html format files in the digital libraries maintained by these societies.

Assignments:

Please note that in all assignments, you must cite all references and sources you use (see links on course WWW page for proper form of references of WWW pages). I will not tolerate the use of solutions, algorithms, or code segments from sources without appropriate citation.

Reading Assignments:

You will be expected to keep up with the readings by reading material before the class at which it will be discussed. You do not serve yourself or the objectives of your company by being exposed to these ideas for the first time in lecture. Keep notes in the margins or in a notebook to remind you to ask them during lectures later.

Homework Assignments:

These assignments will involve research and computation. Research will be done to investigate and study telecommunications and networking described in popular and scientific literature. Computation will be done to analyze the performance of telecommunications and networking solutions. Although the Internet provides more information than you may ever wish to wade through, you are encouraged to think and assimilate, rather than regurgitate. The objective of researching information this semester will be to compare design and performance solutions. For this you need your mind, not just books and the Internet.

Exams:

Two exams are planned. The final exam will contain questions that concentrate on the last half of the course but will assume mastery of material in previous half. These exams are intended to assess your mastery of the key concepts and relationships investigated each half of the course. All exams are equally weighted. Exams will be take-home, open-book, and due the following week.

Graded Assignments:

Distribution of weights in grading:

Homework	(40%)
Research Paper	(40%)
Class Participation	(20%)

Assignments turned in late will be penalized one letter grade per class meeting, including a letter grade reduction for missing the assigned date. Assignments may be marked as excused for extraordinary situations; no points will be assigned and the assignment will not be used in computing your final grade.

Grading Policy:

I will award partial credit for work done even if the result is incorrect, but this implies that you show all your intermediate work and clearly label your answer. I will deduct points for answers that do not make any sense at all; you should always check your work, even work done using the computer. The explanation of your work is as important as the work itself -- do not concentrate on the programs or mathematics and ignore the importance of clear descriptions of what you did and what it means.

The following grading scale will be used 100-90 = A, 89-80=B, 79-70=C, 69-Below=F. Letter grades approximately imply:

- A - complete understanding of the topic plus additional insight, creative, or other indicators of advancement beyond complete understanding of the topic;
- B - mastery of the basic material;
- C - attempt to complete the basic material but significant gaps in understanding and mastery exist;
- F - failure to complete basic material successfully.

I do not grade on a curve.

Attendance:

Class attendance is essential. Significant material is covered at each of our class meetings this semester. I may excuse absences if I am notified in advance.

Academic Standards:

Students are reminded of sections in the current catalog: Academic Ethics (page 9), and Violations of Academic Integrity (page 9)¹.

All assignments this semester are individual effort assignments. It is a violation of the rules of academic conduct in this class for individuals to collaborate with other individuals, whether or not they are members of this class, on assignments, unless specifically directed that such collaboration is allowed for a specific assignment by the professor.

During class, you are expected to concentrate on and contribute to class presentations, lecture, and group discussion. Small group discussions that distract from the ability of others in class to adequately concentrate upon class presentations, lecture, and group discussion will not be tolerated. Use of laptop computers during class will be restricted to note taking and computer-based activities as assigned by the instructor. Internet surfing, writing of other papers, or use of programs not specifically related to the lecture will not be tolerated.

¹ Johns Hopkins University, Whiting School of Engineering, Part-Time Programs in Engineering and Applied Science, Undergraduate and Graduate Programs, 2002-2002, Catalog.

TENTATIVE COURSE SCHEDULE (Revised April 7, 2002)
6035.411 Foundations of Networking and Telecommunications, Spring 2002, JHU

Class meetings Tuesday 1700-2000, ITU Plaza A.

Class	Date	Objectives	Text
1	01/22	Introduction/Data Communications and Telecommunication Stds	Chapter 1
2	01/29	Distance Communication/Collaboration	Chapter 2
3	02/05	<i>cancelled</i>	
4	02/12	Baseband Signals	Chapter 3
5	02/19	Modulated Signals	Chapter 4
6	02/26	Transmission over Distance	Chapter 5
7	03/05	<i>cancelled</i>	
8	03/12	Multiplexed Signals and Their Carriers	Chapter 6
	03/19	Basic Data Communications	Chapter 7
9	03/26	OSI Protocol Stack	Chapter 8
10	04/02	Transfer Modes	Chapter 9
11	04/09	Wireless Communications	Chapter 11
12	04/16	Local, Metropolitan, and Wide Area Networks	Chapter 12
13	04/23	Enterprise Networks	Chapter 13
14	04/30	Final Presentations	