

**Geographic Information Science
College of Arts and Sciences**



**GIS 662
Geographic Database Management Systems
Course Syllabus v1.0**

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<i>Office Hours:</i>	<i>M,W 3:30-4:30 or Confirmed appointment (Office or Teams)</i>
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Course Context:

The focus of the graduate GIS program at the University of Redlands is that of professional practice, rather than a traditional research-based masters program. Consequently, the major creative effort undertaken by students is either the completion of a professional-style GIS project similar to one that might be performed for a client by a private consultant or an agency; or an internship in a professional GIS setting.

Course Description:

The course offers a theoretical foundation for the representation of knowledge in geographic information systems. It presents and uses the Unified Modeling Language (UML) as well as the Structured Query Language (SQL). Key topics discussed are: methods for formalizing interactions of geographic objects; characteristics of various information models including relational and object-oriented; overview of database management systems and their suitability for spatial data; the transaction concept and other data reliability methods; and the design of database scheme for geographic applications. Concepts discussed during lectures will be reinforced through a set of lab/design exercises.

Course Objective:

The goal of this course is to instill an understanding of the foundations of sound database design. Since the data model and relationships established in the database of a GIS express the formal theories of the problem domain, it is essential for students to understand the potential and the limits of modern database management systems. After completing the course, students will have the skills necessary to create a sound database design to support their major individual project. The student will also gain an understanding of the underlying technology upon which modern geographic information systems are built.

Required Text:

Stefanakis, E., (2014). *Geographic Databases and Information Systems*. Frederickton, N.B., Canada.

Forta, Ben (2019). *Sams Teach Yourself SQL* (5th ed.). Indianapolis, Indiana: Pearson Education.

Strongly Recommended:

Elmasri, R. and S. B. Navathe (2015). *Fundamentals of Database Systems* (7th ed.). Boston, Massachusetts: Addison-Wesley.

Recommended:

Ambler, S. W. (2005). *The Elements of UML 2.0 Style* (2nd ed.). New York, New York: Cambridge University Press.

Excerpts will be provided:

McInerny, D. Q. (2005). *Being Logical: A Guide to Good Thinking*. New York, New York: Random House Trade Paperbacks.

Shekhar, S., & Chawla, S. (2003). *Spatial Databases: A Tour* (1st ed.). Upper Saddle River, New Jersey: Prentice-Hall.

Assignments:

The students will complete a series of practical exercises to integrate the theories and approaches discussed in class. The assignments will encompass the process of creating a geographic information system database from a formal theory for a domain, define interactions between actors, select representations in a set of data objects, and implement the design in a relational database management system.

Generative AI Policy

Zero tolerance: In this course, there is no ethical use for generative AI tools such as ChatGPT. All assignments ask you to use only resources from our course or other approved sources to develop your ideas at all stages of writing. Use of generative AI at any stage of a project, including outlines and drafts, will be considered a violation of the university's academic honesty policy.

Grades:

Course grades will be assigned based upon the following breakdown:

Class Attendance.....	45 Hours
Reading prep for class.....	45 Hours
Assignments/Labs	50% 40 Hours
Mid-Term Exam.....	16% 4 Hours
Final Exam (Four Take Home Essays)	24% 16 Hours
Design Project.....	30 Hours
Professor's Discretion/Class Participation.....	10%

Grading Scale:

94.0 – 100 points	A ... (4.0)
90.0 – 93.9 points	A- .. (3.7)
87.0 – 89.9 points	B+ .. (3.3)
83.0 – 86.6 points	B ... (3.0)

Cumulative Grade Point Average of 3.0 is required to earn a Master's degree.

80.0 – 82.9 points	B-.... (2.7)
77.0 – 79.9 points	C+ .. (2.3)
73.0 – 76.6 points	C ... (2.0)

Grade of C (2.0) is required to receive graduate credit for this course.

Do we really need a finer scale of how much you have not passed this course? Okay then, here it is:

70.0 – 72.9 points	C-.... (1.7)
67.0 – 69.9 points	D+ . (1.3)
63.0 – 66.6 points	D ... (1.0)
60.0 – 62.9 points	D- ... (0.7)
Fewer than 60.0 points	F (0.0)

Week	Dates	Topics	Reading	Assignments Due
1	Jan 08	<ul style="list-style-type: none"> The Nature of Geographic Data 	<ul style="list-style-type: none"> ST 01 SC Ch. 1 pp 1-21 	
2	Jan 13 Jan 15	<ul style="list-style-type: none"> Geographic Information System Architectures Logic and DBMS Install Database Systems 	<ul style="list-style-type: none"> Mc Pt 1, Pt 2, Mc Pt 3 ST 04, 05 EN Ch. 1, 2 	<ul style="list-style-type: none"> PostgreSQL Installation Forta (Exercises 1 to 6) Forta (Exercises 1 to 9)
3	Jan 20 22	<ul style="list-style-type: none"> No Class January 20 Relational and Object-Relational Models 	<ul style="list-style-type: none"> ST 15 	<ul style="list-style-type: none"> Forta (Exercises 10 to 18)
4	Jan 27 29	<ul style="list-style-type: none"> Data Structures/Algorithms Spatial Indexing Methods 	<ul style="list-style-type: none"> ST 08 ST 09 	<ul style="list-style-type: none"> Family DB Spatial Queries on Pts
5	Feb 03 05	<ul style="list-style-type: none"> Database Design Design for the End Times 	<ul style="list-style-type: none"> ST 06 ST 07 	<ul style="list-style-type: none"> Spatial Questions Improved Family DB
6	Feb 10 12	<ul style="list-style-type: none"> Exam Review Mid-Term Exam 		
7	Feb 17 19	<ul style="list-style-type: none"> Object-Oriented Methods in DBMS 		<ul style="list-style-type: none"> Ambler EN 4
8	Feb 24 26	<ul style="list-style-type: none"> Geographic Data Models 	<ul style="list-style-type: none"> ST 10 	<ul style="list-style-type: none"> UML Design (Classes)
Spring Break March 3-7				
9	Mar 10 Mar 12	<ul style="list-style-type: none"> Optimizing DB Operations for Space No Class - DEV Summit 	<ul style="list-style-type: none"> ST 13 	<ul style="list-style-type: none">
10	Mar 17 19	<ul style="list-style-type: none"> Computational Geometry Transactions 	<ul style="list-style-type: none"> ST 11/12 ST 14 	<ul style="list-style-type: none"> Revised UML Design Triggers
11	Mar 24 26	<ul style="list-style-type: none"> Database Security 	EN 08	
12	Mar 31 Apr 02	<ul style="list-style-type: none"> Trends in Spatial Databases DB Design Project Definition 		<ul style="list-style-type: none"> Final Exam Q1
13	Apr 07 09	<ul style="list-style-type: none"> DB Design Project 		<ul style="list-style-type: none"> Final Exam Q2 Final Exam Q3
14	Apr 14 16	<ul style="list-style-type: none"> DB Design Project 		<ul style="list-style-type: none"> DB Design Project Final Exam Q4

EN Elmasri, R. and S. B. Navathe (2015). Fundamentals of Database Systems (7th ed.). Boston, Massachusetts: Addison-Wesley.

Forta Forta, Ben (2019). Sams Teach Yourself SQL (5th ed.). Indianapolis, Indiana: Pearson Education.

Mc McInerny, D. Q. (2005). *Being Logical: A Guide to Good Thinking*. New York, New York: Random House Trade Paperbacks.

ST Stefanakis, E., (2014). *Geographic Databases and Information Systems*. Frederickton, N.B. Canada.

SC Shekhar, S., & Chawla, S. (2003). *Spatial Databases: A Tour* (1st ed.). Upper Saddle River, New Jersey: Prentice-Hall.

UNIVERSITY OF REDLANDS SYLLABUS STATEMENTS

Accommodations

If you are a student with a disability that qualifies for academic accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act, contact Academic Success and Accessibility (ASA). ASA is located on the ground floor of the Armacost Library, down the hall from the Jones Computer Center (past the restrooms). You can reach the office at 909-748-8069 or asa@redlands.edu and online [here](#).

Office of Equity and Title IX

In order to provide a safe and equitable learning environment for all students, faculty, and staff, discrimination, harassment, retaliation, sexual misconduct, and sexual harassment (including sexual assault, dating or domestic violence, and stalking) are not tolerated at the University of Redlands. The University prohibits unlawful discrimination or harassment (as defined in the [Policy Prohibiting Discrimination, Harassment, Sexual Misconduct, and Retaliation](#)) on the basis of age, color, race, ethnicity, national origin, ancestry, sex, marital status, pregnancy, status as a complaining party of domestic violence, sexual orientation, gender, gender identity or expression, physical or mental disability, genetic information, religion/creed, citizenship status (except to comply with legal requirements for employment), military/veteran status, or any other characteristic protected by law. If you or someone you know has experienced or experiences any of these behaviors, know that you are not alone. You can contact the Office of Equity and Title IX for reporting options, supportive measures, and resources to support you.

All faculty and staff at the University of Redlands are considered “Responsible Employees,” which means that if you tell me about a situation involving any of the above, I must report the matter to the Office of Equity and Title IX. Although I make that report, you are in control of how you would like to proceed, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of reporting options available to you and have access to the support and resources you need.

To report an incident directly, you can:

- Contact the Interim Director of Equity & Title IX, Christopher Jones, at 909-748-8289 or titleix@redlands.edu
- [Report online](#) at: www.redlands.edu/titleixandequity

You can also report to local law enforcement at 909-798-7681, ext. 1. If you are ever in immediate danger, please call 911 or email/text 911@redlandspolice.org if you cannot call. To reach Public Safety on campus, call 909-748-8888 or use the [Rave Guardian](#) app.

If you wish to speak to someone confidentially (meaning not connecting with the Office of Equity and Title IX Office), you can contact the following resources:

Campus: [Counseling Center](#): 909-748-8108 or 24-Hour Crisis Line: 909-748-8960
[TimelyCare](#), 24/7 emotional support; 12 free telehealth counseling sessions
Community: [Partners Against Violence](#), 24-hour sexual assault crisis line: 909-885-8884
[Option House](#), 24-hour dating/domestic violence crisis line: 909-381-3471
Online: <https://www.rainn.org/> (sexual assault); <https://www.loveisrespect.org/>

For more information, visit www.redlands.edu/titleixandequity

ADDITIONAL RESOURCES

Counseling Center

The Counseling Center provides free and confidential mental health services, including short-term individual therapy, group therapy, single session therapy, consultations, and urgent appointments to all students with in-person or virtual options. Our Counseling Center is committed to inclusivity and to providing a supportive space for everyone. Please call 909-748-8108 to schedule an appointment or email counseling_center@redlands.edu. If a student is in crisis, please call 909-748-8960 for the 24/7 mental health crisis line. For more information on our resources, go [here](#). Another option for individual therapy for all students is [TimelyCare](#), which provides virtual therapy immediately (Talk Now) or up to 12 scheduled virtual therapy sessions per year. Students can choose their therapist from a list of providers for the scheduled therapy option.

Conflict Resolution Center

Experiencing a conflict? Whether it's with a friend, roommate, another member of a student organization, or faculty or staff member, conflicts happen. Learning to navigate conflicts is important to success in virtually any field, and a vital step in being a part of a community and having healthy, meaningful relationships with others. See <https://sites.redlands.edu/conflict-resolution-center/student-resources/> for more information.

CARE Team

The University [CARE Team](#) exists to help provide support and resources to students that are overwhelmed, experiencing significant distress, or possibly present some risk to themselves or others. As a faculty member, I may reach out to students about whom I am concerned to talk individually, and/or refer them to the CARE Team. If you have concerns about a fellow student, consider sharing your concern with the CARE Team via their [online form](#). This is part of who we are as a caring, proactive community where we all look out for one another. Additionally, if you feel that you or someone else needs immediate mental health support, the University has a 24/7 mental health crisis line at 909-748-8960, and the [Timely Care](#) app, which offers on-demand emotional care. Both services connect to a live, licensed counselor.

Book Lending Program:

The Book Lending Program is an initiative to ensure the academic success of First-Generation students (students who are the first to go to college in their families and who meet a particular estimated family contribution [EFC] level). Funded through alumni donations, this program provides books and other classroom materials, when needed, for First-Generation students who could not otherwise afford to purchase them. Books are returned at the end of the course, to be used by other First-Generation students the next semester. The program works alongside the Library and faculty members to ensure the availability of books and classroom materials. For more information, see <https://www.redlands.edu/student-affairs/campus-diversity-and-inclusion/programs/first-generation-student-programs/book-lending-program/>

Contact: blp@redlands.edu

Emergency Student Loans:

Student Financial Services (SFS) administers a short-term, no-interest loan fund to assist students experiencing an emergency or cash-flow problem. Except in unusual circumstances,

these loans do not exceed \$200 and are billed to the student's account. Evidence of repayment ability is a prerequisite for all short-term loans made to students. Students are not eligible for more than one emergency student loan per term. **Contact:** SFS@redlands.edu or x8047

Student Affairs Discretionary Fund:

These endowed funds in Student Affairs can be used to support student success and remove impediments that otherwise may cause the student to stop or leave school. To utilize this fund, divisional leadership should be made aware of the student in dire need of financial support. This support can be anything from personal expenses, such as utility bills, gas money, emergency trips home due to family tragedy, off-campus counseling, and other medical costs, and occasionally mental health assessment expenses. Students receive grants based on their financial need. **Contact:** student_affairs@redlands.edu

Student Food Support Pantry:

The Student Food Support Pantry is a resource available to all established full and part-time University of Redlands students facing food insecurities. The Pantry is located on the north side of North Hall. This space is an open, no-questions-asked space with dried and canned goods, and non-perishable items, as well as seasonal fresh produce from our sustainable farm and limited refrigerated goods. Food for this distribution is provided in partnership with Feeding America Riverside and San Bernardino. It is also funded through private donations, ASUR, and the Office of Community Service Learning. For more information, please contact SURF@redlands.edu

STUDENT LOUNGES MAP can be found [here](#) on the University website.