

Syllabus

Course Title and Number: System Programming – CS 3335

Instructor: Dr. Michela Taufer

Class Time: Tuesday – Thursday, 12:00 -1:20

Room: CS 322

Instructor: Dr. Michela Taufer
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Office Hours: Dr. Taufer in Computer Science 207
Office hours: TBD
or by appointment (requested and scheduled via email)

TA's office hours: TBD

Prerequisites: CS 2302 or CS 3333 with grade of “C” or better.

Course Description: This course will introduce the student to different aspects of programming and controlling their system. In particular, the ability to build their own applications and tools that make use of key operating system characteristics (exceptions, virtual memory, i/o, sockets, threads).

Textbook: Randal E. Bryant and David R. O'Hallaron, Computer Systems: A Programmer's Perspective (2003), Prentice Hall

CS 3335 Learning Outcomes:

The design and implementation of the programming environment including operating system and hardware characteristics, makes, compilers, loaders and linkers, debuggers, exceptions, virtual memory, I/O, network and concurrent programming. Requires a grade of "C" or better in CS 2402. Class meets 3 hours per week, plus labs.

Learning Prerequisites - Students who take this class should know:

- The basic constructs of programming, e.g. data types, control structures, procedures/functions, etc.
- The following computer science concepts: operating system, files, program, memory, input/output and peripheral devices, network.

Knowledge and Comprehension:

- Discuss the process of writing system software, from code to compilation and linking. : L3
- Discuss the storage of information including: data sizes and types, byte ordering, operations on data. : L2

- Discuss the representation of a program (written in C) in a system and accessing/manipulating storage information. : L1
- Discuss the structure and usage of storage technologies and the concept and purpose of a memory hierarchy. : L2
- Discuss the different classes of programming exceptions. : L2
- Discuss different methods and the purpose of measuring the execution time of a program. : L1
- Describe the uses for virtual memory: caching, memory management, memory protection; and virtual memory concepts: virtual address space, address translation, memory mapping, dynamic memory allocation, garbage collection, memory-related bugs in programs (written in C). : L1
- Discuss the UNIX I/O system and the access and use of files. :L3
- Discuss the client-server programming model and how this applies to networks and the global IP Internet. :L2
- Discuss the use of concurrent programming and the three main approaches. :L1

Application and Analysis:

- Be proficient in using the C programming language, its constructs and grammar, to create programs and write system software. L2
- Understand the usage of makefiles, linking, object files, loading, symbol resolution, shared and static libraries, debugging and execution of programs linked in various forms. : L2
- Understand basic UNIX OS concepts such as: process, program, process groups, signals, running programs, process control, address space, user and kernel modes, system calls, context switching. : L2
- Understand how to handle exceptions within a process and to control processes. : L2
- Be proficient in file usage (open, close, read, write, sharing, metadata). : L2
- Understand how to use sockets to model a client-server environment. : L1
- Understand how to use the thread execution model (Posix Threads) to create a concurrent program. : L1

Synthesis and Evaluation:

- Discuss how IDE's relate to the development tools used in this class, in particular makefiles, loaders, linkers, debuggers. : L3
- Discuss the importance of file formats, word sizes, word alignment, hardware characteristics (e.g. processor speeds & memory) when working in an environment with multiple OS & hardware. :L3
- Discuss what options there are in systems programming to providing software updates based on library and language usage. (e.g. shared/static libraries, posix/non-standard development tools, web technology). : L3
- Discuss the use of several tools concepts from this class that are used to support web programming. :L3
- Discuss the impact that threading in programs has on programming and program execution. : L3

University Important Dates:

Labor Day, September 05 – UTEP Closed
 Course Drop Deadline – October 27, 2006

Thanksgiving Holiday – November 23 - 26 - No Classes
Final Exam – TBD, December 4-8, 2006

CS3335 Class Schedule (tentative)

- * Class 01 - Introduction (Aug 22):
 - o Course Overview
 - o Course Organization
 - o Reading chap 1 assigned
- * Class 02 - Bits and Bytes (Aug 24)
 - o Data Lab (L1) handed out
- * Class 03 - Integers (Aug 29)
 - o Quiz chap 1 due
 - o Reading chap 2 assigned
- * Class 04 - Floating point (Aug 31)
- * Class 05 - Machine-Level Programming I - Introduction (Sep 5)
 - o Quiz chap 2 due
 - o Reading chap 3.1 - 3.7 assigned
- * Class 06 - Machine-Level Programming II - Control Flow (Sep 7)
 - o Data Lab (L1) due
 - o Bomb Lab (L2) handed out
- * Class 07 - Machine-Level Programming III- Procedures (Sep 12)
 - o Quiz chap 3.1-3.7 due
 - o Reading chap 3.8 - 3.16 assigned
- * Class 08 - Machine-Level Programming IV - Structured Data (Sep 14)
- * Class 09 - Machine-Level Programming V - Miscellaneous Topics (Sep 19)
 - o Quiz chap 3.8 - 3.16 due
 - o Reading chap 5 assigned
- * Class 10 - Exam 1 (Sep 21)
 - o Bomb Lab (L2) due
 - o Buffer Lab (L3) handed out
- * Class 11 - Program Optimization I (Sep 26)
 - o Quiz chap 5 due
 - o Reading chap 6 assigned
- * Class 12 - Program Optimization II (Sep 28)
- * Class 13 - The Memory Hierarchy (Oct 3)
 - o Buffer Lab (L3) due
 - o Quiz chap 6 due
 - o Reading chap 7 assigned
- * Class 14 - Cache Memories (Oct 5)
 - o Performance Lab (L4) handed out
- * Class 15 - Linking (Oct 10)
 - o Quiz chap 7 due
 - o Reading chap 8 assigned
- * Class 16 - Exceptional Control Flow I (Oct 12)

- o Code examples: forks.c
- * Class 17 - Exceptional Control Flow II (Oct 17)
 - o Code examples: forks.c, external.c, internal.c,
 - o Quiz chap 8 due
 - o Reading chap 9 assigned
- * Class 18 - Measuring Program Execution Time (Oct 19)
 - o Performance Lab (L4) due
 - o Shell Lab (L5) handed out
- * Class 19 - Virtual Memory (Oct 24)
 - o Quiz chap 9 due
 - o Reading chap 10.1 - 10.8 assigned
- * Class 20 - P6/Linux Memory System (Oct 26)
 - o Shell Lab (L5) due
 - o Malloc Lab (L6) handed out
- * Class 21 - Dynamic Memory Allocation I (Oct 31)
 - o Quiz chap 10.1 - 10.8 due
 - o Reading chap 10.9 - 10.13 assigned
- * Class 22 - Dynamic Memory Allocation II (Nov 2)
- * Class 23 - System-Level I/O (Nov 7)
 - o Quiz chap 10.9 - 10.13 due
 - o Reading chap 11 assigned
- * Class 24 - Internetworking (Nov 9)
- * Class 25 - Exam 2 (Nov 14)
- * Class 26 - Network Programming (Nov 16)
 - o Malloc Lab (L6) due
 - o Quiz chap 11 due
 - o Reading chap 12 assigned
- * Class 27 - Web Services (Nov 21)
- * Class 28 - Concurrent Servers (Nov 28)
 - o Reading chap 12.1 - 13.8 assigned
- * Class 29 - Programming with Threads (Nov 30)

NOTE:

The student is responsible for changes that might occur with this schedule. In most cases, these changes will be announced in class and WebCT. It is imperative that the student attends class and check WebCT regularly in order to avoid missing updates.

Course Guidelines

Your grade is based on homework assignments, quizzes, class participation and exams.

- The text is REQUIRED for reference during lectures.
- There are NO make-up quizzes.
- Makeup exams must be approved prior (with valid excuse) or due to an exceptional situation (with supporting documentation).

- Quizzes are posted in WebCT and their solution has to be submitted through WebCT the due date before 8AM.
- Late labs will result in a ten percent reduction in grade for each day they are late. After 4 days the lab will not be accepted.
- You are responsible for keeping track of any changes to quizzes, exams, class meeting location and reading assignments as announced in class.

Grade Calculation:

Quizzes and class participation –	10%
Labs – 8% – 10% each	50%
Two exams - 10% each	20%
Final Exam –	20%
TOTAL -	100%

Attendance:

Your attendance is critical to your success in this course. You are expected to attend and actively participate in class. This includes being prepared for class. You are expected to read the assigned pages from the text and to hand in all homework on time.

Standards of Conduct:

Students are expected to conduct themselves in a professional and courteous manner, exhibiting the highest degree of academic integrity, as prescribed by the UTEP Standards of Conduct.

Students may discuss assignments in a general way with other students, but the solutions must be done independently. Graded work should be unmistakably your own. You may not transcribe or copy a solution taken from another person, book, or other source, (e.g., a web page). Professors are required to—and will—report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.

Disabilities:

If you feel you may have a disability that requires accommodation, contact the Disabled Student Services Office at 747-5148, go to Room 106 E. Union, or e-mail to dss@utep.edu.