Department of Electrical and Computer Engineering
University of Puerto Rico
Mayagüez Campus

Syllabus for ICOM 6115: Computer Networks and the World Wide Web
Fall 2002

1. Faculty

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2. Course Description

Background and history of networking and the Internet, network architectures, the range of specializations within network-centric computing, network standards and standardization bodies, the ISO 7-layer reference model in general and its instantiation in protocols such as TCP/IP, circuit switching and packet switching; streams and datagrams; physical layer networking concepts; data link layer concepts; internetworking and routing; transport layer services; authentication protocols; digital signatures; web technologies; characteristics of web servers; role of client computers; nature of the client-server relationship; web protocols; support tools for web site creation and web management; developing Internet information servers; publishing information and applications.

3. Pre-requisites

ICOM 4035 or equivalent. Proficiency with C++ and UNIX.

4. Time and Place

Lecture: Tuesdays and Thursdays, 3:00 PM – 4:30 PM, S-227

5. Credits

3 credits

6. Class Web Page

http://www.ece.uprm.edu/~manuel/class/fall02/icom6115/

You are responsible to read this Web page periodically to obtain class materials, and other important announcements about this class

7. Textbooks

Required:

Computer Networks, 3rd Ed.
Andres S. Tanenbaum
Prentice Hall, 1996
ISBN: 0-13-349945-6

Recommended:

Computer Networks: A Systems Approach
Larry Peterson and Bruce Davie
Morgan Kauffman, 2000
ISBN: 1-55860-514-2

8. Grading

Your grade will be based **exclusively** on the scores that you obtain in the class projects, and exams. The curve to be used to assign a grade to your score will be as follows:

Score	Grade
100 – 90	A
89 – 80	B
79 – 70	C
69 – 65	D
64 – 0	F

Your total score will be calculated from your individual scores in the projects, exams and laboratory assignments. The weights assigned to each of these categories are as follows:

Programming Projects (5)	55%
Midterm Exams (3)	25%
Final Exam (Comprehensive)	20%

There will be no special project, no special homework, no special exam, nor any other kind of "*special work*" to improve grades. However, each project or exam might have an extra credit problem that you can use to help improve your score in that corresponding category.

9. Exams

In this course, there will be three midterm exams and a comprehensive final exam. Unless otherwise indicated, all exams will be taken with closed books and closed notes. The midterm exams will be administered outside the regular class time. The date and time for each midterm exam will be as follows:

Exam Number	Date	Time	Place
I	September 18, 2002	6:00 PM – 8:00 PM	S-113
II	October 16, 2002	6:00 PM – 8:00 PM	S-113
III	November 25, 2002	6:00 PM – 8:00 PM	S-113

The final exam will be administered in accordance with the schedule specified by the Registrar of the University of Puerto Rico, Mayagüez Campus.

The lowest score in the midterm exams can be replaced with the score in the final exam, provided that the score in the final exam is higher. Otherwise, the scores in the midterm exams will neither be replaced nor dropped.

Each question included in each exam (midterm or final) will fall into one of the following categories:

- Explanation of a technical concept.
- Proof of a mathematical proposition.
- Solution to a problem using the concepts discussed in class.
- Tracing of either C++ or Java code segments or algorithms.
- Implementation of C++ or Java classes and code segments.

10.1 Exam Reposition Policy

In this course, there will be **NO** repositions for missed midterm exams. If a student misses one midterm exam then that scored will be replaced with the score obtained in the final exam. Any other missed midterm exam will carry a score of 0.

10. Incomplete Grade Policy

A student will receive an incomplete grade if and only if the student misses the final exam and has a valid excuse. Such excuse must be one of the following:

- Medical certificate indicating illness.
- Legal certificate indicating an appointment to attend a Court of Law.
- Certificate from a hospital or a physician indicating the death of either: parent, child, husband, wife or sibling.

11. Programming Projects

In this course, you are expected to complete fiver programming projects that are designed with the following objectives**:**

1) Test your knowledge of the networking protocols and algorithms presented in class.
2) Test your individual skills for engineering a programming solution to a particular problem.
3) Provide experience in the design and implementation of complex software modules using layering principles, inter-process communications, networking APIs, and distributed algorithms.

You will be given **two weeks** to complete each programming project. You must implement your project using the Java programming language, and you must work in groups of 2-3 students. These groups will be self-policed. You might discuss with your peers general aspects about the project and/or programming environment. However, you cannot share your code with students that are not in your group, nor use code written by someone else who is not a member of your group. Failure to comply with this requirement will

be considered as an act of academic dishonesty and you will receive a grade of F in the class (**read section below titled Academic Integrity**).

You must submit your project electronically following a procedure that will be discussed in class. For each project, you will be given a **tar file** containing a directory, called the *project directory*, with the following items:

1) A document explaining the tasks to be completed for the programming project.
2) A document indicating a minimal set of operations that your program must execute to be considered a *running program*. **If your program neither compiles nor performs this minimal set of operations it will receive a score of 0.**
3) A *make* file with the commands needed to compile the modules in the project.
4) A set of Java files containing the declarations of the classes and methods to be implemented in the project.
5) A set of Java files containing **empty** implementations of the methods associated with the classes, algorithms and other tasks related with the particular programming project. **It is your job to implement the Java code that executes the tasks these methods are designed to perform.**
6) A set of test input files and their corresponding test output files. You should use these to help you decide whether your program is working correctly or not, based on what type of output your program produces out of these test input files. **NOTE**: This set of input files will not be the only one to be used to grade your project. Hence, a program might pass all the tests in these test files, and yet fail some of the extra tests used for grading. However, if your program executes correctly on the test input files you will receive at least 70% of the total score for a given project.

Your project directory should contain all the files associated with your project. Once you have completed your project, you will create a **new** tar file that **must** contain everything that you have created in your project directory. You will submit this tar file for us to grade your project. Again, you will receive further instructions on how to submit your project electronically.

You are expected to work in the Amadeus UNIX lab provided by the University of Puerto Rico, Mayagüez Campus. But, you are free to use your own UNIX computer, if you prefer to do so. **However, you must ensure that the programs that you submit for grading do compile and execute correctly on the machines available in the Amadeus UNIX lab, since the projects will be graded there**. Failure to comply with this requirement will result in a score of 0 for the project being evaluated. **NOTE: This policy will be strictly enforced**.

Late Project Policy:

Each project will have a due date composed of an hour, month and day (i.e. 4:00 PM-September 12). A project will be considered late if it is submitted for grading one minute after its due date. For example, if the due date for a project is 3:00 PM-October 31, then a project submitted at 3:01 PM-October 31 is considered as one day late. Any late project will receive the following penalty:

1 day past due date	-15%
2 days past due date	-30%

No project will be accepted for grading if submitted 3 or more days after its due date, and any such project will receive a score of 0. Any project that is not submitted for grading will automatically receive a score of 0.

NOTE: We will not debug your code via e-mail. We shall only look at your program source code listings, or login to see your code files during the allotted office hours.

12. Academic Integrity

Each student is expected to work individually on all exams. Group efforts are only allowed on the programming project. You may not use code from another student that is not a member of your group, or code that you find on the Internet or any similar resources. You may not share your code with another student that is not a member of your group. Failure to comply with these requirements will result in a grade of F in the course for the student(s) breaking these rules. Unauthorized group efforts, particularly during exams, will be considered academic dishonesty and the students involved will receive an F in the course. You should read Article 10 of the "Reglamento General de Estudiantes de la Universidad de Puerto Rico" to learn more about the possible sanctions that you might experience if caught in an act of academic dishonesty.

13. List of Topics

The following is a list of the course topics in the order in which they will be presented. This list is subject to change and it will vary depending on the pace of the lectures.

TOPICS:

1. Discussion of the Course Syllabus
2. Introduction to Computer Networks
    a. Hardware issues
    b. Software issues
3. Network Protocols
    a. Layering
    b. Finite State Machines
    c. Interfaces and Services
    d. Connection Oriented and Connectionless services
4. Protocol Reference Models
    a. OSI vs. Internet Model
5. Introduction to Network Programming
    a. Socket APIs
    b. Multi-threaded vs. Multi-process server applications
6. Application Layer
    a. Application Requirements
    b. Domain Name System

c. Electronic Mail
d. World Wide Web
    i. Web Servers
    ii. Web Clients
    iii. HTPP protocol
    iv. CGI
    v. Servlets

7. Physical Layer
    a. Transmission Media
    b. Wireless media
    c. Phone System
    d. DSL
    e. ATM
    f. Cellular
    g. Satellites
8. Data Link Layer
    a. Framing
    b. Error detection and correction
    c. Simplex Protocol
    d. Stop-and-Wait Protocol
    e. Sliding Window Protocols
9. Medium Access Sub-layer
    a. Channel allocation problem
    b. ALOHA
    c. Carrier Sense Multiple Access Protocols
    d. Collision-Free Protocols
    e. Limited-Contention Protocols
    f. Wavelength Division Multiple Access Protocols
    g. Wireless LAN Protocols
    h. Digital Cellular Radio
10. IEEE 802 Standard
    a. 802.2
    b. 802.3
    c. 802.11

11. High Speed LANs
    a. FDDI
    b. Fast Ethernet
12. Satellite Networks
13. Network Layer
    a. Routing Algorithms
        i. Shortest Path Routing
        ii. Flooding
        iii. Distance Vector Routing
        iv. Link State Routing
        v. Multicast Routing
    b. Congestion Control Algorithms
        i. Traffic Shaping
        ii. Resource Reservation Protocols
        iii. Jitter Control
14. Internetworking and Internet Protocol (IP)
    a. IP Protocols
    b. Internet Control Protocols
    c. Interior Gateway Routing Protocol: OSPF
    d. Exterior Gateway Routing Protocol: BGP
    e. Mobile IP
    f. IPv6
15. ATM
    a. Cell Formats
    b. Connection Setup
    c. Routing and Switching
    d. Quality of Service (QoS)
16. Transport Layer
    a. Addressing
    b. Connection Management
    c. Flow Control and Buffering
    d. Multiplexing
17. Transmission Control Protocol (TCP)
    a. Service Model

b. Protocol Specification
c. Connection Management
d. Transmission Policy

18. ATM Adaptation Layer
    a. AAL 1
    b. AAL 2
    c. AAL 3/4
    d. ALL 5
19. Performance Evaluation
    a. Design for Better Performance
    b. Gigabit Networking
20. Network Security
    a. Cryptography
    b. Secret-Key and Public-Key Algorithms
    c. Authentication Protocols
    d. Digital Signatues