1. **Course Description, Goals, and Objectives:** Students will be introduced to advanced topics in stochastic processes. The course aims to be accessible and relevant to a broad community of graduate students, including students specializing in probability theory, mathematical biology, applied mathematics, and PDEs. The course caters to graduate students by providing a broader and more rigorous approach than the 5000 level courses.

2. **Lectures:** Tuesdays and Thursdays: 9:10-10:30am in JTB 110

3. **Instructor:** Sean Lawley  
   - Email: lawley@math.utah.edu  
   - Office: LCB 306  
   - Office Hours: Tuesdays 10:30-11:30am or by appointment

4. **Website:** https://utah.instructure.com (Canvas)

5. **Homework:** Homework will be assigned, collected, and graded. Completion of the homework is critical to learning the course material.

6. **Course contents:**

   Topics to be studied include:

   (a) Elementary probability (random variables; distributions; expectation; law of large numbers; central limit theorem; random number generation and simulation)

   (b) Martingales (conditional expectations; martingales; beginning examples; simulation)

   (c) Markov chains (Dirichlet and heat problem for chains/generators/Master equation; first passage times; relation to chemical reactions; simulation)

   (d) Brownian motion (construction; elementary properties; simulation)

   (e) Stochastic differential equations (Ito theory; diffusions; Wong-Zakai theorem; Stratonovich theory; simulation/numerical solutions)

   (f) Diffusions and partial differential equations (Kolmogorov and Fokker-Planck equations for density, exit times, links to the material studied in Markov chains, the Dirichlet problem; Poisson equation; the Feynman-Kac formula; Monte Carlo simulation)
COVID information

University leadership has urged all faculty, students, and staff to model the vaccination, testing, and masking behaviors we want to see in our campus community. These include:
- Vaccination
- Masking indoors
- If unvaccinated, getting weekly asymptomatic coronavirus testing
- Quarantining after exposure

Vaccination
- Get a COVID-19 vaccination and the booster shot recommended for pairing with your vaccine if you have not already done so. Vaccination is proving highly effective in preventing severe COVID-19 symptoms, hospitalization and death from coronavirus. Vaccination is the single best way to stop this COVID resurgence in its tracks.
- University of Utah students are required (as of August 27, 2021) to complete a cycle of COVID-19 vaccination and booster shot with an approved vaccine, or complete an exemption form. The university provides three convenient vaccination options:
  Attend one of the regularly scheduled vaccine events at the Student Union on campus.
  Schedule an appointment with Student Health here.
  Visit http://mychart.med.utah.edu/,
  https://alert.utah.edu/covid/vaccine/,
  or http://vaccines.gov/ to schedule your vaccination.

Masking
- While masks are not required outside of Health Sciences facilities, on UTA buses or campus shuttles, CDC guidelines now call for everyone to wear face masks indoors.
- Check the CDC website periodically for masking updates–

With high transmission rates in Salt Lake County, the CDC recommends:
“Everyone should wear a mask in public indoor settings.”
- Treat masks like seasonal clothing (i.e., during community surges in COVID transmission, they should be worn indoors and in close groups outside).
- In cases of classroom exposure, masks should be worn for the quarantine period (see details below).

Testing
- If you are not yet vaccinated, get weekly asymptomatic coronavirus tests. This is a helpful way to protect yourself and those around you because asymptomatic individuals can unknowingly spread the coronavirus to others.

- Asymptomatic testing centers are open and convenient:
  Online scheduling
  Saliva test (no nasal swabs)
  Free to all students returning to campus (required for students in University housing)
  Results often within 24 hours
  Visit alert.utah.edu/covid/testing

- Remember: Students, faculty and staff must self-report if they test positive for COVID-19 via this website: https://coronavirus.utah.edu/.

University of Utah Resources and Policies

1. **The Americans with Disabilities Act:** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020, https://disability.utah.edu/. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

2. **Addressing Sexual Misconduct:** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, office for equal opportunity and affirmative action including sexual orientation or gender identity/expression, you are encouraged to report it to the University’s Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, https://oeo.utah.edu/contact-us/index.php or to the Office of the Dean of Students, 270 Union Building, 801-581-7066, https://deanofstudents.utah.edu/. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS), https://police.utah.edu/.

3. **Campus Safety:** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

4. **University Counseling Center:** The UCC staff is committed to supporting the mental health needs of our campus community. Their phone number is 801-581-6826. Their hours are Monday-Friday, 8:00am-5:00pm. For after-hours emergencies, contact the 24/7 Crisis Line: 801-587-3000. More information is at https://counselingcenter.utah.edu/.
5. **Office of the Dean of Students**: The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. To contact the Office of the Dean of Students, please email deanofstudents@utah.edu or call 801-581-7066. There is more information at https://deanofstudents.utah.edu/.