**Course Syllabus**

**CSCI 5280: Software-Defined Networking  
Fall 2022 (12:30 – 1:45 p.m., T/TH, Rm. ECCR 155, 3 Credits)**

## Course Description and Objectives

This course provides an in-depth immersion into the foundational theories and technologies of Software-Defined Networking (SDN), Network Functions Virtualization (NFV) and emerging technologies for computer networks. Expanding on the theoretical knowledge learned throughout the course, students will gain direct experience with real-world lab experiments and demonstrations, which will give them an advantage in the field for this in-demand, constantly changing subject. Popular software and technologies in industry and research institutions, such as Floodlight, Mininet, ONOS, Open vSwitch, OpenFlow, OpenDaylight, OpenStack, and Ryu will be analyzed and used throughout the course to synthesize the theoretical and applied understanding of how high-level software programs can control the behavior of the entire physical network. This course is essential in preparing students to apply their fundamental networking and automation knowledge to the real-world they will enter upon graduation.

In this class students learn, analyze, and apply the fundamentals of next generation network theoretical technologies, services, and tools used in industry and research institutions to design, deploy, and troubleshoot next generation networks through the following key objectives:

* Understand, analyze, and evaluate the core technologies, theories, and dilemmas that face next generation network engineers.
* Understand, analyze, and implement best practices about how to design, deploy, and troubleshoot next generation networks.
* Utilize multivendor, vendor neutral (bare-metal), and commercial equipment (such as Arista, Cisco, Dell, HP, Pica8) to reinforce theoretical knowledge in applied, hands-on labs.

The Software-Defined Networking course covers these topics and achieves these objectives through applied, hands-on lab exercises built around real-world applications and theories presented in the lectures. The course is split into the following units of study:

* Introduction to SDN
* Control Plane and Data Plane
* OpenFlow Fundamentals
* SDN in Business and Key Players
* Cloud and Data Center Architecture
* Next Generation Security
* Network Functions Virtualization

Students successfully completing this course should gain a much greater appreciation of the breadth of theoretical technologies as well as the in-depth procedures required in designing, deploying, and troubleshooting next generation networks. The complex interactions among these aspects are shaping the future of this critical sector of network engineering. The resulting understanding should enhance employment or promotion opportunities in the network engineering sector and enhance the student’s ability to participate in the public discourse regarding the future of the next generation networks.

Upon successfully completing this course, the students will be able to expand upon the theoretical and applied knowledge learned and apply it to vendor neutral SDN/NFV specific industry certifications, such as the ONF-Certified SDN Associate and MEF SDN/NFV Certified Professional. In the competitive job market, understanding the future of networking is necessary. The knowledge and skills gained from this course, when combined with the core Computer Science courses, will provide a well-rounded, highly desirable network engineer.

# Course Outcomes

Upon completion of this course, students are able to:

* Explain, apply, analyze, evaluate, and create original work in the field of software-defined networking
  + Analyze historical network engineering and determine the benefits and evolution of programmable SDN
  + Understand, implement, and analyze SDN software tools and evaluate how they differ from traditional network system and protocols
  + Enhance the understanding of how a separated control plane enhances network functionalities by understanding, implementing, evaluating, and analyzing open and commercial SDN controllers in virtualized and physical infrastructure
  + Understand, implement, analyze, and create original work related to the OpenFlow protocol technology
    - Design, develop, and implement original OpenFlow-based software application solutions to be demonstrated and analyzed in a virtual and hardware environment that reinforces how next-generation network engineering enhances traditional networking
    - Enforce theoretical understanding of how network abstraction alleviates problems in traditional network engineering by implementing northbound applications using APIs to communicate with the SDN controller to
      * Utilize REST (and secure REST) API to communicate from developed GUI to SDN controller
      * Store and parse files in JSON
      * Manage all code via CI/CD using Git
      * Develop web interfaces to accept, present, and abstract information to the client
  + Learn why traditional networking technologies do not operate efficiently on scale by designing, developing, and implementing SDN network automation software applications using technologies to configure both virtualized and physical network infrastructures using tools and technologies
  + Evaluate how next-generation networks can improve network security by understanding and implementing SDN security technologies and processes
    - Design and implement software and hardware solutions to prevent attacks on SDN controllers
    - Configure SSL northbound controller connections
    - Establish TLS connectivity from SDN switches to controllers
  + Understanding and demonstrate practical network engineering technologies and theories, as well as critical thinking and troubleshooting to apply theoretical knowledge into practice for merging traditional, virtual, physical, and SDN, as well as provide a solution based on a created mixed network design that solves current problems in network engineering
  + Explain and evaluate technologies and theories in SDN such as
    - Containers
    - Data Center and Cloud
    - Network Functions Virtualization and Virtual Network Functions
    - Transition from traditional networks to SDN

## Instructor

Dr. Levi Perigo

Scholar in Residence

Department of Computer Science | Network Engineering

[levi.perigo@colorado.edu](mailto:levi.perigo@colorado.edu)

303-735-5131

## Office Hours

Time: TBD, as well as by appointment (via email)

Location: ECOT 535

## Teaching Assistant

Fan Shen: [fan.shen@colorado.edu](mailto:fan.shen@colorado.edu)

Office Hours: TBD

## Course Prerequisites

Understanding of network engineering technologies and automation, Python programming, as well as and Linux system administration is required. The required learning objectives can be obtained from courses such as:

* CSCI 5010: Data Communications or CSCI 4273: Network Systems
* CSCI 5030 / CSCI 4113: Fundamentals of System Administration or Unix System Administration
* CSCI 5180 5150 / CSCI 7000-10: Network Management and Automation

## Grading

|  |  |
| --- | --- |
| Pop Quizzes and Class Participation | 10% |
| Homework Labs and Assignments | 60% |
| Midterm | 10% |
| Final (10%) & \*Final Project (10%) | 20% |

To do well in this course, you will need to be prepared for each class by being ready to discuss and engage in critical thinking on issues covered in the readings. Be forewarned: pop quizzes will often be given at the start of class on the assigned reading material for the class.

All labs, assignments, and homework are due based on the due date on the syllabus. No exceptions to deadlines for course work will be made. Classroom absence may be permitted either for an emergency or prior notification to the professor stating the date and reason for the classroom absence two weeks in advance.

## Grading Scale

|  |  |  |  |
| --- | --- | --- | --- |
| 100 – 93% | A |  |  |
| 92 – 90% | A- |  |  |
| 89 – 87% | B+ |  |  |
| 86 – 83% | B |  |  |
| 82 – 80% | B- |  |  |
|  |  |  |  |
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## Class Readings

There is not a required textbook for the course; however, students will be expected to have read the class readings noted in the course syllabus before attending the class.

RECOMMENDED BOOKS:

Azodolmolky, S. (2013). *Software Defined Networking with OpenFlow*. ISBN-10: 1849698724

Brant, P. (2013). *The Software-Defined Data Center: The Three Caballeros Finally Have Their Cloudy Day*.   
 **Note**: *This book is available for free in the University of Colorado library (online)*

R. Gandotra and L. Perigo, “SDNMA: A Software-defined, Dynamic Network Manipulation Application to Enhance BGP Functionality” in *20th IEEE International Conference on High Performance Computing and Communications (HPCC-2018)*, June, 2018.

R. Gandotra and L. Perigo, "NFEH: An SDN Framework for Containerized Network Function-enabled End Hosts," in *Proceedings of the 29th International Conference on Computer Communications and Networks (ICCCN)*, Honolulu, USA, Aug. 2020, in press.

Goransson, P. & Black, C. (2017). *Software Defined Networks: A Comprehensive Approach*, Second Edition. ISBN: 978-0-12-804555-8  
 **Note**: *The first edition of this book is available for free in the University of Colorado library (online)*

Feamster, N., Rexford, J, & Zegura, E. (2013). *The Road to SDN: An intellectual history of programmable networks*.

N. McKeown et al. (2008). *OpenFlow: enabling innovation in campus networks.* ACM SIGCOMM Computer Communication Review.

[Open Networking Foundation (ONF) Reading list.](https://www.opennetworking.org/sdn-resources/sdn-reading-list)

Peterson, L., Cascone, C., O’Connor, B., & Vachuska, T. (2022). *Software-Defined Networks: A Systems Approach.* Source*:* <https://sdn.systemsapproach.org/index.html>

Underdahl, B., & Kinghorn, G. (2015). *Software Defined Networking For Dummies*. Found Online: <http://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/sdnfordummies.pdf>

Many of the readings will be posted on the Canvas web site. To access Canvas, go to: <https://canvas.colorado.edu/>. You can login using your IdentiKey username and password. Once you login, click on the course name to go into the course[[1]](#footnote-1).

## Course Syllabus (Subject to Change)

|  |  |
| --- | --- |
| **Date** | **Topic, Reading, and/or Work Assignment** |
| 8/22/2022 | Lecture: Introduction to Course  Reading:   * Feamster – Road to SDN (Canvas) * Peterson (Ch. 1)   Homework:   * **Lab 0.0 (Ungraded)** – Review/Install Mininet in VirtualBox * **Lab 0.1 (Ungraded)** –VirtualBox Network Setup * **Assignment 1** (Due 8/29) – Executive Summary: What is the definition of SDN: Compare Open-SDN and commercial SDN. What are the key components of Open-SDN, and how do they differ from commercial SDN? |
| 8/29/2022 | Lecture: SDN Fundamentals  Reading:   * Goransson & Black – Chapters 1-4 * Cisco – Chapter 1 * Peterson (Ch. 2-3)   Recommended Reading:   * [Getting Started with Mininet & Walkthrough](http://mininet.org/download/)   Homework:   * **Lab 1** (Due 9/05): Basic Mininet and MiniEdit Functionality |
| 9/05/2022 | Lecture: OpenFlow Fundamentals: Part 1  Reading:   * Goransson & Black – Chapter 5 * Azodolmolky – Chapters 1-2   Recommended Reading:   * [OpenFlow 1.5 Specification](https://www.opennetworking.org/images/stories/downloads/sdn-resources/onf-specifications/openflow/openflow-switch-v1.5.0.noipr.pdf) * OF-Config (Canvas)   Homework:   * **Assignment 2** (Due 9/12) - Executive Summary: What are containers, how are they implemented, and what are industry use cases? * **Lab** **2** (Due 9/12): GNS3 + Mininet Integration and Hardware |
| 9/12/2022 | Lecture: OpenFlow Fundamentals: Part 2  Reading:   * [OpenFlow 1.5 Specification](https://www.opennetworking.org/images/stories/downloads/sdn-resources/onf-specifications/openflow/openflow-switch-v1.5.0.noipr.pdf): Chapters – 1, 2, 5, 6, 7.2.3, 7.3-7.5 * OpenFlow State of the Union (Canvas) * Peterson (Ch. 4)   Homework:   * **Lab** **3** (Due 9/19): OpenFlow and Wireshark |
| 9/19/2022 | Lecture: Mininet and Controllers: Floodlight, ODL, ONOS, Ryu, OFM  Reading:   * Goransson & Black – Chapters 10 & 11 * Azodolmolky – Chapters 3-5 * SDN Controller Landscape (Canvas) * Peterson (Ch. 6)   Recommended Reading:   * ODL – User Guide * [OVS Commands](http://therandomsecurityguy.com/openvswitch-cheat-sheet/) * [OFM Github](https://github.com/CiscoDevNet/OpenDaylight-Openflow-App) * [APIC-EM](https://developer.cisco.com/site/apic-em/) * [Getting Started with Mininet & Walkthrough](http://mininet.org/download/)   Homework:   * **Lab 4** (Due 9/26)– Advanced Mininet, Open vSwitch, and SDN Controllers |
| 9/26/2022 | Lecture: Real World SDN, Key Players, and Transition; Midterm Review  Reading:   * Goransson & Black – Chapters 6, 9, 11 & 14 * Azodolmolky – Chapter 8 * Cisco – Chapter 2 * Google OpenFlow (Canvas)   Homework:   * **Lab 5** (Due 10/10)– Midterm Lab |
| 10/03/2022 | Midterm Challenge (T) & Exam (R)  Homework:   * **Midterm Challenge Lab** - (In-class) |
| 10/10/2022 | Lecture: REST APIs & SDN Design  Reading:   * [REST API for Network Engineers](http://networkop.co.uk/blog/2016/01/01/rest-for-neteng/) * [REST SDN](http://searchsdn.techtarget.com/tip/REST-APIs-in-SDN-An-introduction-for-network-engineers) * [RYU Documentation (REST)](https://media.readthedocs.org/pdf/ryu/latest/ryu.pdf) * [Software is Eating the World](http://a16z.com/2016/08/20/why-software-is-eating-the-world/) * [Future Predictions 1](https://www.reddit.com/r/Bitcoin/comments/5mc38b/future_predictions_by_dr_robert_goldman_including/) & [Future Predictions 2](https://www.drbobgoldman.info/single-post/2017/01/10/FUTURE-PREDICTIONS-FOR-2017-2045-by-Dr-Robert-Goldman-World-Medical-Chairman)   Video:   * [CCIE vs. Python](https://www.ciscolive.com/online/connect/sessionDetail.ww?SESSION_ID=84165&tclass=popup)   Homework:   * **Lab 6** (Due 10/17)– REST Router, Firewall, and QoS |
| 10/17/2022 | Lecture: SDN Security  Reading:   * [SDN Security Attack Vectors](http://www.networkworld.com/article/2840273/sdn/sdn-security-attack-vectors-and-sdn-hardening.html) * Security in the Data Center (Canvas) * SDN Security (Canvas) * Bryant – Chapter Security   Homework:   * **Assignment** **3 (in-class)** (Due 10/24) – SDN Security * **Lab** 7 (Due 10/24) – SDN Security (TLS; Python/REST Firewall and Static Routing (Flask)) |
| 10/24/2022 | Lecture: Guest Speaker; Programming Protocol-Independent Packet Processors (P4)  Reading:   * <https://p4.org/> * CableLabs: Transparent Security: <https://www.fiercetelecom.com/telecom/cablelabs-brews-up-transparent-security-to-mitigate-ddos-attacks> * Peterson (Ch. 4-5)   Homework:   * **Lab 8** (Due 10/31) – “Push of a Button” Routing * \*COVID-19 **Final Project Proposal Submission**- (Due 10/26)   + Present your topic to the class (elevator speech) |
| 10/31/2022 | Lecture: SDN in the Cloud and Data Center  Reading:   * Goransson & Black – Chapter 8 * Azodolmolky – Chapters 6 & 7 * Cisco – Chapters 3 & 5 * Bryant – Chapters Introduction, The Network Caballero, & Orchestration * [OpenStack Introduction](http://docs.openstack.org/arch-design/introduction.html) * Peterson (Ch. 7)   Homework:  **Lab** 9 (Due 11/7): Python Load-balancer Application |
| 11/07/2022 | Lecture: Network Functions Virtualization (NFV)  Reading:   * ONF – NFV Solutions * Goransson & Black – Chapter 6 & 10 * HP NFV (Canvas) * [OpenFlow Network Planning](http://archive.openflow.org/wp/deploy-production-planning/) * Peterson (Ch. 8)   Recommended Reading:   * ETSI – NFV (Canvas) * [Open vSwitch In-Band Control](https://github.com/openvswitch/ovs/blob/6dfee9ae376f0128f00684bfc85d706925741cde/DESIGN#L605)   Homework:   * **Lab 10** - SDN Hardware and Application Group Lab   + Lab Work Completed by TBD 11:59 p.m.     - \*COVID-19   + Group Interview/demo TBD   + Lab Report Due (12:00 p.m. TBD) |
| 11/14/2022 | \*COVID-19 **Final Project Presentations** (in class)  Homework:   * **Final Project Report** – (Due TBD) * **Lab 10** - SDN Hardware and Application Group Lab (in-class) |
| 11/21/2022 | Fall Break – No Class |
| 11/28/2022 | Lecture: Final Review(T) & OCSA Review/Certification(R) |
| 12/05/2022 | Final Challenge Practical Exam(T) & Final Exam(R)  Homework:   * Interview/Demonstration with professor/SAs to be scheduled |

# University Policies

# Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](http://www.colorado.edu/policies/student-classroom-and-course-related-behavior) and the [Student Conduct & Conflict Resolution policies](https://www.colorado.edu/sccr/student-conduct).

# Requirements for COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the [MyCUHealth portal](https://mycuhealth.colorado.edu/).

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to [Student Conduct and Conflict Resolution](https://www.colorado.edu/sccr/). For more information, see the policy on [classroom behavior](http://www.colorado.edu/policies/student-classroom-and-course-related-behavior) and the [Student Code of Conduct](http://www.colorado.edu/osccr/). If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the [Public Health Office](https://www.colorado.edu/health/public-health/quarantine-and-isolation) ([contacttracing@colorado.edu](mailto:contacttracing@colorado.edu)). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the [Public Health Office](https://www.colorado.edu/health/public-health/quarantine-and-isolation) ([contacttracing@colorado.edu](mailto:contacttracing@colorado.edu)). In this class, if you are sick or quarantined, please email the instructor from your Colorado.edu email address or use Canvas to let the professor know you will be missing class.

# Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](https://www.colorado.edu/disabilityservices/). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](http://www.colorado.edu/disabilityservices/students/temporary-medical-conditions) on the Disability Services website.

# Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

# Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the [Honor Code website](https://www.colorado.edu/osccr/honor-code).

# Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, [reporting options](https://www.colorado.edu/oiec/reporting-resolutions/making-report), and the support resources can be found on the [OIEC website](http://www.colorado.edu/institutionalequity/).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options. To learn more about reporting and support options for a variety of concerns, visit [Don’t Ignore It](https://www.colorado.edu/dontignoreit/).

## Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance.

See the [campus policy regarding religious observances](http://www.colorado.edu/policies/observance-religious-holidays-and-absences-classes-andor-exams) for full details.

# University Resources and Support Services

***Counseling and Psychiatric Services***

We offer confidential, on-campus mental health and psychiatric services for a variety of concerns such as academics, anxiety, body image, depression, relationships, substance use and more.

Contact Us: 303-492-2277 (24/7 support including crisis care)

[**CAPS Main Office**](http://www.colorado.edu/map/?id=336&mrkIid=193820)

**Fall hours**

* Monday - Thursday: 8 a.m. to 6 p.m.
* Friday: 8 a.m. to 5 p.m.

**Walk-in hours**

* **​**Monday - Friday: 10 a.m. to 4 p.m.

 Center for Community, Suite N352

Our Services

We offer a range of mental health services tailored to fit the needs of CU Boulder students.

[***Counseling***](https://www.colorado.edu/counseling/services/counseling)

CAPS is a place where students can receive confidential short-term counseling with a licensed therapist who respects and understands their needs.

[***Psychiatry***](https://www.colorado.edu/counseling/services/psychiatry)

CAPS has psychiatrists and psychiatric mental health nurse practitioners who are specially trained to help students deal with or overcome mental disorders and psychological issues.

[***Workshops***](https://www.colorado.edu/counseling/workshops)

Our educational workshops are designed to provide valuable information and insight to students on a variety of topics. They are a great option to address a variety of needs.

[***Process Therapy Groups***](https://www.colorado.edu/counseling/services/process-therapy-groups)

These confidential groups are contained settings where students can speak on and get support for a variety of topics. All groups are free for CU students.

[***Skill-Based Therapy Groups***](https://www.colorado.edu/counseling/services/skill-based-therapy-groups)

These free, confidential groups focus on skill building in specialty topic areas such as Dialecticial Behavior Therapy (DBT) and Acceptance and Commitment Therapy (ACT).

[***Let's Talk: Informal Consultations***](https://www.colorado.edu/counseling/lets-talk)

Let’s Talk is a free service where CU Boulder students can stop by for an informal and confidential consultation with a counselor. No appointment necessary.

[***Canine-Assisted Therapy***](https://www.colorado.edu/counseling/caninetherapy)

Canine-assisted therapy incorporates the presence of a dog during a counseling session. Dogs can reduce stress and help a student feel more comfortable discussing difficult issues.

[***Suicide Prevention***](https://www.colorado.edu/counseling/suicide-prevention)

Recognize signs and find information about how to support someone in need.

[***Virtual Reality Therapy***](https://www.colorado.edu/counseling/services/vr)

The virtual reality therapy (VRT) program aims to integrate VR with traditional therapy techniques for students facing common mental health issues like anxiety, depression and phobias.

[***Eating Disorders Services***](https://www.colorado.edu/counseling/services/eating-disorders)

Through our eating disorders services, CAPS works in collaboration with other Health and Wellness Services unites to provide assessment and treatment to students struggling with issues related to food, weight, and body image, including mild to moderate eating disorders.

[***ADHD***](https://www.colorado.edu/counseling/services/adhd-information)

We offer assessment and treatment of Attention-Deficit/Hyperactivity Disorder (ADHD).

[***Substance Use***](https://www.colorado.edu/counseling/services/substance-use-services)

In an effort to support students and help them succeed at CU, CAPS is committed to working with students to avoid pitfalls related to alcohol and drug use. CAPS offers several services to address these issues.

1. Please visit https://oit.colorado.edu/services/teaching-learning-tools/canvas/help to watch videos and learn more about using Canvas. If you run into any problems using Canvas, contact the help desk at: help@colorado.edu or at (303) 735-HELP. [↑](#footnote-ref-1)