Name: Clint Richardson
Email: crichardson@sfasu.edu
Phone: Office—936-468-1736
Office: Bush Mathematical Sciences Building, room 306
Office Hours: MWF 9–9:50, TR 2–3:15, or by arrangement
Department: Mathematics and Statistics
Class meeting time/place: MW 2:30–3:45, Bush Math 306

Credit hours: 3
The following is an excerpt from SFA Policy 5.4:

The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:

1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;

2. At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

Course Description: Metric spaces, topological spaces and Cartesian product spaces are studied together with certain topological properties, such as compactness, connectivity and separability.

Text and Materials: Course materials will be provided.

Program Learning Outcomes (PLO): Students graduating from SFASU with a M.S. degree and a major in mathematics will:

1. (Critical Reasoning) Independently apply the principles of logic in mathematics to develop and analyze conjectures and proofs. (understanding of abstract structures, development of definitions, development and proof of conjectures)

2. (Skills) Execute advanced mathematical procedures and build upon these standard procedures. (learning of new skills, applying or extending skills in new situations)
3. (Concepts) Demonstrate knowledge of core mathematical concepts. (definitions and theorems in analysis, definitions and theorems in linear or abstract algebra, definitions and theorems in theoretical statistics)

4. (Problem Solving) Demonstrate initiative in using various mathematical tools, including technology, to formulate, represent, and solve problems. (implement algorithms or definitions, discuss algorithmic proficiency, find numerical approximations)

5. (Communication) Demonstrate proficiency in communicating mathematics in a format appropriate to expected audiences. (written, visual, oral)

**Student Learning Outcomes (SLO):** At the end of MTH 5320, a student who has studied and learned the material should be able to:

1. Define and apply basic set theoretic notions, including function image sets and preimage sets, cardinality, and countability. [MTH-PLO: 1,2,3,5], [STA-PLO: n.a.]

2. Understand and apply the basic properties and concepts of abstract metric spaces, especially complete metric spaces and convergence in metric spaces. [MTH-PLO: 1,2,3,5], [STA-PLO: n.a.]

3. Prove and apply the standard results regarding continuity, convergence, compactness, and connectivity. [MTH-PLO: 1,2,3,5], [STA-PLO: n.a.]

4. Prove and contrast the standard results regarding the topological properties of spaces that satisfy the various separation axioms. [MTH-PLO: 1,2,3,5], [STA-PLO: n.a.]

**Course Requirements:** This class will be conducted as an independent study class. The final exam will be comprehensive and is scheduled for Fr, 15 Dec, 8–10am.

**Course calendar/outline:** (Topics may be presented in a different order than given here)

<table>
<thead>
<tr>
<th>Category</th>
<th>Topics</th>
<th>Approximate time spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Set Theory</td>
<td>- Basic definitions and operations on sets</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>- Function image sets and preimages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Equivalence of sets</td>
<td></td>
</tr>
<tr>
<td>Metric Spaces</td>
<td>- Metrics</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>- Continuity and uniform continuity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Cluster points, open and closed sets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Cauchy sequences and completeness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Properties of complete metric spaces</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Completions of metric spaces</td>
<td></td>
</tr>
<tr>
<td>General Topology</td>
<td>- Basic definitions</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>- Continuity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Product and quotient spaces</td>
<td></td>
</tr>
<tr>
<td>Separation and Countability</td>
<td></td>
<td>15%</td>
</tr>
</tbody>
</table>
- Countability properties
- Convergence of sequences
- Separation axioms

- Compactness
  - Basic properties
  - Variants
  - Compact metric spaces

- Connectedness
  - Basics
  - Local Connectivity

Grading Policy: Grades will be based on performance on assessments and the amount of material covered by the end of the semester.

Attendance Policy: Attendance is expected and roll will be checked every day. Students who miss no more than two class days may receive special consideration in determining their grade.

Academic Integrity (4.1): The Code of Student Conduct and Academic Integrity outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy.

Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for oneself, to take a test, (5) Falsifying research data, laboratory reports, and/or other records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one's own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one's own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.

Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.
Withheld Grades (Semester Grades Policy A-54): Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average. For additional information, go to https://www.sfasu.edu/policies/course-grades-5.5.pdf.

Students with Disabilities: To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations.

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Student Wellness and Well-Being: SFA values students overall well-being, mental health and the role it plays in academic and overall student success. Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, emotional well-being, alcohol and other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help, SFA provides a variety of resources to support students mental health and wellness. Many of these resources are free, and all of them are confidential.

On-campus Resources:
The Dean of Students Office (Rusk Building, 3rd floor lobby)
www.sfasu.edu/deanofstudents
(936) 468-7249
dos@sfasu.edu

SFASU Human Services Counseling Clinic (Human Services Room 202)
www.sfasu.edu/humanservices/139.asp
936-468-1041

The Health and Wellness Hub (“The Hub”) Located at the corner of East College and Raguet Streets
To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person mind, body and spirit. Services include:

- Health Services
- Counseling Services
- Student Outreach and Support
- Food Pantry
• Wellness Coaching
• Alcohol and Other Drug Education

www.sfasu.edu/thehub
(936) 468-4008
thehub@sfasu.edu

Crisis Resources:
Burke 24-hour crisis line 1(800) 392-8343
National Suicide Crisis Prevention: 9-8-8
Suicide Prevention Lifeline 1(800) 273-TALK (8255)
Crisis Text Line: Text HELLO to 741-741
Math 5320 - Topology  
Course Syllabus  

Course description: Metric spaces, topological spaces and Cartesian product spaces are studied together with certain topological properties such as compactness, connectivity and separability.

Credit hours: 3

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Course Prerequisites and Corequisites: MATH 4330 or equivalent

Course outline: Approximate time spent

- Topological Spaces 20%
  - Definition of topology
  - Closed set
  - Base for a topological space
  - Subbase for a topological space
  - Relative topology and subspaces
  - Limit point
  - Convergence

- Metric Spaces 20%
  - Definition of a metric space
  - Open ball
  - Interior point
  - Open set

- Functions 20%
  - Continuity
  - Homeomorphism
  - Topological property

- Axiom of Choice 5%

- Product Spaces 20%
  - Product topology
  - The Tychonoff Theorem
Selected topics as time permits

**Separation Axioms**
- $T_0$ space
- $T_1$ space
- $T_2$ space (Hausdorff space)
- Regular space
- $T_3$ space
- Normal
  - Urysohn’s Lemma
  - Tietze Extension Theorem
- $T_4$ space

**Special Topological Spaces**
- Separable Space
- First axiom of countability
- Second axiom of countability
- Lindelof space
- Connected space
- Compact space
  - Alexandroff’s One Point Compactification
  - The Stone-Cech compactification

- **The principle of transfinite induction**
- **Continua**
  - Irreducible continuum
  - Limiting set

**Student Learning Outcomes (SLO):** At the end of MATH 5320, a student who has studied and learned the material should be able to:

1. Fully discuss the basic notions covered in this topology course. [PLO: 1,2,3]
2. Read and interpret written mathematics. [PLO: 1,2,3]
3. Recognize those things that must be proven and how to best describe their thoughts that lead to an easily understandable proof of a basic theorem. [PLO: 1,2,3]
4. Use the language successfully, in oral and written form, while expressing their mathematical thoughts. [PLO: 1,2,3]
5. Present their proofs in class by relying on their material they generated prior to class. [PLO: 1,2,3]

**Program Learning Outcomes (PLO):** Students graduating from SFA with a M.S. Mathematical Sciences Degree will:

1. Written Communication - SFA Mathematics majors communicate mathematical ideas effectively in written form, integrating mathematical notation correctly and consistently.
2. Verbal Communication - SFA Mathematics majors communicate mathematics effectively to diverse audiences.
3. Mathematical Maturation - SFA Mathematics majors grow from a computational understanding of mathematics to an integrated approach which includes critical thinking proficiency, computational facility, conceptual understanding, and problem-solving persistence.

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dos@sfasu.edu

SFA Human Services Counseling Clinic Human Services, Room 202
www.sfasu.edu/humanservices/139.asp
936.468.1041

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www.sfasu.edu
Location: corner of E. College and Raguet St.

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- Counseling Services
- Student Outreach and Support
- Food Pantry
- Wellness Coaching
- Alcohol and Other Drug Education

Crisis Resources:

- Burke 24-hour crisis line: 1.800.392.8343
- National Suicide Crisis Prevention: 9-8-8
- Suicide Prevention Lifeline: 1.800.273.TALK (8255)
- Crisis Text Line: Text HELLO to 741-741

Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy 10.4). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom.

Date of document: 08/23/2023