Minnesota State University, Mankato
Curriculum Proposal

Please type or select the requested information. Print completed forms, add appropriate paper attachments, and route through MSU's curricular process for recommendations and decisions.

| College: Science, Engineering and Technology | (Check all that apply): |
| Department: Computer and Information Sciences | Undergraduate |
| Program: Information Systems (ISYS) | Graduate |
| CIP # 11.040100 |

Type of Change: COURSE PROPOSALS

Proposed: New Course

Title Current: 

Title Proposed: Database Modeling for Applications

24-Char. Abbrev: DB Modeling for Apps

Course Designator: ISYS 4541

Number of Credits: 4

Effective Date of Change: 2007-07-12

(Restricted Use Only)

Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):

Data modeling techniques such as E/R, UML, ORM, and LDS. Requirements analysis, conceptual data modeling, and transformation of models to SQL. Higher normal forms, advanced SQL, object-relational mapping, complex data models in business applications.

Pre: ISYS 340 or IT 340

Fall

Rationale or Justification for change:

Course is required for new ISYS curriculum.

***For General Education or Cultural Diversity Courses Only***

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<th>GE Category #</th>
<th>GE Category Name (Maximum of 3 Categories)</th>
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? For Writing Intensive Courses, attach a description of the kind and quantity of writing.

? For Upper Division Courses, include a description of the respects in which it is broad and general rather than narrow and specific, and so suitable as GE.

Attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes associated with each GE competency or CD designation.

c. List of strategies to be used to assess students' achievement of each GE competency or CD designation.

***For New Courses***

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<th>Instructional Type:</th>
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<td>Grading Format:</td>
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<td>Course is required for program</td>
<td>Information Systems (ISYS)</td>
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<td>Pre- or Co-requisites:</td>
<td>ISYS 340 or IT 340</td>
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Other courses are being changed or eliminated. (Explain.)

ISYS 340(4) Introduction to Database Application Systems

Course content or title is similar to courses in other departments. (Attach copy of letter of agreement with other program(s) contacted. Indicate the nature of the discussions and/or resolution of differences or potential conflicts.)

attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes.

c. A list of resources required to offer and support this course.

d. A description of how teaching this course will affect department staffing.

e. If 400/500 level course, an explanation of added expectations of graduate students.

Revised September 2002
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Proposal: ISYS 4/541: Database Modeling for Applications

Catalog Description

Data modeling using techniques such as E/R, UML, ORM, and LDS. Requirements analysis, conceptual data modeling, and transformation of models to SQL. Higher normal forms, advanced SQL, object-relational mapping, and use of complex data models in business applications.

Prerequisites

- ISYS 340(4) Introduction to Database Application Systems (or IT 340)

Topics

Knowledge Unit 1. Conceptual Modeling Techniques

- Goal: to be able to demonstrate analysis-level mastery of conceptual modeling techniques such as: entity-relationship (E/R), UML (unified modeling language), ORM (object-role modeling), LDS (logical data structure)
- Approximate classroom hours: 7
- Mastery level 4: Analysis
- Objectives:
  - 1.1 analyze whether a given conceptual data model satisfies its requirements specification
  - 1.2 compare conceptual modeling to logical modeling and discuss their differences
  - 1.3 discuss the appropriateness of a given conceptual model for a particular set of requirements
  - 1.4 discuss the importance of conceptual modeling when developing a database
  - 1.5 discuss the relationship between conceptual, logical, and physical database models

Knowledge Unit 2. Logical Database Modeling

- Goal: to be able to demonstrate analysis-level mastery of logical models, including tables, columns, primary keys, foreign keys, constraints
- Approximate classroom hours: 7
- Mastery level 4: Analysis
- Objectives:
  - 2.1 compare conceptual and logical modeling and discuss their differences
o 2.2 discuss the appropriateness of a given logical model for a particular conceptual model

Knowledge Unit 3. Physical Database Modeling

- Goal: to be able to demonstrate application-level mastery of physical models, including indexes, data storage, memory usage, table splitting and merging, distributed tables, views, conversion from logical to physical model
- Approximate classroom hours: 7
- Mastery level 3: Application
- Objectives:
  o 3.1 demonstrate ability to convert a logical database model to a physical model

Knowledge Unit 4. Relational Normal Forms

- Goal: to be able to demonstrate analysis-level mastery of relational normal forms, decomposition, denormalization and tradeoffs
- Approximate classroom hours: 5
- Mastery level 4: Analysis
- Objectives:
  o 4.1 simplify a database schema by decomposing tables into the highest possible normal form (up to 4NF/5NF)

Knowledge Unit 5. Object-Relational Mapping

- Goal: to be able to demonstrate application-level mastery of object-relational mapping
- Approximate classroom hours: 7
- Mastery level 3: Application
- Objectives:
  o 5.1 utilize an object-relational mapper to make a relational database appear as an object-oriented structure to an application

Knowledge Unit 6. DB Application Development

- Goal: to be able to demonstrate application-level mastery of the development of database-backed online analytical processing (OLAP) and online transaction processing (OLTP) systems from a data model, enterprise data models, advanced SQL
- Approximate classroom hours: 11
- Mastery level 3: Application
- Objectives:
  o 6.1 demonstrate ability to write SQL statements that use subqueries, inner and outer joins, and aggregates
  o 6.2 demonstrate ability to write SQL stored procedures
6.3 demonstrate ability to write SQL triggers
6.4 design and implement a substantial OLTP application

Knowledge Unit 7. Business Rules

- Goal: to be able to demonstrate comprehension-level mastery of business rules: types of rules, discovery and verification, implementation and enforcement
- Approximate classroom hours: 7
- Mastery level 2: Comprehension
- Objectives:
  o 7.1 explain how business rules can be enforced
  o 7.2 list and explain several commonly-used techniques to identify business rules

Knowledge Unit 8. Temporal Data

- Goal: to be able to demonstrate comprehension-level mastery of time-dependent data: when appropriate, sequences and versions, deletion, archiving, modeling relationships, temporal business rules
- Approximate classroom hours: 7
- Mastery level 2: Comprehension
- Objectives:
  o 8.1 explain how to keep track of transaction time in a relational database
  o 8.2 explain how to keep track of valid time in a relational database
  o 8.3 explain the purpose and importance of archiving information
  o 8.4 list and explain considerations involved in deletion of data

Additional topics may also be covered based on time and student interest.

Graduate Students

Students taking the 500-level version of this course are required to perform beyond expectations of undergraduate students by completing one or more of the following, at the discretion of the instructor:

- A term paper that summarizes and critiques an article from a scholarly journal in the area of database modeling and applications backed by databases.
- A project that implements advanced ideas in database modeling and applications backed by databases.
- A presentation about an advanced area in database modeling and applications backed by databases, or that presents the student’s term paper or project.
- Some other activity that demonstrates grasp of the material beyond what is expected of undergraduates.

Instructional and Library
Resources currently in place within the department and the University Library will support this new course. No new resources are required.

**Staffing**

This course will be able to be staffed by the faculty that have been designated "Information Systems" by the Dean of the College of Science, Engineering, and Technology, Dr. John Frey. This course will not need assistance from faculty of the new Computer Science Department.

**Possible Textbook(s)**


Syllabus for ISYS 4/541: Database Modeling for Applications

Instructor

Name: Prof. Sample Faculty
Office: 200 Wissink Hall
Department: Information Systems and Technology, Minnesota State University, Mankato
Office hours: Monday through Friday from 1:00 to 4:00 pm
Phone: 507-389-1212
Email: sample.faculty@mnsu.edu
Course page: https://d2l.mnsu.edu/

Meeting

MTRF 10-11

Catalog Description

Data modeling using techniques such as E/R, UML, ORM, and LDS. Requirements analysis, conceptual data modeling, and transformation of models to SQL. Higher normal forms, advanced SQL, object-relational mapping, and use of complex data models in business applications.

Prerequisites

- ISYS 340(4) Introduction to Database Application Systems (or IT 340)

Topics

The following content areas will be covered.

1. Conceptual Modeling Techniques (about 7 hours)
2. Logical Database Modeling (about 7 hours)
3. Physical Database Modeling (about 7 hours)
4. Relational Normal Forms (about 5 hours)
5. Object-Relational Mapping (about 7 hours)
6. DB Application Development (about 11 hours)
7. Business Rules (about 7 hours)
8. Temporal Data (about 7 hours)

Additional topics may also be covered based on time and student interest.

Objectives

By the end of this course, you should be able to

- analyze whether a given conceptual data model satisfies its requirements specification
- compare conceptual modeling to logical modeling and discuss their differences
- discuss the appropriateness of a given conceptual model for a particular set of requirements
- discuss the importance of conceptual modeling when developing a database
- discuss the relationship between conceptual, logical, and physical database models
- compare conceptual and logical modeling and discuss their differences
- discuss the appropriateness of a given logical model for a particular conceptual model
- demonstrate ability to convert a logical database model to a physical model
- simplify a database schema by decomposing tables into the highest possible normal form (up to 4NF/5NF)
- utilize an object-relational mapper to make a relational database appear as an object-oriented structure to an application
- demonstrate ability to write SQL statements that use subqueries, inner and outer joins, and aggregates
- demonstrate ability to write SQL stored procedures
- demonstrate ability to write SQL triggers
- design and implement a substantial OLTP application
- explain how business rules can be enforced
- list and explain several commonly-used techniques to identify business rules
- explain how to keep track of transaction time in a relational database
- explain how to keep track of valid time in a relational database
- explain the purpose and importance of archiving information
- list and explain considerations involved in deletion of data

Students with Disabilities

Every attempt will be made to accommodate qualified students with disabilities. If you are a student with a documented disability, please see me as early in the semester as possible to discuss the necessary accommodations, and/or contact the Disability Services Office at (507) 389-2825 (V) or 1-800-627-3529 (MRS/TTY).
Textbook

This course will use one more more of the following textbooks:


Additional readings may be assigned by the instructor.

Grading

Your course grade will be based on:

[Varies by faculty]

If you receive 90% or more of the possible points, you are guaranteed an A, 80% a B, et cetera. However, a score just below the grade cutoff will not necessarily earn the higher grade. Therefore, you should try to attain a score well above the cutoff to achieve the grade you want.

Exams

The exams will cover reading assignments, lectures, and class discussion. It is your responsibility to remember the exam schedule. If you forget to attend an exam or are more than ten minutes late for the exam, you must forfeit the grade for that exam.

You may take the exam at an alternate testing time if you participate in a university-sponsored activity that requires your attendance. You must arrange with the instructor at least a week ahead of the exam date.

If you miss an exam because of illness or family emergency, you may arrange with the instructor for a makeup exam. You must produce written proof of the reason you cannot take a test at the normally scheduled time.
Graduate Students

If you are taking the 500-level version of this course, you must complete one or more of the following additional requirements, at the discretion of the instructor:

- A term paper that summarizes and critiques an article from a scholarly journal in the area of database modeling and applications backed by databases.
- A project that implements advanced ideas in database modeling and applications backed by databases.
- A presentation about an advanced area in database modeling and applications backed by databases, or that presents the student's term paper or project.
- Some other activity that demonstrates grasp of the material beyond what is expected of undergraduates.

Programming Assignments

[Varies by faculty]

Homework

[Varies by faculty]

Class Policies

Attendance

[Varies by faculty]

Late Policy

[Varies by faculty]

Academic Honesty

Please be aware that the University's policy for Academic Honesty appears in the Student Handbook. Each student is expected to have read this material. If you do not understand what is meant by this policy, or if you are confused by terms such as plagiarism, cheating, or collusion, please discuss this policy with me, your advisor, or another faculty member as soon as possible. I absolutely require that each student in this class will fulfill his or her academic obligations in a fair and honest manner.

Anything that you observe in other students that is of questionable integrity should be brought to my attention. You may do so anonymously if you desire (e-mail works fine for this).
For the writing of papers and program design documents, it is quite easy to define cheating in terms of traditional definitions of plagiarism; however, for the writing of computer programs, the distinction is not as obvious to many students. It is easy to use the English paper comparison when thinking about what is appropriate and what constitutes dishonest academic work when writing computer programs. Like writing a paper, you may discuss general ideas with fellow students.

You must write each programming assignment yourself. It is acceptable to discuss logic and other strategies such as the number of variables or methods, but it is NOT acceptable to show another student even a single line of your program until after the due date.

Protect your programming assignments. If another student obtains a copy of your program even though you are unaware of the infraction, you are still guilty of collusion. Do not leave an ACC workstation unattended, even for a little while. Other students monitor your patterns and, while you are out for even a few seconds, walk up to your workstation and email a copy of your program to themselves! You should also be careful where you leave paper copies of your program. Do not leave files on ACC computers. A trash receptacle anywhere near the ACC is likely to be rummaged. Make sure you log out of the course web site when you are done using it, close all browser windows, and log out of the system.

I strongly suggest you consult your student handbook or talk with me if you are unsure as to what is acceptable academic behavior. The consequences are quite severe. Academic misconduct will automatically result in my informing Judicial Affairs, a division of Student Affairs, of the misconduct. This misconduct usually results in a failing grade for the course. (And it can be worse.)

Specific items that will be considered cheating on programming assignments are:

- Turning in work done by somebody else as your own (with or without that person's consent). This includes turning in a copy of something that can be mechanically transformed into a copy of someone else's work. Do not try to disguise cheating by simply modifying someone else's work and calling it your own. I use software that detects this type of cheating.
- Allowing someone else to turn in your work as his or her own work. This includes allowing fellow students access to your copy, even without your knowledge or consent.
- Using a solution developed by a student in a previous semester or another section.

Errors in Grading

If something has been graded incorrectly, or if a grade has been recorded incorrectly, you must request a correction no later than one week after the grade has been posted. Course grades are final, and cannot be changed unless there has been a substantial error.
Grades are based on the quality of your work and on how well you are prepared for class. While working hard is admirable, your grade will not be based on how much time you spent working on an assignment or preparing for an examination.

**Weather and Other Problems**

In the event inclement weather conditions or other problems cause class not be held on a given day, any work due for that day will be due at the next class meeting. It will not cause any other changes in the schedule. Weather-related closings will be made by the university and announced on the Twin Cities and local media. You can call the MSU WeatherLine at 2463 for weather-related closing or cancellation information.

**Classroom Etiquette**

Please turn off or silence your cell phone or pager while in class. If you are expecting an urgent call (such as from your sick child):

- Use the "silent" mode of your cell phone or pager.
- Sit right next to the door.
- Leave the room as quietly as possible when you receive the call, so you do not disturb other students.