

CS240 – Database Management

M. E. Kabay, PhD, CISSP-ISSMP, Prof of Computer Information Systems
School of Business & Management, Norwich University

Dewey 209 <mailto:mkabay@norwich.edu> Skype: mekabay
Facebook: Mich Kabay Web: <http://www.mekabay.com>

1 Course Description

A study of the concepts and structures necessary to design and implement a database management system. Various data models will be examined and related to specific examples of database management systems including Structured Query Language (SQL). Techniques of system design, system implementation, data security, performance, and usability will be examined. Prerequisite: C or higher in IS131 or CS140.

2 Course Objectives

By the end of this course, students will be able to

- Define the term *database management system (DBMS)* and describe the functions of a DBMS
- Define the term *database* and describe what is contained within the database
- Define the term *metadata* and provide examples of metadata
- At a management level, describe database design from existing data, as new systems development and in database redesign
- Discuss at a management level the history and development of database processing Use Microsoft Access 2013 or MySQL 5.6 for simple database applications
- Use basic relational terminology, describe the characteristics of relations, to identify functional dependencies, determinants, and dependent attributes, to identify primary, candidate, and composite keys, to identify possible insertion, deletion, and update anomalies in a relation, and to normalize data tables
- Judge intelligently when to denormalize a database design
- Recognize and be able to correct common design problems such as the multivalued, multicolumn problem, the inconsistent values problem, the missing values problem and the general-purpose remarks column problem
- Use SQL queries to manipulate data in databases
- Apply a spiral approach to database design
- Use a consistent, generic Information Engineering Crow's Foot entity-relationship diagram notation for data modeling and database design
- Choose when and how to apply ID-dependent and other weak entities, supertype/subtype entities, strong entity patterns, ID-dependent association pattern, the ID-dependent multivalued attribute pattern, the ID-dependent archetype/instance pattern, the line-item pattern, the for-use-by pattern and recursive patterns
- Transform data models into database designs using primary keys, surrogate keys, referential integrity constraints, and tables representing weak entities, supertypes/subtypes, recursive relationships, and ternary relationships
- Implement referential integrity actions required by minimum cardinalities
- Describe the role of database administration, concurrency control, security, and backup and recovery

- Use appropriate terminology and methods for concurrency control including optimistic and pessimistic locking, ANSI isolation levels, and rollback vs rollforward recovery
- Describe at a management level the critical functions and considerations for DB-driven Web servers
- Discuss non-SQL databases used in data warehouses for big-data analysis and business-intelligence systems

3 Course Schedules & Locations

Mondays, Wednesdays & Fridays and using NUoodle

- Section A: from 09:00:03 to 09:49:57 in D309
- Section B: from 13:00:03 to 13:49:57 in D211

4 Text

Kroenke, D. M. & D. J. Auer (2014). *Database Processing: Fundamentals, Design, and Implementation (13th Edition)*. Prentice Hall (ISBN 978-0133058352). xxxii + 608 pp. AMAZON <http://www.amazon.com/Database-Processing-Fundamentals-Implementation-Edition/dp/0133058352>

5 Methods of Assessment

All assignments and exams are submitted using NUoodle. Deadlines for each assignment are posted in NUoodle and on the class syllabus.

*Responding punctually to professional responsibilities is part of the maturation of students. To encourage promptness, late submissions for any of the assignments will result in **zero grades**.*

There will be no grading on a curve. There are no predetermined numbers of A, B and other grades – which means everyone can get an A 😊 (or everyone can fail ☹).

5.1 Weekly Homework: 25% of final grade

Students will respond in writing to specific assignments issued weekly for deepening competence in applying the principles discussed in the text and in class.

5.2 Term Project: 25% of final grade

Working in randomly-assigned teams of three (or two if necessary), students will design, create, test, document and demonstrate a database project during the semester.

The Project will be assigned 50% of the final grade and will be a simple database demonstrating normalized design, correct implementation in MS-Access, effective queries, and appropriate reports. Topic areas are suggested online. The project will be due by the end of Week 14. Projects will be discussed in class in Week 15 and posted online for all students to examine and learn from.

5.3 Multiple-Choice Quizzes & Exams: 50% of the final grade

Multiple-choice quizzes and exams have two minutes allocated per question.

5.3.1 Weekly Quizzes: 25% of final grade

Students will complete an open-book quiz after the week's work; deadline 23:55 Sunday at the end of the week.

5.3.2 *Mid-term Exam: 10% of final grade*

At the mid-point of the course defined by the Registrar's schedule for submission of mid-term grades, students will complete an open-book exam on all the material in the course assigned up to two weeks before the exam deadline.

5.3.3 *Final Exam: 15% of final grade*

At the end of the course students will complete an open-book exam on all the material in the course.

5.3.4 *Replacement quizzes and exams: replacement of lower score for each element*

For students who have experienced difficulties in their weekly quizzes, midterm exam or final exam, there are opportunities to improve their specific grades by replacing a lower exam grade by a higher. Grades cannot be lowered by taking a make-up exam. Make-up exams are designed with *one* minute per question; thus if there are 50 questions, the students have 50 minutes to complete as many as they can.

6 Extra-credit Work

6.1.1 *Submitting written responses to exercises in textbook*

Students may earn 1 point to add to their homework score for each written answer to an unassigned problem from the appropriate chapter in their textbook. Thus if a student got a zero out of 10 on homework in, say, Week 5, answering 5 questions correctly from questions not assigned for homework from the end of the chapter assigned in that week could bring their homework score up to 5/10. It is also possible to exceed the maximum score on a homework: for example, answering 15 unassigned questions correctly from the chapter concerned could add 15 points to the 0/10 score, resulting in 15/10.

6.1.2 *Extra written assignments – up to 10 points maximum added to total 100-point final grade for course for up to 5,000 words total across all submissions*

Students may submit extra assignments such as analyses of real-world data or discussions of interesting articles involving database applications; good ones will be posted for other students to read. These contribute points to the final-grade score and can compensate for less-than-perfect grades on required assignments, quizzes and exams.

- There is no limit to the word-count other than noting that even a perfect score on a paper with more than 5,000 words would generate no more than 10 final-grade points.
- The point-score is calculated using a ratio of up to 1 extra final-grade point per 500 words (not counting title page, tables and figures) on essays. Students may write less than 500 words in a submission, receiving partial credit (e.g., 100 words could net up to 0.2 points on the final score) – which could, for instance, make the difference between an A- and an A grade).
- The maximum number of extra homework points achievable to increase the final grade points in this way is 10 in all per semester. Thus a student with 84.5% who wrote 6,000 words of acceptable extra-credit assignments would receive a grade of 94.5% at the end of the course.

7 Cheating and Plagiarism

- Students are graded on an individual basis and must therefore complete their own work. However, projects #1 & #2 are to be completed in teams and the collaborators must pool their work; all members of a specific team will receive the same grade.
- Students are reminded of the University's Policy against cheating and plagiarism (Chapter 2, Section V of the *Student Rules*): < <http://www.norwich.edu/about/policy/StudentRulesRegs.pdf> >.
- Plagiarism consists of using someone else's text or ideas without using quotation marks to indicate exact duplication of the original and/or failing to indicate the source of reference materials and

quotations. If in doubt as to what constitutes plagiarism, ask the instructor for a review of your work before submitting an assignment.

- All instances of cheating and of plagiarism must be reported to the *Academic Integrity Committee* by the instructor or by students who have observed the dishonesty. Penalties include expulsion from the University.
- **Ignorance of the University's Rules is not a valid defense against accusations of academic dishonesty.**

8 Additional Notes

- Students are encouraged to study together but may not collaborate during quizzes or exams.
- University regulations stipulate that “Unless stated otherwise, the maximum number of permitted absences is the number of times the course meets per week. When the student has reached the maximum number of permitted absences, the faculty member will warn the student of impending dismissal from class with a grade of ‘F.’ This warning letter will include the course number and section and dates(s) of absence(s). The letter will state that any future unexcused absences may result in recommendation to the Vice President of Academic Affairs through the course School Dean that the student be dismissed from the class with a grade of ‘F.’ A copy of the warning letter will go to the student’s academic advisor and to the Commandant and Vice President of Student Affairs.” (See pp 69-70 of the PDF version of the *Academic Regulations* available online at < <http://catalog.norwich.edu/residentialprogramscatalog/academicregulations/> >.)
- Therefore, students may miss exactly three sessions of this course without explanation; the fourth and subsequent unexcused absences will be reported as stipulated in the academic regulations and may lead to dismissal from the course with an F grade.
- If you plan to be absent for an approved purpose, discuss the absence with the instructor in advance.
- Always explain a previous absence using the space available on the daily sign-in sheets. The instructor does NOT want to expel you!

9 Coordination with AAC

- The instructor routinely and willingly provides reasonable accommodations for students with documented disabilities on an individualized and flexible basis.
- For any student with a documented disability, the University's *Academic Achievement Center* (AAC) determines appropriate accommodations through consultation with each student.
- To receive accommodations in this or any other class, affected students need to make an appointment with the AAC, located on the 4th Floor of the Kreitzberg Library (phone ext. 2130).
- AAC will work with students to determine eligibility for services and, if appropriate, will provide an Educational Profile for each student to bring to their instructors.
- After making arrangements with the AAC, students should arrange a meeting with the instructor to discuss accommodations in this course.
- In keeping with the University's policy of providing equal access for students with disabilities, any student with a disability who needs academic accommodations is welcome to meet with the instructor privately. All conversations will be kept confidential (for example, the instructor's office door may be closed at the student's request).
- The instructor will review the Profile with the student and discuss accommodations in relation to this course.

10 Office Hours & Contact Information

- Office hours are posted online < http://www.mekabay.com/current_schedule.jpg > and students are welcome to drop in without an appointment. The usual greeting is, "Hi! What can I do for you?"
- Students are also welcome to call the instructor at (802) 479-7937 at any time (that number rings in his office or his cell phone but cannot disturb him at home); leave a voice-mail message with a return number if necessary.
- SMS (text) messages are also acceptable at 802-479-7937.
- Students may also use Skype Instant Messaging at any time using his Skype ID (mekabay).
- Email should be addressed only to the NU address <

You are not required to read the biographical details on the next page.

They're available for any students who are curious about their instructor's professional background.

mkabay@norwich.edu > to respect FERPA.

- Students should put the string *CS240* in the subject line of email and in the first Skype message of a conversation for easier identification so the instructor (whose memory is getting worse every year) doesn't have to look up what class they are referring to.

11 More Than You Need or Want to Know About your Instructor

M. E. Kabay began teaching his high school classmates how to use the slide rule in 1963 (NOT the best way to become popular) and began programming IBM 1401 computers in assembly language in 1965, switching to FORTRAN IV G as fast as he could. He continued to program throughout his BSc & MSc studies at McGill University and used assembler for his HP programmable calculators throughout his studies. In 1976, he received his PhD from Dartmouth College in applied statistics and invertebrate zoology (!?) and taught statistics (and a couple of biology courses too) as a university professor in Canada (in French at Université de Moncton) and statistics and programming courses overseas (in French at the Université nationale du Rwanda in central Africa).

In 1979, he joined a compiler team for a new 4GL and RDBMS in the US and wrote the parser in DTSS BASIC and code generator (DTSS COBOL) for a set of statistical functions in the compiler, as well as being responsible for system testing and documentation.

In 1980 he joined Hewlett-Packard Canada in 1980 as an operating-systems-internals and database-performance specialist. He won the *Systems Engineer of the Year Award* in 1982. His teaching for HP was primarily on the MPE/3000 operating system internals, IMAGE/3000 database and VPLUS/3000 GUI-design courses. He served as support engineer mostly to HP's hospital and university customers in Montreal and Ottawa; he also managed HP's bilingual call center (*Phone-In Consulting Service*) for Québec & the Maritime provinces from 1981 through 1983.

From 1984 through June 1986 he was Director of Technical Services for MATHEMA Inc., a major service bureau in Montréal at the time. He was responsible for training and supervision of all operations in the 24x365 HP3000-based computing center.

He founded his consulting firm, JINBU Corporation in July 1986 and continued his work as an operations-management consultant, although information security became an ever-important component of his work starting around 1988. He worked extensively on performance optimization for HP computers in several departments of the Canadian government.

He served as Director of Education for the National Computer Security Association (NCSA, later ICSA and then TruSecure and now Verizon's Business Security Solutions) from 1991 to 1999 and then worked with the short-lived AtomicTangerine company, where he supported the *International Institute for Information Integrity*® (I-4®).

He collaborated in the (ISC)² committees defining the *Common Body of Knowledge* for the *Certified Information Systems Security Professional* (CISSP) designation in the mid-1990s and earned his CISSP in 1997 and his ISSMP (*Information Systems Security Management Professional*) in 2005.

Since 1986 (and as of the end of 2016), he has published over 1,300 articles in operations management and security, written a college textbook on enterprise security (McGraw-Hill, 1996), and served as Technical Editor of the 4th (2002), 5th (2009) and 6th (2014) editions of the *Computer Security Handbook* (Wiley). He wrote two security-management columns a week distributed by *Network World* from February 2000 to September 2011 and published one a week in the *InfoSec Perception* blog from October 2011 through November 2013.

He has been an invited lecturer at the United States War College, the Pentagon, NATO HQ in Brussels, and at NATO Counterintelligence training in Germany. He was inducted into the Information Systems Security Association (ISSA) *Hall of Fame* in December 2004.

From January 2002 to June 2009, he was the creator and Director of the *Master's Program in Information Assurance* (MSIA, now MISA) in the School (now College) of Graduate and Continuing Studies (SGCS) at Norwich University, Northfield, Vermont where he was also the Chief Technical Officer of the SGCS from 2007 to 2009.

From July 2001 to April 2011, Dr Kabay was Associate Professor of Computer Information Systems in the School of Business and Management; he became Professor of Computer Information Systems in May 2011. He was appointed Associate Director of the *Norwich University Center for Advanced Computing and Digital Forensics* in July 2011.

Dr Kabay also serves as Strategic Advisor, Information Assurance for a high-tech company, *On Point Cyber* < <http://www.opcyber.com/#!team/cjg9> >. His LinkedIn page is < <http://www.linkedin.com/mkabay/> > and his Website is < <http://www.mekabay.com> >.

Students are welcome to *friend* him on Facebook (but to protect their privacy he generally does not follow students) for a stream of links to interesting information security and high-technology articles (mostly from *The Guardian*, *BBC News* and *National Public Radio*) with occasional forays into politics (especially commie-pinko-radical commentary), culture, science, funny cartoons, pictures of cute animals, and horrible puns.

