

# CMSC 311

## Computer Organization

### Syllabus

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<b>Catalog listing:</b>	CMSC 311
<b>Course Level:</b>	Undergraduate
<b>Prerequisites:</b>	A minimum grade of C in CMSC 101 and MATH 211 (pre-/co-requisite: CMSC 302)
<b>Instructor:</b>	Dr. Changqing Luo
<b>Office:</b>	Engineering Research Building 2312
<b>Phone:</b>	(804) 828-0460
<b>Email:</b>	cluo@vcu.edu
<b>Classroom:</b>	Engineering Building West 0101
<b>Class website:</b>	Canvas
<b>Office Hours:</b>	TR 11:30 AM – 12:30 PM (or by appointment)

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### 1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Introduction to the basic organization of computers including elementary digital logic design, processor and arithmetic/logic unit design, data paths, memory hierarchy, I/O devices, instruction set architecture, addressing modes, and data representation.

### 2.0 – Course Structure:

Lecture hours<sup>1</sup>/week – 3

Lab hours/week – 0

### 3.0 – Course Goals

Upon successful completion of this course, the student will be able to:

1. Understand computer system organization
2. Understand data types and their representations
3. Understand digital logic circuits and state machine
4. Understand machine language
5. Understand memory hierarchy

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<sup>1</sup> This course has built-in lab sessions in programming. Please **bring your computer** to the class.

6. Understand system-level I/O
7. Understand virtual memory
8. Understand processor architecture

#### **4.0 – ABET Criteria Addressed:**

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.

#### **5.0 – Major Topics Covered:**

- A tour of computer system
- Data types and representations
- Digital Logic Structures
- The von Neumann Model
- Instruction Set Architecture: the LC-3
- Machine Language & Programming
- Assembly Language & Programming
- I/O
- Trap Routines/Subroutines
- Stack
- Memory management

#### **6.0 – Textbook(s):**

“Introduction to Computing Systems: From bits & gates to C and beyond,” by Yale N. Patt and Sanjay J. Patel, McGraw-Hill, 3rd Edition, ISBN-13: 978-1260565911 / ISBN-10: 1260565912 / ISBN-13: 978-1260424744 / ISBN-10: 126042474X / ISBN-13: 978-1260150537 / ISBN-10: 1260150534

“Computer Systems - A Programmer’s Perspective,” by R. Bryant and D. O’Hallaron, Prentice Hall, 2nd Edition, 2011, ISBN: 10: 0-13-610804-0.

(The first book is the required textbook. Depending on the form of the book, e.g., ebook, loose leaf, hardcover, the ISBN number may be different. The second book is a reference. The Powerpoint slides should be sufficient to cover it. But you can get more technical details as needed from the second book.)

#### **7.0 – Class Schedule:**

- Lecture: TR 3:30-4:45 PM, Engineering Building West 0101

## 8.0 – Evaluation:

### □ General Instructions:

1. All assignments must be uploaded to Canvas on or before the due date specified. Only files submitted to Canvas on or before the due date will be considered for grading. Requests to re-grade assignments must be made with one week from the date the grade is posted in Canvas, requests after this time will be denied.

2. No assignments will be accepted late unless special permission has been given prior to the due date.

3. No makeup exams will be given unless special permission has been given prior to the date of the test. Request to adjust scores or re-grade exams must be made at the end of the class meeting in which the exam is returned, requests after this time will be denied.

4. Students will not be allowed to communicate in any way during an exam, nor use an Internet or classroom search. Any perceived communication or search will result in an academic integrity violation.

5. Do your own work. Plagiarism applies to all assessments as with any other intellectual property. Plagiarism is a form of cheating and will be treated as such.

### □ General Info:

**Final grade:** A ( $\geq 90\%$ ), B ( $\geq 80\%$  and  $< 90\%$ ), C ( $\geq 70\%$  and  $> 80\%$ ), D ( $\geq 60\%$  and  $< 70\%$ ), F ( $< 59\%$ )

**Homework:** 5 homework assignments via Canvas.

**Lab:** There will be 4 in-class lab assignments. (*Bring your computer!*)

**Exam:** There will be 3 close book exams.

**Late submission:** *No late submission will be accepted and no exception.*

**Class participation:** You are required to attend class.

**Grading:** Assignments will be graded within a week of their due date.

### □ Course Grading Policy:

Category	Weight (%)
Assignment	25%
In-session Lab	20%
Exam I	15%
Exam II	15%
Exam III	25%

Note: Any dispute of grade must be brought to the instructor's attention within a week from when the grade is posted to Canvas. Students are responsible to check grades on Canvas regularly and report issues to the instructor in a timely manner. *A dispute outside the time period will not be considered.*

## 9.0 – Technology Support

### Engineering & VCU Resources:

- **Personal Computer Requirement:** For our current system requirements and recommendations, see: <https://egr.vcu.edu/admissions/accepted/computer-recommendations/>
- **Remote Access to Public Lab computers:** To provide remote access, we use the Citrix App2Go environment to provide full and exclusive control over "the next available" computer in the lab. See this link for more details: <https://wiki.vcu.edu/x/Oa0tBg>
- **VCU provides a lot of software available for students to download to their personal computers.** For a list of software and the specifics for each, see: <https://ts.vcu.edu/software-center/>. In particular, Microsoft Office is available free to students.
- **VCU is transitioning to Canvas.** See the Canvas Student Guide at this link: <https://community.canvaslms.com/t5/Student-Guide/tkb-p/student>
- **For IT help in the College of Engineering,** see our Wikipedia for "student" help at: <https://wiki.vcu.edu/display/EGRITHELP>
- **VCU's Technology Services (TS) provides support for "central IT" services.** If you have a technical issue with any of the following services, please submit a ticket with VCU Technology Services at <https://itsupport.vcu.edu/> or call (804) 828-2227. VCU TS maintains and supports these services and will be able to provide assistance to you.
  - o VCU Cisco VPN
  - o 2Factor or Dual Authentication (DUO)
  - o Blackboard/Canvas
  - o Gmail or other Google Apps
  - o Zoom videoconferencing
  - o VCU App2Go (Application server)
  - o Resetting VCU password
- **For IT issues related to College of Engineering teaching and research,** email [egrfixit@vcu.edu](mailto:egrfixit@vcu.edu)
- **For loaner Chromebooks for emergency purposes:** See this link for more details: <https://vcutsmpc.getconnect2.com/>

### General Instructions:

1. Clear your browser's cache.
2. Shutdown and restart your computer.
3. If your problems persist, contact the IT support center [itsc@vcu.edu](mailto:itsc@vcu.edu) or 804-828-2227.

## 10.0– Others:

The university publishes the last day to withdraw from a course on the academic calendar (<https://academiccalendars.vcu.edu/>) each semester. ***Students are responsible to check the calendar and withdraw from the course before the last day in case of need.***

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## **Student responsibilities**

**(source: One VCU: Responsible Together available at: <https://together.vcu.edu/students/>)**

When we return, things will look and feel different as we take necessary steps to protect the well-being of our community. Here is what is expected of you:

- Monitor your health daily. Testing will occur according to protocols.
- Wear a face covering or mask in common areas, including class.
- Apply physical distance guidelines to all settings.
- Clean and disinfect personal and shared spaces before and after use. Cleaning supplies will be available in numerous locations.
- Report symptoms associated with COVID-19 to VCU Student Health Services. A call center hotline will be available later in the summer.
- Not sharing is caring during this unique pandemic. Please do not share calculators, tools, lab supplies, etc.

Following rules regarding face coverings or masks, cleaning and disinfecting, and physical distancing is required. Students will receive reminders for daily health monitoring. Staff in the Dean of Students office will be notified after incidents of non-compliance. Refusal to comply with rules can include progressive disciplinary action up to and including suspension, based on the VCU Student Code of Conduct.

## **Requesting accommodations**

**(from One VCU: Responsible Together)**

The university recognizes that some students who previously did not need Section 504 Academic Accommodations, and who have a qualifying condition or disability, may need support or assistance during the return to campus process. A modified approach for the temporary and more permanent need for accommodation has been developed and implemented to provide students with full access to programs and activities related to their academic majors. Because every case is different, student requests are evaluated on a case-by-case basis. Please share your need for an accommodation with the Student Accessibility and Education Office, or for MCV Campus students, the Division for Academic Success, after you have worked directly with your faculty member.

## **Health and well-being**

**(from One VCU: Responsible Together)**

Navigating the anticipated stressors of daily life can often be challenging enough. When unexpected stressors emerge or when we are faced with uncertainty, it can be tough to know how to cope. Try out some of these tips and resources for health and wellness to see if they are a right fit for you.

*Symptoms or Diagnosis:* If an on-campus student identifies symptoms, has tested positive for COVID-19 or has come into contact with someone diagnosed with COVID-19, that student should contact University Student Health Services. At that point, isolation should begin and contact tracing will be performed by Student Health Services. Symptoms will be monitored and the student should refer to a medical provider if symptoms worsen or be released from isolation after 14 days, if symptom-free.

## **Nondiscrimination policy**

**(from One VCU: Responsible Together)**

VCU is committed to providing a safe, equitable and inclusive environment for all its employees, patients and students. Discrimination or discriminatory harassment is not only unlawful, it is harmful to the well-being of our university community. Our university's core values, specifically those related to diversity and inclusion, have withstood many difficult situations and trying times, and they will not falter now.

Reports of discrimination, bullying, harassment and/or stereotyping of persons of color or those impacted by COVID-19 or otherwise, will not be tolerated. Be assured that VCU will make every effort to address and prevent the occurrence of unlawful discrimination and, if necessary, take prompt and appropriate action to remedy and prevent its reoccurrence.

Every member of our community is asked to:

- Become familiar with the university's policies on Preventing and Responding to Discrimination and Duty to Report and Protection from Retaliation in the VCU Policy Library.
- Consult with Equity and Access Services or VCU Human Resources for additional guidance on how to file a report of discrimination.
- Contact the Office of Institutional Equity, Effectiveness and Success (IES) on how to address and maintain a culture of inclusion.
- Encourage individuals who may need an ADA accommodation for a known or newly acquired disability, to contact the ADA/504 Coordinator in ADA Services.
- Bookmark and share information on university or community agencies that offer support or services, such as VCU's Counseling Services or Ombudsperson.
- Explore training and educational opportunities on diversity and inclusion at IExcel Education and through the Office of Institutional Equity, Effectiveness and Success.
- Offer nonjudgmental support and empathy to those affected by current events and this health crisis.

I want you to know that I am grateful for your presence and input in our classrooms (whether in person or online). I appreciate and welcome you regardless of your immigration status, country of origin and/or citizenship, race, ethnicity, religious affiliation, gender/sex, gender identity, sexual orientation, age, or dis/ability. Thank you for enriching our world, sharing your vital experience, and contributing to the diversity that makes our intellectual community vibrant and evermore creative.

### **Tips for Success:**

- When taking online and hybrid courses, your self-motivation and self-pacing are absolutely critical. For this course, you should plan to work about 7-9 hours per course module as we move through the materials. Be sure to plan your time accordingly.
- Make yourself a calendar with all of your due dates across ALL of your courses. Plan for when you will work on each one for completion in advance of the due dates.
- Make sure you note any "online" course that still have a required meeting time (such as a Google Meet or Zoom session).
- Avoid the common assumption that online courses are easier or should be easier. That is a MYTH!!
- Plan Ahead!! Study as you go instead of at the last minute!

### **Where to post questions**

Questions of general interest should first be posted to the discussion board (only if they have not already been answered) so that other students can benefit from the response or have an opportunity to respond to your question. Only questions of a private nature should be communicated to me through email. When sending a message to me, please allow a minimum of 24 hours for a response. Most of the time I will respond much faster, but sometimes meetings and other courses take over my schedule.

### **Netiquette Guidelines**

Netiquette is a set of rules for behaving properly online. Your instructor and fellow students wish to foster a safe online learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea but you are not to attack an individual. Working as a community of learners, we can build a polite and respectful course community. The following netiquette tips will enhance the learning experience for everyone in the course:

- Do not dominate any discussion.
- Give other students the opportunity to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Popular emoticons such as ☺ can be helpful to convey your tone but do not overdo or overuse them.
- Never make fun of someone's ability to read or write.
- Share tips with other students.
- Keep an "open-mind" and be willing to express even your academically informed opinion.
- Think and edit before you push the "Send" button.
- Do not hesitate to ask for feedback.
- Using humor is acceptable (adapted from UWSP)

### **Be Proactive in Communication with Instructor**

If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible. As you will find, building rapport and effective relationships are key to becoming an effective professional. Make sure that you are proactive in informing your instructor when difficulties arise during the semester so that we can help you find a solution. (adapted from UWSP)

### **Campus emergency information**

What to know and do to be prepared for emergencies at VCU:

- Sign up to receive VCU text messaging alerts. Keep your information up-to-date. Within the classroom, the professor will keep his or her phone on to receive any emergency transmissions.
- Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms.
- Listen for and follow instructions from VCU or other designated authorities. Within the classroom, follow your professor's instructions.
- Know where to go for additional emergency information.
- Know the emergency phone number for the VCU Police (828-1234).
- Report suspicious activities and objects.
- Keep your permanent address and emergency contact information current in eServices.

### **Course Attendance and Participation**

It is expected that you will spend between 9-12 hours a week on this class completing readings, activities, and engaging with your peers. For every credit hour it is expected that students are putting in 3-4 hours of work. This is a 3-credit class therefore you should expect to spend 9-12 hours per week on this class. In addition, it is expected that you are logging into the course several times throughout the week to complete assignments and engage with your classmates.

### **Important dates**

You can view important dates for the semester in the academic calendar.

### **Honor System: upholding academic integrity**

The VCU Honor System policy describes the responsibilities of students, faculty and administration in upholding academic integrity, while at the same time respecting the rights of individuals to the due process offered by administrative hearings and appeals. According to this policy, "Members of the academic community are required to conduct themselves in accordance with the highest standards of academic honesty, ethics and integrity at all times." In addition, "To support a commitment to the Honor System, all members of the VCU community are required to:

- Adhere to the Honor System policy and its procedures;
- Report any suspicion or knowledge of possible violations of the Honor System;
- Answer truthfully when called upon to do so regarding Honor System matters;
- Maintain appropriate confidentiality regarding related to Honor System matters.

More information can be found at in the <https://students.vcu.edu/studentconduct/>.

### **Managing stress**

Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, alcohol and/or other drug use, concern for a friend or family member, loss, sleep difficulties, feeling hopeless or relationship problems. There are numerous campus resources available to students including University Counseling Services (804-828-6200 MPC Campus, 804-828-3964 MCV Campus), University Student Health Services (MPC 804 828-8828, MCV Campus 804 828-9220) and the Wellness Resource Center (804-828-9355). 24 hour emergency mental health support is available by calling 828-1234 and asking to speak to the on-call therapist or utilizing the National Suicide Prevention Lifeline (1-800-784-2433).

### **Tutoring**

The Campus Learning Center offers appointment, drop-in and group tutoring in undergraduate courses across the disciplines.

### **Writing Center**

The writing center provides assistance at all stages of the writing process, from brainstorming to final draft.

### **Mandatory responsibility of faculty members to report incidents of sexual misconduct**

It is important for students to know that all faculty members are mandated reporters of any incidents of sexual misconduct/violence (e.g., sexual assault, sexual exploitation and partner or relationship violence). This means that faculty cannot keep information about sexual misconduct/violence confidential if you share that information with them and they must report this information immediately to the university's Title IX Coordinator. In addition, department chairs, deans, and other unit administrators are required to report incidents of sex or gender-based discrimination to the university's Title IX Coordinator. Once a report is made, you will receive important information on your reporting options, on campus and off campus resources and remedial measures such as no-contact directives, residence modifications, and academic modifications. If you would prefer to speak with someone confidentially for support and to discuss your options for reporting, contact:

- VCU's Wellness Resource Center
  - o 804.828.9355 | [myoptions@vcu.edu](mailto:myoptions@vcu.edu) | [thewell.vcu.edu](http://thewell.vcu.edu)
- Greater Richmond Regional Hotline (Community program)
  - o 804.612.6126 | 24-hour hotline
- VCU's Counseling Services
  - o 804-828-6200



For more information on how to help, please click [here](#). The Policy on Sexual Misconduct/Violence and Sex/Gender Discrimination, can be found in the VCU policy library. For more information about the University's Title IX process, please visit [equity.vcu.edu](http://equity.vcu.edu).

### **Students with disabilities**

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, as amended, require that VCU provide "academic adjustments" or "reasonable accommodations" to any student who has a physical or mental impairment that substantially limits a major life activity. To receive accommodations, students must register with the Office of Student Accessibility and Educational Opportunity on the Monroe Park Campus (828-2253) or the Division for Academic Success on the MCV campus (828-9782). Please also visit the Student Accessibility and Educational Opportunity website and/or the Division for Academic Success website for additional information.

Once students have completed the registration process, they should schedule a meeting with their instructor (s) and provide their instructor (s) with an official accommodation letter. Accommodation letters will outline the required classroom accommodations. Additionally, if coursework requires the student to work in a lab environment, the student should advise the instructor or a department chairperson of any concerns that the student may have regarding safety issues related to a disability. Students should follow this procedure for all courses in the academic semester.

### **Military short-term training or deployment**

If military students receive orders for short-term training or for deployment/mobilization, they should inform and present their orders to Military Student Services and to their professor(s). For further information on policies and procedures contact Military Student Services at 828-5993 or access the corresponding policies.

### **Additional Resources**

Students should visit <http://go.vcu.edu/syllabus> and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.

### **Student conduct in the classroom**

According to the Faculty Guide to Student Conduct in Instructional Settings, "The university is a community of learners. Students, as well as faculty, have a responsibility for creating and maintaining an environment that supports effective instruction. In order for faculty members (including graduate teaching assistants) to provide and students to receive effective instruction in classrooms, laboratories, studios, online courses, and other learning areas, the university expects students to conduct themselves in an orderly and cooperative manner."

This applies to the virtual classroom as well and discussions will be monitored for appropriate conduct. The Student Code of Conduct also prohibits the possession of or carrying of any weapon. For more information see <http://register.dls.virginia.gov/details.aspx?id=3436>.

### **Student email policy**

Email is considered an official method for communication at VCU because it delivers information in a convenient, timely, cost-effective, and environmentally aware manner. Students are expected to check their official VCU email on a frequent and consistent basis in order to remain informed of university-related communications. The university recommends checking email daily. Students are responsible for the consequences of not reading, in a timely fashion, university-related communications sent to their official VCU

student email account. This policy ensures that all students have access to this important form of communication. It ensures students can be reached through a standardized channel by faculty and other staff of the university as needed. Mail sent to the VCU email address may include notification of university-related actions, including disciplinary action. Please read the policy in its entirety at the VCU Policy Library.

### **Student financial responsibility**

Students assume the responsibility of full payment of tuition and fees generated from their registration and all charges for housing and dining services, and other applicable miscellaneous charges. Students are ultimately responsible for any unpaid balance on their account as a result of the University Financial Aid Office or their third party sponsor canceling or reducing their award(s).

### **Students representing the university – excused absences**

Students who represent the university (athletes and others) do not choose their schedules. Student athletes are required to attend games and/or meets. All student athletes should provide their schedules to their instructors at the beginning of the semester. The Intercollegiate Athletic Council strongly encourages faculty to treat missed classes or exams (because of a scheduling conflict) as excused absences and urges faculty to work with the students to make up the work or exam.

### **Withdrawal from classes**

Before withdrawing from classes, students should consult their instructor as well as other appropriate university offices. Withdrawing from classes may negatively impact a student's financial aid award and his or her semester charges. To discuss financial aid and the student bill, visit the Student Services Center at 1015 Floyd Avenue (Harris Hall) and/or contact your financial aid counselor regarding the impact on your financial aid.

### **Faculty communication about students**

VCU instructional faculty, administrators and staff maintain confidentiality of student records and disclose information in accordance with the Family Educational Rights and Privacy Act (FERPA). This means that VCU officials may disclose student record information without the consent of the student in certain situations. To support university operations, for example, VCU officials share information about students with other educational officials as necessary to perform their job duties. FERPA permits this disclosure to school officials who have a legitimate educational interest in the student information. In addition, VCU officials have obligations to report information shared by a student depending on the content of that information, for example, in compliance with VCU's policy on the duty to report ([policy.vcu.edu](http://policy.vcu.edu)). Unless FERPA permits a certain disclosure, VCU generally requires consent from a student to disclose information from their education record to another individual. You may find additional information on the VCU FERPA website: <http://rar.vcu.edu/records/family-educational-rights-and-privacy-act/>.