

## CS 531 – Fundamentals of System Programming (3 Units)

[Professor Jim X. Chen](#)

### Course Description

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**Office/Hours:** Check out CS 531 in Blackboard.

#### Textbooks

*The C Programming Language*, Second Edition by Kernighan and Ritchie. (ISBN 0-13-110362-8)

*Mastering Algorithms with C*, by Kyle Loudon, O'Reilly, ISBN-10: 1565924533, ISBN-13: 978-1565924536

*Advanced Programming in the UNIX Environment* by W. Richard Stevens, Addison-Wesley Professional; 2nd (or 3rd) edition (June 17, 2005), ISBN-10: 0201433079, ISBN-13: 978-0201433074

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**DESCRIPTION:** CS 531 provides a hands-on introduction to systems programming with an emphasis on data structures and interfacing with the UNIX operating system. While focusing on the fundamental data structures necessary for designing and implementing systems applications, we introduce the Unix Application Programming Interface (API), signals, threads, and inter-process communication (IPC).

The objective of this course is to focus on the principles and pragmatic methods for designing and implementing solutions to problems in Computer Science. The course will be instructed in the C programming language and the techniques discussed will be relevant for low-level or systems programming tasks. The data structures and algorithmic design aspects of the course are relevant across many different fields and are language independent. This course will prepare you directly for CS571 (Operating Systems) and CS555 (Networking), as well as for CS540 (Language Processors), CS550 (Database Systems), CS551 (Computer Graphics), and CS580 (AI).

**Topics for this semester will include:**

- C Programming Language
  - Foundations, Control Flow, and Functions
  - Memory and Pointers, Address Arithmetic, Structures
  - Bitwise Operators
  - Text and Binary File I/O
  - Header Files

- Static and Dynamic Memory Allocation
- Unix API Calls
- Analysis of Algorithm Complexity
- Stacks, Queues, and Linked Lists
- Hashing, Trees, and Graphs
- Heaps and Queues
- Unix Processes, Signals, and Exceptions
- Multithreading and Inter-Process Communication

## **COURSE POLICIES**

*Class:* Students are expected to attend all lectures and are responsible for all material covered in lectures. Students are expected to work independently outside of class on homework assignments and projects. Course-related materials are posted on Blackboard in the folder Starting here! in weekly lessons.

*Reading:* Be aware that some material covered in class, which are posted in weekly lessons, may not be found in the textbook. For any doubts, students have opportunities to ask questions in class, on Blackboard, or during UTA/GTA/instructor office hours.

*Assignments:* Homework and project assignments will be posted on Blackboard in weekly lessons as they are assigned, and student solutions must be submitted on Blackboard by the specified deadline. For programming assignments, solution programs must run without obvious errors (even if not all functionalities are present). Any solution program that is submitted but either does not compile or has major errors when it is run will receive no more than 50% of the total credits. Therefore, develop your program and make sure it works at each developing stage.

*Deadlines:* The Blackboard system permits you, as a student in this course, to resubmit your work until the deadline for THREE times, so you may submit your work early and resubmit if you improve your work prior to the deadline. If you cannot finish, you should submit your work before the deadline for partial credits.

*Late work and missing participation:* No late work will be accepted except if you have a good reason and provide proofs.

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## **GRADING POLICY**

There are all together 100 points:

- Homework assignments (30 points)
- Quizzes (30 points)
- Final examination (40 points)
- Participation/Discussion (Optional: 5 extra points)

Your overall course score, S, will be the sum of these points.

- A: S is at least 90 points

- B: S is at least 80 points
  - C: S is at least 60 points
  - F: S is fewer than 60 points
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## **CLASS COMMUNICATIONS**

CS 531 will be using the Blackboard system for most class communications. You are responsible for any notifications/assignments or information posted on Blackboard either by your instructor or the class GTA. Some information may be disseminated through Blackboard or email rather than in class. Individual communications with the professor/GTA/UTA may be done by email using your GMU email account. When you email, please be sure to include the class number and the topic in the subject header. (e.g.: Subject: CS 531 / Homework 1).

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## **PROGRAMMING POLICIES**

(1) No sharing or discussion of code for assignments. Unless specifically stated otherwise, all assignments are individual assignments, not group assignments. Students are expected to do their own work, not to share programs with each other, nor copy programs from anyone else. However, you may offer limited assistance to your fellow students regarding questions or misunderstandings on their programming assignments by responding to queries on Blackboard. Suspected honor code violations are taken very seriously, and will be reported to the Honor Committee. (See CS [Honor Code](#))

(2) No incorporation of code from any source external to the course. You may not incorporate code written by others. Of course, you may freely use any code provided as part of the assignment specifications, and you need not credit the source. Working something out together with an instructor or TA will not require crediting the source.

(3) Back up your program regularly. You are expected to back up your program in separate files as you get different pieces working. Failure to do this may result in your getting a much lower grade on a program if last minute problems occur. (Accidentally deleting your program, having problems connecting, etc., will not be accepted as excuses.)

(4) Keep an untouched copy of your final code submission. It is important that you do not touch your programs once you have made your final submission. If there are any submission problems, consideration for credit will only be given if it can be verified that the programs were not changed after being submitted.

(5) Code must run on Mason gcc. Students may develop programs using any computer system they have available. However, submitted programs must run under gcc compiler available on Mason.

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## **OTHER POLICIES**

General Course Policies

- GMU Email Accounts: students must activate their GMU email accounts to receive important University information, including messages related to this class. You should understand that your email box may be full, so check your email and make sure you have enough space.

#### University Policies, Requirements, and Services

- The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university affairs.
- Academic Integrity: <http://oai.gmu.edu>
- Disability Statement: <http://ods.gmu.edu>
- Counselling and Psychological Services: <http://caps.gmu.edu>