

CMSC 591

Robotic Vision

Catalog listing:	CMSC 591
Course Level:	Graduate
Prerequisites:	CMSC 257 with a minimum grade of C
Instructor:	Cang Ye
Phone:	(804) 827-0346
Email:	cye@vcu.edu
Class website:	http://blackboard.vcu.edu
Office Hours:	TR 1:30 - 2:30 PM or by appointment

1.0 – Overview (Catalog Course Description):

This course focuses on recent advancements in 3D robotic vision. It covers basic concepts and computational models of 3D sensing, robotic mapping kinematic model, visual odometry, simultaneous localization and mapping, as well as 3D point data processing for robotic navigation. Students will acquire in-depth knowledge in robotic vision by completing a course project.

2.0 – Course Structure:

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

3.0 – Course Goals

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

1. Understand the state-of-the-art 3D computer vision theory
2. Use advanced 3D imaging sensors and the software tools
3. Design a 3D computer vision software system for robotic applications

4.0 – Major Topics Covered:

- Overview
- Sensing
- Color-Depth Sensing
- Robotic Mapping: Kinematic Model
- ROS: Robot Operating System

- Visual Odometry
- Pose Estimation: Simultaneous Localization and Mapping
- 3D point Data Segmentation and Navigation
- Object Recognition based on Geometric Information

5.0 – Textbook(s):

There is no required textbook. Class notes and some reading materials will be provided via Blackboard by the instructor.

6.0 – Class Schedule:

- Lecture: TR 11:00 AM-12:15 PM via Zoom (a link will be emailed)

7.0 – Evaluation:

General Instructions:

A	[90% - 100%]
B	[80% - 89%]
C	[70% - 79%]
D	[60% - 69%]
F	[0% - 59%]

Grading:

Category	Weight (%)
Project	30%
Presentation/Homework	30%
Midterm	25%
Attendance	15%

Any dispute of grade must be brought to the instructor's attention within **10 days** from the time the grade is posted to blackboard. Students are responsible to check grades on blackboard regularly and report issues to the instructor in a timely manner. **A dispute outside the period will not be considered.**

8.0– 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 as needed.**

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/Oa0tBq>
- **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.
 - VCU Cisco VPN
 - 2Factor or Dual Authentication (DUO)
 - Blackboard/Canvas
 - Gmail or other Google Apps
 - Zoom videoconferencing
 - VCU App2Go (Application server)
 - Resetting VCU password
- **For IT issues related to College of Engineering teaching and research**, email egrfixit@vcu.edu
- **For loaner Chromebooks for emergency purposes:** See this link for more details: <https://vcutsmpc.getconnect2.com/>

VCU Syllabus Statement

Students should review **all** syllabus statement information.

Visit <http://go.vcu.edu/syllabus> to view online.

Syllabus Statement topics include:

1. [Campus emergency information](#)
2. [Class registration required for attendance](#)
3. [Honor System: upholding academic integrity](#)
4. [Important dates](#)
5. [Managing stress](#)
6. [Mandatory responsibility of faculty members to report incidents of sexual misconduct](#)

7. [Military short-term training or deployment](#)
8. [Student email standard](#)
9. [Student financial responsibility](#)
10. [Students representing the university - excused absences](#)
11. [Students with disabilities](#)
12. [Withdrawal from classes](#)
13. [Faculty communication about students](#)

Campus emergency information

- Sign up to receive at alert.vcu.edu/signup/. It is essential to keep your information up-to-date within VCU Alert and to keep your permanent address and emergency contact information current in eServices.
- VCU uses a variety of communication methods to alert the campus community about emergency situations and safety threats. Learn more about types of alerts at alert.vcu.edu/know/typesofalerts.php
- Know the emergency phone number for the VCU Police (828-1234), and report suspicious activities and objects.

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. 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. 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." Students are expected to read the policy in full and learn about requirements here: <https://conduct.students.vcu.edu/vcu-honor-system/>

Important dates

Important dates for the semester are listed in the VCU Academic Calendar: <https://academiccalendars.vcu.edu/>

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

All employees, including faculty, department chairs and deans, are required to report any incidents of sexual assault, sexual exploitation and partner or relationship violence to the university's Title IX Coordinator.

Confidential offices which can provide support at VCU are: University Counseling Services (804) 828-6200

For more information about Title IX, please visit please visit <https://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 email standard

Email is considered an official method for communication at VCU. Students are expected to check their official VCU email on a frequent and consistent basis (the university recommends daily) in order to remain informed of university-related communications. Students are responsible for the consequences of not reading, in a timely fashion, university-related communications sent to their official VCU student email account. Mail sent to the VCU email address may include notification of university-related actions, including disciplinary action. Students must read this standard in its entirety at <https://ts.vcu.edu/media/technology-services/content-assets/university-resources/ts-groups/information-security/StudentEmailStandard.pdf>

Student financial responsibility

Students assume the responsibility of full payment of tuition and fees generated from their registration, 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. 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 via <https://saeo.vcu.edu/> and/or the Division for Academic Success website via <https://das.vcu.edu/> 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. 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. 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/>.
