

Fall 2005

# CEG 320/520: Computer Organization and Assembly Language Programming

Travis E. Doom

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Wright State University  
College of Engineering and Computer Science  
Department of Computer Science and Engineering

# Computer Organization and Assembly Language Programming

CEG 320/520

Fall Quarter, 2005

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**Professor:** Travis E. Doom, Ph.D.

**Professor's Office:** 331 Russ Engineering Center

**Office Hours:** 2:00-3:00 TR. Other office hours by appointment (via email).

**Email: (Preferred contact)** [travis.doom@wright.edu](mailto:travis.doom@wright.edu)

**Office Phone:** (937) 775-5105

**Room & Time:**

Section 01: 4:10 - 5:25 TR 148 Russ

**Course Description:**

Terminology and understanding of functional organizations and sequential operation of a digital computer. Program structure, and machine and assembly language topics including addressing, stacks, argument passing, arithmetic operations, traps, and input/output. Macros, modularization, linkers, and debuggers are used. Three hours lecture, two hours lab. Prerequisite: CS 242, CEG 260.

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**Textbook:**

*Required:* Patt, Yale and Patel, Sanjay (2004). "Introduction to Computing Systems, 2e", McGraw Hill, ISBN 0-070246750-9.

**Grading:** A student's demonstration of their ability to discuss issues, solve problems, and demonstrate mastery of computer organization and assembly language programming concepts will be the underlying metric for the determination of a student's overall grade in this course. Students will be provided the opportunity to demonstrate their mastery through examinations and laboratory projects. Grades will be assigned on a standard A/90%, B/80%, C/70%, D/60%, F/60%- scale. Clustering of grades may cause the thresholds to be lowered; they will not be raised. The instructor reserves the right to fail any student who does not attain both a passing grade (70%+) in the laboratory and at least a grade of 50% on the final. The overall course grade will be the weighted sum of the three grades:

20% Course Assignments (Projects, etc)	~5 @ ~10 pts. each	[50 pts. total]
40% Two (2) Mid-term Examinations	2 @ 50 pts. each	[100 pts. total]
40% Final Examination		100 pts.

**Laboratory Projects:** Points will be deducted for projects submitted late. No points will be awarded for projects that are more than one week late. Corrupt files or other computer problems will not be considered a sufficient excuse to extend this deadline. It is your responsibility to back-up your work!

**Course Assignments:** The instructor will provide a number of opportunities for students to develop their mastery of the subject throughout the course through ungraded course assignments. **Examinations:** Examinations will occur at the normally scheduled class time and location unless announced otherwise in class. The final examination is cumulative and will take place during the university scheduled time period in the normally scheduled class location unless announced otherwise in class.

It is neither possible, nor desirable, to discuss every nuance of the material covered in this course during our limited class time. Students should be aware that although we will discuss the most important materials in class, the textbook contains important facts that may not be discussed in class. Students should not only be able to discuss course concepts in detail, but they should also be able to demonstrate their mastery by applying these concepts on examinations to related problems with which they have no previous experience.

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**Academic Integrity :** Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses that they teach, and teachers must trust that the assignments which students turn in are their own. Acts which undermine this trust undermine the educational process. It is the policy of Wright State University to uphold and support standards of personal honesty and integrity for all students consistent with the goals of a community of scholars and students seeking knowledge and truth. Furthermore, it is the policy of the university to enforce these standards. The following recommendations are made for students:

1. Be honest at all times.
2. Act fairly towards others. For example, do not seek an unfair advantage over others by cheating with or by looking at other individual's work during examinations or laboratory assignments.
3. Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and reports acts of misconduct that you witness.
4. Know the policy -- ignorance is no defense. Read the policy contained in the student handbook. If you have any questions regarding academic misconduct, contact your instructor.

Students are encouraged to get together in small study groups to discuss the course topics and ungraded homework problems. However, **students must work on all graded course assignments and examinations on an individual basis.**

*Conduct for Laboratory Assignments:* Students may discuss "general concepts" of laboratories assignments with each other, but may not, under any circumstances, work with (or show) anyone on their actual implementation. If you work with other student on "general concepts" be certain to acknowledge the collaboration and its extent in the assignment. Unacknowledged collaboration will be considered dishonest. *You are responsible for ensuring that other students do not have access to your work* - do not give another student access to your account, do not leave printouts in the recycling bin, pick up your printouts promptly, do not leave your workstation unattended, etc. If you suspect that your work has been compromised notify your instructor immediately.

*Conduct for Examinations:* The academic code demands that no student should have an unfair advantage over any other student during examinations. Thus, it is strictly forbidden for any student to refer to information from previous offerings of this course unless this information is provided by the instructor

to all students fairly. Thus, the use of test banks of previous quizzes or asking questions about examinations or laboratory assignments to prior students is strictly forbidden.

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**Absences:** Class attendance will not be a direct factor in your grade but will strongly effect the quality of your education. Students who miss class are responsible for the material or announcements presented. Any extenuating circumstances which impact on your participation in the course should be discussed with me as soon as those circumstances are known. Make-ups for examinations may be arranged if a student's absence is caused by documented illness or personal emergency. It is the student's responsibility to provide a written explanation (including supporting evidence) to the instructor in a timely manner. Students registering after the term begins are responsible for all missed assignments and cannot expect that due dates will be altered.

**Additional Information:** Copies of the transparencies used in lecture and additional course-related information will be made available via course web page.

**Additional Needs:** Students with disabilities or any additional needs are encouraged to set up an appointment at their convenience to discuss any classroom accommodations that may be necessary.

CEG 320/520: <http://www.wright.edu/~travis.doom/courses/CEG320>

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*Dr. Travis Doom, [travis.doom@wright.edu](mailto:travis.doom@wright.edu).*

Last modified: 08/24/05



# Computer Organization and Assembly Language Programming

CEG 320/520

Fall Quarter, 2005

<b>Section I: Low-level structures, organization, and programming</b>		
<b>DATE</b>	<b>TOPIC / ACTIVITY</b>	<b>HOMEWORK ASSIGNMENT</b>
T 9/6	Class overview, Design abstraction and the digital computer	Read: Patt, Ch. 1
R 9/8	Representing information	Read: Patt, Ch 2.
T 9/13	Digital logic and the von Neumann Model	Read: Patt, Ch. 3 and 4.
R 9/15	A simple ISA: The LC-3	Read: Patt, Ch 5.
T 9/20	Machine Language Programming	Read: Patt, Ch 6.
R 9/22	Assembly Language Programming	Read: Patt, Ch 7 and 8.
T 9/27	I/O and Traps	Read: Patt, Ch 8 and 9.
R 9/29	Midterm Examination I	Study/Recover

<b>Section II: A programmer's perspective of system organization</b>		
<b>DATE</b>	<b>TOPIC / ACTIVITY</b>	<b>HOMEWORK ASSIGNMENT</b>
T 10/4	The runtime stack	Read: Patt, Ch 10.
R 10/6	Linking and compiling high-level languages	Read: Patt, Ch 11, 12, 13, 15.
T 10/11	Allocation records and the run-time stack	Read: Patt, Ch 12 and 14.
R 10/13	Implementation of Pointers and Arrays	Read: Patt, Ch 16.
T 10/18	Recursion	Read: Patt, Ch 17.
R 10/20	High-level I/O	Read: Patt, Ch 18.
T 10/25	Dynamic memory allocation	Read: Patt, Ch 19.
R 10/27	Midterm Examination II	Study/Recover

<b>Section III: Optimizing Program Performance</b>		
<b>DATE</b>	<b>TOPIC / ACTIVITY</b>	<b>HOMEWORK ASSIGNMENT</b>
T 11/1	Memory Hierachy and Cache-friendly code	TBD
R 11/3	Capabilities/Limitations of Optimizing	TBD

	Compilers	
T 11/8	x86	Read: Patt, Appendix.
R 11/10	Course Review	Study for Final
R 11/15	Final examination	5:45-7:45; Regularly scheduled class room

NOTE: As this is the instructor's first offering of this course the course schedule should be considered VERY tentative. This page was last modified on Monday, 01-Aug-2005 11:19:18 EDT. Assignments prior to this date should be accurate. Assignments listed after this date are *projections* and may not correspond to the actual material and assignments presented in class.

The most recent version of this document is available on the world wide web via:  
<http://www.wright.edu/~travis.doom/courses/CEG320>

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Last modified: 08/01/05