NEWM N221
MOBILE AND GAME NONRELATIONAL DATABASE DEVELOPMENT

DEPARTMENT OF HUMAN-CENTERED COMPUTING
INDIANA UNIVERSITY SCHOOL OF INFORMATICS AND COMPUTING, INDIANAPOLIS
SPRING 20XX

Section No.: XXXXX *Credit Hours:* 3
Time: 03:00P-05:40P T
Location: IT 271

Instructor: Travis Faas, M.S.
Office Hours: Monday, 9AM-Noon, or by Appointment
Office: IT 461
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COURSE DESCRIPTION

This course covers the design and implementation of databases for mobile and game applications. Students learn to develop frontend and backend nonrelational databases, methods of data modeling, best practices for maintaining data integrity, and techniques for using data in mobile and game projects to be completed within the course.

Prerequisites: N220~~???~~

Required Text:

MongoDB in Action (2nd ed.)
Kyle Banker, Peter Bakkum, Shaun Verch, Doug Garrett, and Tim Hawkins (2016).
Shelter Island, NY: Manning Publications
ISBN-10: 1617291609 ISBN-13: 978-1617291609
Note: Covers MongoDB version 3.0

Principles of Undergraduate Learning (PUL):

1. Core Communication and Quantitative Skills
2. Critical Thinking
3. Integration and Application of Knowledge
4. Intellectual Depth, Breadth, and Adaptiveness
5. Understanding Society and Culture

6. Values and Ethics

Learning Outcomes:

Upon completion of this course, the student will	**RBT***	**PUL**	**Assessment**
1. Describe the primary concepts of document-based nonrelational databases.	2	1	Code comments, written reports associated with projects 1,2,3
2. Write queries for data stored within a database.	3	1	Lab 4, Check in #1 on project 1, used in all subsequent projects
3. Design a database based on a written needs list.	6	2,3,5	Check in #1 on project 2
4. Use queries to perform basic create, read, update and delete (CRUD) operations on data.	3	3	Lab 4, Check in #2 on Project 1, used in all subsequent projects
5. Use Entity-Relationship diagrams (ERDs) to design databases.	4	1	Design phase of projects 2 & 3
6. Use the data returned from queries to represent spatially positioned objects in a game or app programmed in JavaScript.	6	3	Lab 8, Check in #3 in project 2, Project 3
7. Critique a database design.	5	1,5	Presentations of projects 2 & 3, final submissions
8. Use database data to drive media experiences such as games or interactive displays.	6	1	Projects 2 & 3 final submissions, Lab 10
9. Use JavaScript to place spatial data onto ~~webpages~~ mobile apps~~.~~	3	3	Projects 2 & 3
10. Update displayed app data in real-time based on new data added to the database.	3	3	Project 3, Lab 13
11. Use a JavaScript media framework to create interactive visual elements ~~on an HTML page.~~ on app's data display	6	3	Project 3, Lab 7

*RBT: Revised Bloom's taxonomy; PUL: Principle of Undergraduate Learning

Software used:

Visual Studio Code, available for free from https://code.visualstudio.com/

EXPECTATIONS, GUIDELINES, AND POLICIES

Attendance:

A basic requirement of this course is that you will participate in all class meetings, whether online or face-to-face, and conscientiously complete all required course activities and assignments. Class attendance is required for classroom-based courses. It entails being present and attentive for the entire class period. Attendance shall be taken in every class. If you do not sign the attendance sheet while in class, you shall be marked absent. Signing the attendance sheet for another student is prohibited. The instructor is required to submit to the Registrar a record of student attendance, and action shall be taken if the record conveys a trend of absenteeism.

Only the following are acceptable excuses for absences: death in the immediate family (e.g. mother, father, spouse, child, or sibling), hospitalization or serious illness; jury duty; court ordered summons; religious holiday; university/school coordinated athletic or scholastic activities; an unanticipated event that would cause attendance to result in substantial hardship to one's self or immediate family. Absences must be explained with the submission of appropriate documentation to the satisfaction of the instructor, who will decide whether missed work may be made up. Absences that do not satisfy the above criteria are considered unexcused. To protect your privacy, doctor's excuses should exclude the nature of the condition and focus instead on how the condition impacts your attendance and academic performance.

Missing class reduces your grade through the following grade reduction policy: You are allowed two excused or unexcused absences. Each additional absence, unless excused, results in a 10% reduction in your final course grade. More than six absences result in an F in the course. Missing class may also reduce your grade by eliminating opportunities for class participation. For all absences, the student is responsible for all covered materials and assignments.

Incomplete:

The instructor may assign an Incomplete (I) grade only if at least 75% of the required coursework has been completed at passing quality and holding you to previously established time limits would result in unjust hardship to you. All unfinished work must be completed by the date set by the instructor. Left unchanged, an Incomplete automatically becomes an F after one year. http://registrar.iupui.edu/incomp.html

Deliverables:

You are responsible for completing each deliverable (e.g., assignment, quiz) by its deadline and submitting it by the specified method. Deadlines are outlined in the syllabus or in supplementary documents accessible through Canvas. Should you miss a class, you are still

responsible for completing the deliverable and for finding out what was covered in class, including any new or modified deliverable.

No work accepted after due date.

Class assignments:

There will be a number assignments given to you to be completed outside of class. They will be designed to get you to apply your new skills with a challenging application. You are expected to work alone on these assignments.

Grading Information:

Labs	30%
Project 1*	15%
Project 2*	30%
Project 3*	25%

* Projects are comprised of

- Three progress checks (5% each for a total of 15% of project points,)
- A presentation (15% of project points)
- Final deliverable (70% of project points)

WEEKLY SCHEDULE

Week 1

Lecture	Introduction to the course
Assignment	Install PhpStorm, Git, and node.js on your computer (if they were not already).
Outcome	Installation of software and development of the necessary skills to begin to complete the work for the semester

Week 2

Lecture	Writing JavaScript Object Data, Introduction to NoSQL
Assignment	Implement an inventory data structure in a JavaScript Object. Code a JavaScript implementation that allows users to drill down through this nested structure. Then learn how to transfer that data into a NoSQL database.

Outcome Demonstrate ability to hard code data collections, and use that data to display information to a user. Become familiar with creating deep data structures and targeting data in a nested data structure.

Week 3

Lecture Introduction to NoSQL

Assignment Transfer the inventory data from JSON format to a NoSQL database, write queries to recreate the prior week's lab

Outcome Understand the use of IDs to identify unique entries in the database and how they can be used to link data together.

Week 4

Lecture Introduction to modelling data and diagrams

Assignment Add new tables to the inventory that stores character data and represents the links between the characters and items within the inventory.

Project 1

Outcome Be able to describe how to model data, and draw diagrams. Indicate the different types of relationships between data that are used within a relational database

Week 5

Lecture Transactional operations

Assignment Creation of a basic CRUD system that allows for adding new information into items and characters by the users. Write code that displays this data in a navigable app display.

Outcome Understand and apply queries that can insert, edit, and remove data from a database at runtime, & ensure links between entries remain intact

Week 6

Lecture Database Creation Operations

Assignment Finish the CRUD exercise from last week and create an additional table in the database for quests that the users have completed. The entire dataset will also be reset and remade using database creation strings.

Outcome Understand how to create databases in a form that can easily be transferred and set up on other machines.

Week 7

Lecture Storing referential data in databases & database version migration

Assignment Add in fields into the database for images of items (via a migration table that can be used to update other client databases as well). Write the code to both upload images, and update the field with links to those images in the database. Add in game logic for adding and subtracting player money based on items purchased during gameplay.

Outcome Understand how to use databases to store references to large, binary files. Apply a migration to keep all client databases in sync.

Week 8

Lecture Project 1 Presentations

Assignment Project 2

Outcome

Week 9

Lecture Introduction to visual programing concepts

Assignment Using a media programming framework, create a simple game-like application that allows users to highlight objects on mouse over, and move objects around on the screen via keyboard interaction.

Outcome Understand media programming concepts like coordinate space, creating objects and placing them onto the screen, and enabling interaction via update loops

Week 10

Lecture Storing and using spatial data

Assignment Using a pre-made game system, adjust the items database to include locations of shops in the world where a player might buy and sell these items.

Outcome Understand how to use numeric data to represent visual and spatial locations within an application

Week 11

Lecture Data Aggregation

Assignment Write instructions that aggregate and summarize stats in the items database, and shows these stats on an application page.

Outcome Be able to describe and implement aggregation methods

Week 12

Lecture Project 2 Presentations

Assignment Project 3

Outcome Develop a foundational ability to visualize numeric data for easier digestion by users

Week 13

Lecture Saving and storing world data

Assignment Using the prior lab's work, adjust the world database through a migration to store more features of the world including NPCs and monsters to fight. Implement a save feature that will add and remove these characters from the game based on player actions.

Outcome Understand how to implement database queries in a real time, media-focused environment

Week 14

Lecture Redesigning databases

Assignment Given a database with flaws in design, discuss possible solutions and implement them through a series of migrations and tests. Using a profiler, show that the game uses less data and processing time on communicating with the database server.

Outcome Be able to analyze existing databases and redesign them for easier use and less chance of data replication or corruption.

Week 15

Lecture Wrap up / Further applications

Assignment

Outcome

Week 16

Lecture Project 3 Presentations

Assignment

Outcome

Projects

Project 1

Wizarding School Database

Project 2

Quest Based Game

Project 3

Student defined, requires media interaction (art based or 3D based interactions)

Grading Scale:

A+	100%	Professional level work, showing highest level of achievement
A	93–99%	Extraordinarily high achievement, quality of work; shows command of the subject matter
A–8	90–92%	Excellent and thorough knowledge of the subject matter

B+	87–89%	Above average understanding of material and quality of work
B	83–86%	Mastery and fulfillment of all course requirements; good, acceptable work
B–	80–82%	Satisfactory quality of work
C+	77–79%	Modestly acceptable performance and quality of work
C	73–76%	Minimally acceptable performance and quality of work
C–	70–72%	Unacceptable work (Core course must be repeated for credit)
D+	67–69%	Unacceptable work (Course must be repeated for credit)
D	63–66%	Unacceptable work
D–	60–62%	Unacceptable work
F	Below 60	Unacceptable work

No credits toward major, minor, or certificate requirements are granted for a grade below C. No credits toward general education or elective requirements are granted for a grade below C–.

CODE OF CONDUCT

All students should aspire to the highest standards of academic integrity. Using another student's work on an assignment, cheating on a test, not quoting or citing references correctly, or any other form of dishonesty or plagiarism shall result in a grade of zero on the item and possibly an F in the course. Incidences of academic misconduct shall be referred to the Department Chair and repeated violations shall result in dismissal from the program.

All students are responsible for reading, understanding, and applying the *Code of Student Rights, Responsibilities and Conduct* and in particular the section on academic misconduct. Refer to *The Code* > *Responsibilities* > *Academic Misconduct* at http://www.indiana.edu/~code/. All students must also successfully complete the Indiana University Department of Education "How to Recognize Plagiarism" Tutorial and Test. https://www.indiana.edu/~istd You must document the difference between your writing and that of others. Use quotation marks in addition to a citation, page number, and reference whenever writing someone else's words (e.g., following the *Publication Manual of the American Psychological Association*). To detect plagiarism instructors apply a range of methods, including Turnitin.com. http://www.ulib.iupui.edu/libinfo/turnitin

Academic Misconduct:

1. **Cheating:** Cheating is considered to be an attempt to use or provide unauthorized assistance, materials, information, or study aids in any form and in any academic exercise or environment.
   a. A student must not use external assistance on any "in-class" or "take-home" examination, unless the instructor specifically has authorized external assistance. This prohibition includes, but is not limited to, the use of tutors, books, notes, calculators, computers, and wireless communication devices.
   b. A student must not use another person as a substitute in the taking of an examination or quiz, nor allow other persons to conduct research or to prepare work, without advanced authorization from the instructor to whom the work is being submitted.
   c. A student must not use materials from a commercial term paper company, files of papers prepared by other persons, or submit documents found on the Internet.
   d. A student must not collaborate with other persons on a particular project and submit a copy of a written report that is represented explicitly or implicitly as the student's individual work.
   e. A student must not use any unauthorized assistance in a laboratory, at a computer terminal, or on fieldwork.
   f. A student must not steal examinations or other course materials, including but not limited to, physical copies and photographic or electronic images.
   g. A student must not submit substantial portions of the same academic work for credit or honors more than once without permission of the instructor or program to whom the work is being submitted.
   h. A student must not, without authorization, alter a grade or score in any way, nor alter answers on a returned exam or assignment for credit.
2. **Fabrication:** A student must not falsify or invent any information or data in an academic exercise including, but not limited to, records or reports, laboratory results, and citation to the sources of information.
3. **Plagiarism:** Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged, unless the information is common knowledge. What is considered "common knowledge" may differ from course to course.
   a. A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.
   b. A student must give credit to the originality of others and acknowledge indebtedness whenever:

1. directly quoting another person's actual words, whether oral or written;
2. using another person's ideas, opinions, or theories;
3. paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
4. borrowing facts, statistics, or illustrative material; or
5. offering materials assembled or collected by others in the form of projects or collections without acknowledgment

4. **Interference:** A student must not steal, change, destroy, or impede another student's work, nor should the student unjustly attempt, through a bribe, a promise of favors or threats, to affect any student's grade or the evaluation of academic performance. Impeding another student's work includes, but is not limited to, the theft, defacement, or mutilation of resources so as to deprive others of the information they contain.
5. **Violation of Course Rules:** A student must not violate course rules established by a department, the course syllabus, verbal or written instructions, or the course materials that are rationally related to the content of the course or to the enhancement of the learning process in the course.
6. **Facilitating Academic Dishonesty:** A student must not intentionally or knowingly help or attempt to help another student to commit an act of academic misconduct, nor allow another student to use his or her work or resources to commit an act of misconduct.

OTHER POLICIES

1. **24 hours no-questions:** One day before a project is due, no questions will be answered on the material.
2. **Grade freeze:** One week after a grade has been assigned it will not be changed.
3. **Administrative withdrawal:** Students must participate in all class discussions and conscientiously complete all required course activities and/or assignments. If a student is unable to attend, participate in, or complete an assignment on time, the student must inform the instructor. If a student misses more than half of the required activities within the first 25% of the course without contacting the instructor, the student may be administratively withdrawn from this course. Administrative withdrawal may have academic, financial, and financial aid implications. Administrative withdrawal occurs after the full refund period, and a student who has been administratively withdrawn is ineligible for a tuition refund.

4. **Civility:** To maintain an effective and inclusive learning environment, it is important to be an attentive and respectful participant in lectures, discussions, group work, and other classroom exercises. Thus, unnecessary disruptions should be avoided, such as ringing cell phones, engagement in private conversations, and other unrelated activities. Cell phones, media players, or any noisy devices should be turned off during a class. Texting, web surfing, and posting to social media are generally not permitted. Laptop use may be permitted if it is used for taking notes or conducting class activities. Students should check with the instructor about permissible devices in class. IUPUI nurtures and promotes "a campus climate that seeks, values, and cultivates diversity in all of its forms and that provides conditions necessary for all campus community members to feel welcomed, supported, included, and valued" (IUPUI Strategic Initiative 9). IUPUI prohibits "discrimination against anyone for reasons of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, or veteran status" (Office of Equal Opportunity). Profanity or derogatory comments about the instructor, fellow students, invited speakers or other classroom visitors, or any members of the campus community shall not be tolerated. A violation of this rule shall result in a warning and, if the offense continues, possible disciplinary action.
5. **Communication:** For classroom-based courses, the instructor or teaching assistant should respond to emails by the end of the next class or, for online courses, within two Indiana University working days, which excludes weekends and holidays. The instructor should provide weekly office hours or accept appointments for face-to-face, telephone, or teleconferenced meetings, and announce periods of extended absence in advance.
6. **Counseling and Psychological Services (CAPS):** Students seeking counseling or other psychological services should contact the CAPS office at 274-2548 or capsindy@iupui.edu. For more information visit http://life.iupui.edu/caps/.
7. **Course evaluations:** Course evaluations provide vital information for improving the quality of courses and programs. Students are urged to complete one course and instructor evaluation for each section in which they are enrolled at the School of Informatics and Computing with the following exceptions: (a) The student has withdrawn from the course; (b) fewer than five students are enrolled in the section (in which case maintaining anonymity is difficult); and (c) the section is a laboratory that must be taken with a course having a different section number. Course evaluations are completed at https://soic.iupui.edu/app/course-eval/. Course evaluations are typically open from the eleventh week. Course evaluations are anonymous, which means that no one can view the name of the student completing the evaluation. In addition, no one can view the evaluation itself until after the instructor has submitted the final grades. In small sections, demographic information should be left blank, if it could be used to identify the student.

8. **Disabilities policy:** All qualified students enrolled in this course are entitled to reasonable accommodations for a disability. Notify the instructor during the first week of class of accommodations needed. Students requiring accommodations register with Adaptive Educational Services (AES) and complete the appropriate AES-issued before receiving accommodations. The AES office is located at UC 100, Taylor Hall (Email: aes@iupui.edu, Tel. 317 274-3241). For more information visit http://aes.iupui.edu.
9. **Email:** Indiana University uses your IU email account as an official means of communication, and students should check it daily. Although you may have your IU email forwarded to an outside email account, please email faculty and staff from your IU email account.
10. **Emergency preparedness:** Know what to do in an emergency so that you can protect yourself and others. For more information, visit the emergency management website at http://protect.iu.edu/emergency.
11. **IUPUI course policies:** Several campus policies governing IUPUI courses may be found at the following link: http://registrar.iupui.edu/course_policies.html
12. **No class attendance without enrollment.** Only those who are officially enrolled in this course may attend class unless enrolled as an auditor or making up an Incomplete by prior arrangement with the instructor. This policy does not apply to those assisting a student with a documented disability, serving in an instructional role, or administrative personnel. http://registrar.iupui.edu/official-enrollment-class-attendance.html Children may *not* attend class with their parents, guardians, or childcare providers.
13. **Religious holidays:** Students seeking accommodation for religious observances must submit a request form to the course instructor by the end of the second week of the semester. For information visit http://registrar.iupui.edu/religious.html.
14. **Right to revise:** The instructor reserves the right to make changes to this syllabus as necessary and, in such an event, will notify students of the changes immediately.
15. **Sexual misconduct:** IU does not tolerate sexual harassment or violence. For more information and resources, visit http://stopsexualviolence.iu.edu/. Student advocate:
16. **The Student Advocate** assists students with personal, financial, and academic issues. The Student Advocate is in the Campus Center, Suite 350, and may also be contacted at 317 274-4431 or studvoc@iupui.edu. For more information visit http://studentaffairs.iupui.edu/advocate.

MISSION STATEMENT

The Mission of IUPUI is to provide for its constituents excellence in

- Teaching and Learning;
- Research, Scholarship, and Creative Activity; and
- Civic Engagement.

With each of these core activities characterized by

- Collaboration within and across disciplines and with the community;
- A commitment to ensuring diversity; and
- Pursuit of best practices.

IUPUI's mission is derived from and aligned with the principal components—Communities of Learning, Responsibilities of Excellence, Accountability and Best Practices—of Indiana University's Strategic Directions Charter.

STATEMENT OF VALUES

IUPUI values the commitment of students to learning; of faculty to the highest standards of teaching, scholarship, and service; and of staff to the highest standards of service. IUPUI recognizes students as partners in learning. IUPUI values the opportunities afforded by its location in Indiana's capital city and is committed to serving the needs of its community. Thus, IUPUI students, faculty, and staff are involved in the community, both to provide educational programs and patient care and to apply learning to community needs through service. As a leader in fostering collaborative relationships, IUPUI values collegiality, cooperation, creativity, innovation, and entrepreneurship as well as honesty, integrity, and support for open inquiry and dissemination of findings. IUPUI is committed to the personal and professional development of its students, faculty, and staff and to continuous improvement of its programs and services.