

## Mathematics 6330 (Fall 2021): Manifold Theory

**Instructor:** Dmitri Pavlov, Assistant Professor

**Lectures:** TuTh 2–3:30, MA 114

**Credit hours:** 3

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### 1 Course Outline

This course will teach the basics of smooth manifolds, understood in the broadest possible sense.

The initial emphasis will be on mastering differential forms and all the related machinery.

The following advanced topics will be covered if the time permits: jets and differential operators; variational bicomplex;  $G$ -structures, Cartan geometry, and Spencer cohomology; sheaf cohomology, de Rham cohomology, Dolbeault cohomology; gauge theory.

The exposition will be heavily geometric, and connections to physics will be strongly emphasized.

### 2 Catalog Course Description

Differentiable manifolds theory: smooth structures, tangent spaces, implicit mapping theorem, embeddings, immersions and submersions, vector fields, tensor analysis, Stokes' theorem.

### 3 Course Specific Expected Learning Outcomes

Upon completion of this course, students will be able to apply smooth manifolds to their area of research.

### 4 Assessment of Expected Learning Outcomes

Homework assignments may be given throughout the course. Students may also elect to do a project (a 10-page paper and a 1-hour oral presentation) on a topic relevant to the subject matter. Midterms and a final may be administered in class or as 4-hour take-home exams.

### 5 Grading

The final grade depends on the homework, projects, midterms, and final exam, if any of these were administered.

### 6 Text

The material will be drawn from a variety of sources, individual texts will be indicated as the course progresses.

## 7 Schedule

There will be 28 class meetings on the following days:

August 24  
August 26  
August 31  
September 2  
September 7  
September 9  
September 14  
September 16  
September 21  
September 23  
September 28  
September 30  
October 5  
October 7  
October 12  
October 14  
October 19  
October 21  
October 26  
October 28  
November 2  
November 4  
November 9  
November 11  
November 16  
November 18  
November 23  
November 30

## 8 Operating Policy 34.19: Student absence for observance of religious holy day

1. “Religious holy day” means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.
2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.
3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

## 9 Operating Policy 34.22(2b): Reasonable accommodation for students with disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

## **10 Operating Policy 34.12(5): Academic dishonesty definitions**

Students must understand the principles of academic integrity, and abide by them in all class and/or course work at the University. Academic Misconduct violations are outlined Part I, section B.1 of the Code of Student Conduct. If there are questions of interpretation of academic integrity policies or about what might constitute an academic integrity violation, students are responsible for seeking guidance from the faculty member teaching the course in question.

Academic misconduct includes cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, violations of published professional ethics/standards, and any act or attempted act designed to give unfair academic advantage to oneself or another student. Additional information about academic misconduct is available in the Texas Tech University Handbook in Part II, section B of the Community Policies section in the Student Handbook at <http://www.depts.ttu.edu/dos/handbook/>.