

CMSC 502 Parallel Algorithms Syllabus

Catalog listing:	CMSC 502
Course Level:	Graduate
Prerequisites:	CMSC 401 and CMSC 312; graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science
Instructor:	Preetam Ghosh
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Classroom:	ENGRB 0105
Class website:	Canvas
Office Hours:	T/R 12:30-1:30PM

1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 312 and CMSC 401, graduate student standing or acceptance into the five-year accelerated B.S. and M.S. program in computer science. Software and hardware mechanisms for providing mutual exclusion in uniprocessor and multiprocessor environments. Architectural issues including pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues. Design and uses of parallel algorithms to solve concurrency problems in a distributed environment including message passing and remote procedure calls. Students will work in teams (as well as on individual projects) to design and implement parallel algorithms.

2.0 – Course Structure:

Lecture hours/week – 3 Lab hours/week – 0

3.0 – Course Goals

The course is designed as a fundamental systems level course. The students will be expected to work in UNIX and C/C++ languages. The students will also be expected to have mathematical models and analytical reasoning abilities.

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

- Software and hardware mechanisms for providing mutual exclusion in uniprocessor and multiprocessor environments.
- Architectural issues including pipeline design, superscalar computers, multiprocessors, memory systems, peripherals, interfacing techniques, networks, performance and software issues.
- Design and use of parallel algorithms to solve concurrency problems in a distributed environment including message passing and remote procedure calls.

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.
3. Communicate effectively in a variety of professional contexts.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

Other Criteria Addressed:

- Substantial coverage of at least one general-purpose programming language.
- A major project that requires integration and application of knowledge and skills acquired in earlier course work.

5.0 – Major Topics Covered:

- Parallel architectures, data structures and communication operations
- Parallel performance metrics
- Using MPI and Posix Threads
- Dense matrix algorithms
- Parallel sorting
- Parallel graph algorithms
- Distributed dynamic programming algorithms
- Parallel discrete optimization algorithms

6.0 – Textbook(s):

Introduction to Parallel Computing, 2nd Edition, Grama, Gupta, Karypis and Kumar, ISBN: 0-201-64865-2

7.0 – Class Schedule (In person modality):

- Lecture: 3, Bldg. Engineering - West Hall , Room ENGRB 105

8.0 – Evaluation:

General Instructions:

There will be 4-5 programming assignments. These assignments will be worth 30% of the final grade. All assignments will be electronically submitted. Each assignment will be due at the start of the class period of the due date.

There will be 1 test which will be comprehensive with emphasis on recent topics and worth 30% of the final grade.

Research paper presentations will be worth 10% of the grade. Additionally, there will be a separate research project worth 30% of the final grade.

Grading Scale

90 – 100 %	A
75 – 89 %	B
60 – 74 %	C
50 – 59 %	D
50 %	and below F

Class Participation: To be successful in both projects and exams a regular class attendance is necessary.

Grading:

Category	% weight
Assignments	30%
Research Paper presentation	10%
Test	30%
Research Project	30%

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.

Class registration required for attendance

Students may attend only those classes for which they have registered. Faculty may not add students to class rosters or Blackboard. Therefore, if students are attending a class for which they have not registered, they must stop attending.

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 [VCU policy library](#).

Important dates

You can view important dates for the semester in the [academic calendar](#).

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).

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 nocontact 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

804.828.9355 | myoptions@vcu.edu | thewell.vcu.edu

Greater Richmond Regional Hotline (Community program)

804.612.6126 | 24-hour hotline

VCU's Counseling Services 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.

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.

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." Among other things, cell phones should be turned off while in the classroom. 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.

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.

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). 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-andprivacy-act/>.