INFO I308
Information Representation
Department of Human Centered Computing
Indiana University School of Informatics and Computing , Indianapolis
Spring 2019

Section No.: 35303
Credit Hours: 3
Instructor: William Helling
Email: whelling@indiana.edu -- use Canvas Inbox for course-related correspondence
Prerequisites: INFO-I210
Instruction mode: online

COURSE DESCRIPTION

This course covers information representation in computer systems. Topics include relational databases in the ER model; SQL commands; database design, implementation, and normalization; database triggers; backup, security, and other data management tasks; data extraction from JSON and XML and their use for transmitting objects between browser and server; and social and ethical issues.

EXTENDED COURSE DESCRIPTION

Information Representation introduces you to technical skills, theoretical concepts, and data issues on relational database design, management, and related concerns including social and ethical implications. We will cover basic principles of database development from conception to completion. Although we review different systems, our emphasis will be on MySQL databases, which will support your work in future information roles. Attention is given to the roles of XML and JSON in databases.

Required Text

Harrington, J. (2016). *Relational database design and implementation* (4th ed.). Cambridge, MA: Morgan Kaufmann. (ISBN: 978-0128043998)

Recommended Readings/Resources

Student should already have mastered basic technology skills. For students lacking entry skills, existing online resources can be valuable. IUPUI provides access to excellent online tutorials. The following resources are recommended for course assignments, exercises, and projects:

- For self-instructional modules focusing on a wide range of basic technology skills, go to UITS IT Training (iu.edu/explore-topics/show-all/index.html)
- For additional software training materials, go to UITS IT Training: Skillsoft(iu.edu/skillsoft/)

Required Software

In your SoIC courses you will need to work with software in order to complete assignments. You have three sources for software: IUware, IUanyWare, Office 365

- **IUware (https://iuware.iu.edu/)** allows students, faculty, and staff to download software at no charge. See: What is IUware? https://kb.iu.edu/d/agze
- **IUanyWare (https://uits.iu.edu/iuanyware)** uses a web browser or mobile app to run certain IU-licensed software applications without your needing to install them on your device. See What is IUanyWare https://kb.iu.edu/d/bbbr (Note: You will be asked to download and install Citrix Receiver the first time you use the full service.)
- **Office 365 (https://uits.iu.edu/office365)** is a subscription-based service free to all IU currently enrolled students that provides multiple options for accessing the newest versions of Microsoft Office. See About Microsoft Office 365 at IU (https://kb.iu.edu/d/bexq)

In addition, you may want to perform some local server-side scripting using WAMP (Windows), MAMP (Mac or Windows), or XAMPP (Mac, Windows, Linux) that you may wish to install on your computer.

- XAMPP: apachefriends.org/
- WAMP: wampserver.com/en/
- MAMP: mamp.info/en/

Recommended: any installation that includes phpMyAdmin.

Teaching and Learning Methods

Active learning (AL), project-based learning (PBL), and asynchronous use of Canvas.

OUTCOMES and ASSESSMENTS

Course Learning Outcomes

Q: Quiz
E: Exercise
D: Database design project

Course Outcomes	Assessment
C1. Diagram a relational database design with entity–relationship diagrams (ERDs) using crow's foot notation to enforce referential integrity.	E1, D3
C2. Evaluate tables for compliance to third normal form and perform normalization procedures on noncompliant tables.	E2, E3, D2a
C3. Design and implement relational databases using tables, keys, relationships, and SQL commands to meet user and operational needs.	E4, E5, D2b, D3, D4
C4. Create views and write triggers to handle events to enforce business rules within a relational database.	D4
C5. Perform data management tasks associated with the data lifecycle including backup and security.	D1, Q2, Q3, Q4
C6. Extract data from JavaScript Object Notation (JSON) and XML documents.	E6
C7. Transmit objects between the browser and server by converting them into JSON.	E6, E7
C8. Evaluate the social and ethical implications of data management.	Q1

Assessments Details

Each student should not only read the assigned material but also arrive at a competent understanding of it prior to assessment. These measures will be used to assess student-learning outcomes:

1. ***Exercises*** are scheduled by the instructor on course materials.
2. ***Quizzes*** assess comprehension and skill acquisition. Quizzes are conducted in the learning management system (Canvas). Students do not work under a time limit.
3. ***Database design project*** affords the opportunity for students to apply concepts covered in the course.
4. ***Content questions based on readings*** determine attitude and effort in course activities.

Program-level Learning Outcomes (PLOs)

Please visit Learning Outcomes for the B.S. in Informatics (https://soic.iupui.edu/undergraduate/degrees/informatics/learning-outcomes/) to view the complete list of the program-level learning outcomes for B.S. in Informatics. This course is designed to mainly demonstrate the following PLOs:

- A4. Describe data and information representation
- B1. Use problem-solving techniques to design program algorithms, including pseudo code and flow charts
- C3. Create effective visualizations to analyze and communicate data
- D1. Apply fundamental concepts of software architecture
- D2. Develop user requirements
- E1. Analyze the social, cultural, and organizational settings in which IT solutions will be deployed to achieve successful implementation
- F2. Support the ethical and appropriate design and use of technology

Program-level Learning Outcomes	Level of Knowledge*	Course Learning Outcomes	Profiles of Learning for Undergraduate Success	Assessment
A4. Describe data and information representation	R	C2	P1.4. Communicator: Convey Ideas Effectively	E2, E3, D2a
B1. Use problem-solving techniques to design program algorithms, including pseudo code and flow charts	M	C4, C6	P2.3. Problem Solver: Analyzes, synthesizes, and evaluates	D4, E6
C3. Create effective visualizations to analyze and communicate data	M	C1, C3	P3.2. Innovator: Creates/designs	E1, D3, E4, E5, D2b, D3, D4
D1. Apply fundamental concepts of software architecture	R	C7	P2.1. Problem Solver: Think critically	E6, E7
D2. Develop user requirements	M	C3	P2.1. Problem Solver: Analyzes, Synthesizes, and Evaluates	E4, E5, D2b, D3, D4
E1. Analyze the social, cultural, and organizational settings in which IT solutions will be deployed to achieve successful implementation	R	C5	P2.1. Problem Solver: Analyzes, Synthesizes, and Evaluates	D1, Q2, Q3, Q4

Program-level Learning Outcomes	Level of Knowledge*	Course Learning Outcomes	Profiles of Learning for Undergraduate Success	Assessment
F2. Support the ethical and appropriate design and use of technology	R	C8	P4.4. Community Contributor: Anticipates consequences	Q1

*Indicators of level of knowledge: I – Introduce; R – Reinforce; M – Master

COURSE SCHEDULE

Chapter readings, unless otherwise indicated, refer to: Harrington, J. (2016). *Relational database design and implementation* (4th ed.). Cambridge, MA: Morgan Kaufmann. (ISBN: 978-0128043998)

Module	Contents	ASSESSMENT
1	**Database design principles and methodology** • Chapter 1: The Database Environment • Chapter 2: Systems Analysis and Database Requirements	Q1
2	**ER modeling** • Chapter 3: Why Good Design Matters • Chapter 4: Entities and Relationships	E1
3	**ER modeling, Normalization** • Chapter 5: The Relational Data Model • Chapter 6: Relational Algebra • Chapter 7: Normalization	E2
4	**Normalization, Performance enhancement** • Chapter 8: Database Design and Performance Tuning • Chapter 9: Codd's Rules for Relational DBMSs	E3, D1
5	**SQL basics** • Chapter 10: Introduction to SQL	E4

Module	Contents	ASSESSMENT
	• Chapter 11: Using SQL to Implement a Relational Design See also for reference: • Appendix B: SQL Programming • Appendix C: SQL Syntax Summary • MySQL Tutorial (www.w3resource.com/mysql/mysql-tutorials.php)	
6	**SQL DML** • Chapter 16: Simple SQL Retrieval • Chapter 17: Retrieving Data from More Than One Table Note: For MySQL reference, see IUPUI ebook: Sheldon, R. (2005). Beginning MySQL. John Wiley & Sons, Incorporated	E5
7	**SQL DML** • Chapter 18: Advanced Retrieval Operations • Chapter 19: Working With Groups of Rows	D2a
8	**SQL DML and DDL** • Chapter 20: Data Modification • Chapter 21: Creating Additional Structural Elements	D2b
9	**Database design and management** For class discussion: • Chapter 13: Database Design Case Study #1: Mighty-Mite Motors For the assessment: • Chapter 14: Database Design Case Study #2: East Coast Aquarium • Chapter 15: Database Design Case Study #3: SmartMart	Q2

Module	Contents	ASSESSMENT
10	**Database implementation** • Chapter 22: Concurrency Control • Chapter 23: Database Security • Appendix B: SQL Programming, pp. 626-627 (stored procedures, triggers)	Q3
11	**Social and ethical implications of data management** • Chapter 24: Data Warehousing • Chapter 25: Data Quality	Q4
12	**The role of XML in database systems** • Chapter 26: XML Support • For background: XML at w3schools tutorial (https://www.w3schools.com/xml/)	D3
13	**The role of JSON in database systems** • Chapter 28: Relational Databases and "Big Data": The Alternative of a NoSQL Solution • JSON Tutorial (https://www.w3resource.com/JSON/introduction.php) • Structures of JSON (https://www.w3resource.com/JSON/structures.php)	E6
14	**Transmitting objects between browser/server using JSON** • JSON with MariaDB 10.2 (mariadb.com/resources/blog/json-mariadb-102) • JSON Data Type (mariadb.com/kb/en/library/json-data-type/) • JSON Support in MariaDB (mariadb.org/wp-content/uploads/2017/11/JSON-MariaDB.pdf)	E7
15	**Database project completion**	D4

GRADING SCALE

The total score is 150 points. At the end of the semester, everybody's score is mapped to one of the letter grades according to the standing of the class.

Grade Allocation

- Q = Quizzes (4)--17 pts
- E = Exercises (7)--37 pts
- D = Database design project (5)--35pts
- Content questions (14)--61pts

Grade	Minimum %	Description
A+	97.0	Professional level work, showing highest level of achievement
A	93.0	Extraordinarily high achievement, quality of work; shows command of the subject matter
A-	90.0	Excellent and thorough knowledge of the subject matter
B+	87.0	Above average understanding of material and quality of work
B	83.0	Mastery and fulfillment of all course requirements; good, acceptable work
B-	80.0	Satisfactory quality of work
C+	77.0	Modestly acceptable performance and quality of work
C	73.0	Minimally acceptable performance and quality of work
C-	70.0	Unacceptable work (Core course must be repeated for credit)
D+	67.0	Unacceptable work (Course must be repeated for credit)
D	63.0	Unacceptable work
D-	60.0	Unacceptable work
F	0.0	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–.

EXPECTATIONS, GUIDELINES, AND POLICIES

Participation (online "attendance")

A basic requirement of this course is that you will participate in all class Modules and conscientiously complete all required course assignments. Students are expected to complete the assignments, quizzes, and projects on time.

Only the following are acceptable excuses for long periods of inactivity ("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.

Incompletes

Incompletes are only available when unexpected events prevent completion of the course requirements in the usual time frame. No student with multiple incompletes may register for additional courses. Left unchanged, an Incomplete automatically becomes an F after one year. See: IUPUI Registrar: Grade of Incomplete (registrar.iupui.edu/incomp.html)

Deliverables

You are responsible for completing each deliverable (e.g., quiz, exercise, project) by its deadline and submitting it by the specified method. Deadlines and submission instructions are outlined in the syllabus or in supplementary documents accessible through Canvas. In fairness to the instructor and students who completed their work on time, a grade on a deliverable shall be reduced 10%, if it is submitted late and a further 10% for each 24-hour period it is submitted after the deadline.

Your Questions, Concerns, and Comments

Please do not hesitate to contact the instructor directly via Canvas mail with any questions. If needed, the instructor will also use Canvas Announcements to notify the entire group (e.g., syllabus change, instructor availability, etc.).

If you have problems accessing Canvas, please contact the University Information Technology Services (UITS) Support Center at 317-274-HELP. All course Announcements will be found in Canvas along with the course schedule, assignments, and other course documents.

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 of Student Rights (studentcode.iu.edu/)

All students must also successfully complete the Indiana University Department of Education "How to Recognize Plagiarism" Tutorials and Tests (www.indiana.edu/~academy/firstPrinciples/)

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.

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.
    1. 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.
    2. 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.
    3. 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.
    4. 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.
    5. A student must not use any unauthorized assistance in a laboratory, at a computer terminal, or on fieldwork.
    6. A student must not steal examinations or other course materials, including but not limited to, physical copies and photographic or electronic images.

7. 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.
8. 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.
    1. A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.
    2. 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
    3. **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.
    4. **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.
    5. **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. **Administrative withdrawal:** A basic requirement of this course is that students complete all required course activities. If a student is unable to attend, participate in, or

complete an assignment on time, it is the student's responsibility to 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 will take place after the full refund period, and a student who has been administratively withdrawn from a course is ineligible for a tuition refund. Contact the instructor with questions concerning administrative withdrawal. Learn more at IUPUI Administrative Withdrawal Policy (iupui.edu/withdrawal-policy.html)

2. **Civility:** To maintain an effective and inclusive learning environment, it is important to be an attentive and respectful participant in all course exercises. 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 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.
3. **Communication:** For online courses, the instructor or teaching assistant should respond to emails within two Indiana University working days, which excludes weekends and holidays. The instructor should accept appointments for face-to-face, telephone, or teleconferenced meetings, and announce periods of extended absence in advance.
4. **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 the CAPS website (iupui.edu/health-wellness/counseling-psychology/)
5. **Course evaluations:** Course evaluations provide vital information for improving the quality of courses and programs. Students are not required to complete a course or instructor evaluation for any section in which they are enrolled at the School of Informatics and Computing. Course evaluations are completed in Canvas (Course Questionnaire). Course evaluations are 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 for the course. In small sections, demographic information should be left blank, if it could be used to identify the student.
6. **Disabilities policy:** In compliance with the Americans with Disabilities Act (ADA), all qualified students enrolled in this course are entitled to reasonable accommodations. Please notify the instructor during the first week of class of accommodations needed for the course. Students requiring accommodations because of a disability must register with Adaptive Educational Services (AES) and complete the appropriate AES-issued before receiving accommodations. Students with learning disabilities for which accommodations are desired should contact the Adaptive Educational Services office on

campus, and inform the instructor as soon as possible: Adaptive Educational Services (AES) (iupui.edu/) 317-274-3241.

7. **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.
8. **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 Protect IU (protect.iu.edu/emergency)
9. **IUPUI course policies:** Several campus policies governing IUPUI courses may be found at IUPUI Course Policies (registrar.iupui.edu/course_policies.html)
10. **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. See Administrative Policy: No Class Attendance without Official Enrollment (iupui.edu/official-enrollment-class-attendance.html)
11. **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 IUPUI Policy on Religious Holidays (registrar.iupui.edu/religious.html).
12. **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.
13. **Sexual misconduct:** IU does not tolerate sexual harassment or violence. For more information and resources, visit Stop Sexual Violence (iu.edu/)
14. **Student advocate:** 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 Division of Student Affairs (studentaffairs.iupui.edu/advocate)

IUPUI COURSE POLICIES

A number of campus policies governing IUPUI courses may be found at the following link: **Course Policies** (registrar.iupui.edu/course_policies.html)

See **the Important Supplement for IUPUI Syllabi** (.pdf). This link is also automatically inserted at the **top of the Canvas Syllabus page. This supplement covers:**

- IUPUI Policy on Disability Accommodations
- **IUPUI Policy on Religious Holidays**
- **IUPUI Policy on Academic Integrity**
- **IUPUI Policy on Sexual Misconduct**
- **Education and Title VI**

- Military Related Personnel Statement
- Two-Step Login (Duo)

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.