



MATH 390: Advanced Research Seminar in Mathematics

MW 4:15 - 5:05 pm in TBA

Instructor: Xiang Wan Email: xwan1@luc.edu
Office: BVM 516 Office Hours: TBA

Credit Hours: 2

Notice that students need 3 credit hours of Engaged Learning courses in total for the completion of their engaged learning requirement. MATH 390 with 2 credit hours is intended as the continuation of *MATH 298: research Seminar in Mathematics*, which is 1 credit hour of Engaged Learning.

Prerequisite: Completion of Math 304/STAT 304 or Math 313 or Math 351

Course overview: A seminar-style course that covers various topics about how to conduct research in mathematical sciences while engaging students in active research projects with faculty mentors.

Objectives: The main objectives for a student in this course are to

1. develop a project in a topic beyond the standard curriculum and conduct research that relates to the state-of-the-art work in the field;
2. participate in colloquium/seminar talks and develop skills of listening to and processing of research-level mathematics;
3. sharpen their ability to communicate advanced mathematics, including the findings of their research;
4. advance their capability to write mathematics in a rigorous way and improve their skills using \LaTeX , including making presentation slides and scientific posters.

Course content: The students will work on a research project of their interest under the supervision of a faculty member in the Department of Mathematics and Statistics, or on a project with faculty from other departments under the approval of the instructor.

Throughout the semester, they will

- either continue working on a project that they have had experience with, or find a topic beyond the standard curriculum that they are interested in researching in mathematical sciences through reading of some advanced materials;
- form a peer-support group with 2-3 other students. Students in the same groups will do break-out discussions together during class time and share research progress throughout the semester;
- attend a series of classes (seminars) about common topics about research, such as project management, resources, references and citations, research ethics, presentations preparation and skills, professional writing and typeset (in \LaTeX), etc.;
- attend several research seminars and colloquium talks and submit feedback with peer discussion followed;
- develop formative reflections throughout the semester alongside their research work;

- showcase their work twice during the semester. The first one will be a presentation during class, and the second one will be either a poster or an oral presentation during URES (Undergraduate Research and Engagement Symposium);
- create a learning portfolio as the final write-up that will include notes on their research project, slides for their presentations, a report of their project, and a critical reflection on their overall experience;
- learn about opportunities that the mathematical community offers for further engagement in research such as involvement in professional organizations in mathematical sciences (like AMS, SIAM, MAA, AWM, and ASA); understanding the process of journal paper submission; opportunities for participating in local, national, or international workshops and conferences; as well as information about funding programs both inside (such as LUROP) and outside (such as summer REUs; Goldwater) of Loyola;
- learn about opportunities for graduate school: how to apply to a PhD program, the GRE exam, and available funding opportunities such as the NSF Graduate Research Fellowship Program.

Learning Outcomes:

Students will develop a research plan in an area of mathematics of their interest. Moreover, they will carry out this plan and refine their mathematical writing and presentation skills through work on their project.

Course Assessment:

- Two presentations (20% each, 40% in total), tentatively in mid-February and early-April, respectively. Each presentation will be evaluated according to the quality of the following aspects:
 - Abstract;
 - Organization;
 - Appropriate amount and depth of material;
 - Accuracy of content;
 - Overall clarity of presentation;
 - Answering questions effectively;
 - A reflection report; see below.
- Four Reports (2.5% each, 10% in total) throughout the semester. The second and third reports follow the two presentations, respectively. The first and third reports are tentatively due in late January and late March, respectively.

The reports should include reflections on

- connections and differences between their research and coursework;
 - their experience with mentors;
 - group discussions in and outside of class;
 - attended seminars and colloquium talks;
- Final Write-up (25%). The write-up should include
 - A report of their project (built up from their research notes and presentation materials);
 - A critical reflection on their overall course and research experience.
- Course participation (25%), including
 - attendance of class and participation of in-class discussions;
 - Regular progress check-up with faculty mentors;
 - attendance of research seminar and colloquium talks; provided feedback of these talks.

Special Note: Students will attend colloquia or career panels in lieu and sometimes in addition to our usual seminar. If they are planned for different times or days than the usual class time, this will be announced well in advance.

Recommended materials:

[AZ] Aigner, M., Ziegler, G.M. Proofs from THE BOOK. Springer, 6th ed., 2018.

[Kr1] Krantz, S.G. How to Teach Mathematics. American Mathematical Society, 3rd ed., 2015.

Additional readings provided throughout the semester. Drawn from, e.g.,

[FB] Felder, R.M., Brent, R. Teaching and Learning STEM: A Practical Guide. Jossey-Bass, 2016.

[Ha] Hagelgans, N.L., et al., eds. Practical Guide to Cooperative Learning in Collegiate Mathematics. MAA, 1995.

[He] Henrich, A.K., et al., eds. Living Proof: Stories of Resilience. AMS & MAA, 2019.

[Hi] Higham, N.J. Handbook of Writing for the Mathematical Sciences. SIAM, 2nd ed., 1998.

[Ku] Kung, D., Speer, N. What Could They Possibly be Thinking!?! MAA, 2020.

[Su] Su, F. Mathematics for Human Flourishing. Yale UP, 2000.

Diversity, Equity, and Inclusion Statement:

The diversity that students bring to this class, in all its forms, is viewed as a resource, a strength, and a benefit. It is my intent to invest in each student's success and attend to each student's learning needs, both in and out of class. I will aim to present materials and activities that are respectful of diversity, equity, and inclusion, and that students from all diverse backgrounds and perspectives be well-served by this course.

Accommodations for Disabilities or Conditions:

Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with the Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Students will provide professors with an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professors individually to discuss their accommodations. All information will remain confidential. For more information or further assistance, please call 773.508.3700 or visit <https://www.luc.edu/sac/>

Academic Integrity:

All work in this course must be completed in a manner consistent with the accepted standards of academic integrity. The Code of Academic Integrity will be enforced in all areas of the course. More information regarding the relevant policies and procedures, including information about your rights and responsibilities as a student, is available at https://www.luc.edu/academics/catalog/undergrad/reg_academicintegrity.shtml

Copyright:

Copyright law was designed to give rights to the creators of written work, artistic work, computer programs, and other creative materials. The Copyright Act requires that people who use or make reference to the work of others must follow a set of guidelines designed to protect authors' rights. The complexities of

copyright law in no way excuse users from following these rules. The safest practice is to remember (1) to refrain from distributing works used in class (whether distributed by the professor or used for research); they are likely copyright protected and (2) that any research or creative work should be cited properly. Read more about LUC's copyright resources online: luc.edu/copyright.

Notice of Reporting Obligations for Responsible Campus Partners:

As an instructor, I am considered a Responsible Campus Partner (RCP) under Loyola's Comprehensive Policy and Procedures for Addressing Discrimination, Sexual Misconduct, and Retaliation (located at luc.edu/equity). While my goal is for you to be able to share information related to your life experiences through discussion and written work, I want to be transparent that as a RCP I am required to report certain disclosures of sexual misconduct (such as sexual assault, sexual harassment, intimate partner and/or domestic violence, and/or stalking) to the University's Title IX Coordinator. As an instructor, I also have a mandatory obligation under Illinois law to report disclosures of or suspected instances of child abuse or neglect. The purpose of these reporting requirements is for the University to inform students who have experienced sexual/gender-based violence of available resources and support. Such a report will not generate a report to law enforcement (no student will ever be forced to file a report with the police). Furthermore, the University's resources and support are available to all students even if a student chooses that they do not want any other action taken. Please note that in certain situations, based on the nature of the disclosure, the University may need to take additional action to ensure the safety of the University community. If you have any questions about this policy, you may contact the Office for Equity & Compliance at equity@luc.edu or 773-508-7766. If you wish to speak with a confidential resource regarding gender-based violence, I encourage you to call The Line at 773-494-3810. The Line is staffed by confidential advocates from 8:30am-5pm M-F and 24 hours on the weekend when school is in session. Advocates can provide support, talk through your options (medical, legal, LUC reporting, safety planning, etc.), and connect you with additional resources as needed. More information can be found at luc.edu/coalition or luc.edu/wellness.

Important dates: <http://www.luc.edu/academics/schedules>