Undergraduate Course

Department of Industrial Engineering and Engineering Management

National Tsing Hua University

<table>
<tr><td>Course No.</td><td colspan="2">10710IEEM316000</td><td colspan="2">Required/Elective course</td><td colspan="2">Elective</td></tr>
<tr><td>Course Time</td><td colspan="2">F7F8F9</td><td>Room</td><td>R827</td><td>Size limit</td><td>50</td></tr>
<tr><td>Credits</td><td colspan="4">3</td><td rowspan="3">Hours offered per week</td><td rowspan="3">3</td></tr>
<tr><td rowspan="2">Math</td><td rowspan="2">Basic Science</td><td colspan="2">Engineering</td></tr>
<tr><td>Theory</td><td>Design</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>Course Title</td><td colspan="6">資料庫管理系統 Data Base Management System</td></tr>
<tr><td>Lecturer</td><td colspan="6">Dr. Hareesh 何玄 (hareesh.pillai@ie.nthu.edu.tw)</td></tr>
<tr><td>TA</td><td colspan="6">Ms. Yeh Li-chia 葉力嘉 (home.yeh@gmail.com)</td></tr>
<tr><td>Prerequisite</td><td colspan="6">No prerequisite required. The course will have basic computation and data concepts refresher in the first week.</td></tr>
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Core capability to be cultivated by this course	■	Integration-將工業工程與工程管理各項技術整合應用，有效處理工工領域相關議題 Abilities of integrating various technologies of Industrial Engineering and Engineering Management	20%
	■	Information -資訊科技的善加應用，以利解決工工領域之問題 Utilization of information technology to problem solving and applications in the field of Industrial Engineering	30%
	■	Interaction-協調溝通與團隊精神的發揮 Coordination and communication abilities with teamwork	20%
	■	Innovation/Ideas-激發創造力、培養創新思維 Creative and innovative capabilities	10%
	■	Internationalization-國際化互動與表達能力 Global interaction and public presentation skills	20%

Course Description

This course is designed for **undergraduate** students.

Data leads to insights that are converted into decisions and actions. A database stores information that has been translated into a form that is efficient for movement and processing. This course teaches the design, implementation, manipulation, and management of data in database systems. The course emphasizes the understanding of the fundamentals of relational systems through a problem-based approach to learning. At the conclusion of the course, students are able to:

- Understand terms related to database design and management

	• Understand the objectives of data and information management • Understand the database development process • Understand the relational model and relational database management system • Assess data and information requirements • Construct conceptual data models • Develop logical data models • Evaluate the normality of a logical data model, and correct anomalies • Develop physical data models for relational database management systems • Implement relational databases using an RDBMS • Retrieve data using SQL • Understand database performance issues • Understand the basics of data management and administration
Textbook	• Hoffer, J. A., Ramesh, V., & Topi, H. (2011). *Modern database management*. Upper Saddle River, NJ: Prentice Hall.
References	• Elmasri, R., & Navathe, S. (2010). *Fundamentals of database systems*. Addison-Wesley Publishing Company. • Date, C. J., & Darwen, H. (1997). A guide to the SQL standard: a user's guide to the standard database language. • https://www.w3schools.com/sql/ • http://www.sqlcourse.com
Teaching Method	The primary teaching objective will be towards enabling students to think logically and in the context of data, its design, management, and real-world applications. The course is planned as a practice centered applications course.
Teaching software	MySQL 5.7, MariaDB 10.3, MySQL Workbench 8.0, draw.io
Syllabus	**<u>Week 1. Class Introduction and Overview:</u>** Introduction, syllabus, class policy and grading, I-P-O cycle, flow charts, the role of data in IPO, definition of key terms and concepts, major components, environment, interaction, broad spectrum of applications, issues in database management, data flow diagrams, software development life cycle, data models in SDLC, roles in database development team. **<u>Week 2 and 3. Analysis and Logical Design:</u>** Logical data definitions, logical design in the overall database development process, practical examples, semantics meaning of data, business rules, E-R model, supertype/subtype relationships, specialization (top-down perspective), generalization (bottom-up perspective), mapping E-R diagrams to relations, notation for completeness, and disjointness constraints. **<u>Week 4. Lab Practice Session:</u>**

	Week 5. Relational Data Base Systems: Introduction to RDBMS, overall database objectives, physical database design, factors in distributing data effectively, first-cut distribution, indexes and trade-offs, principles of functional dependencies, determinants, concepts of normalization, anomalies when merging relations, normal forms, normalization process, denormalization. **Week 6. Lab Practice Session:** **Week 7. Structured Query Language using MySQL - I:** Relational database implementation using open source MYSQL, data definition language (create, alter, drop), data manipulation language (select, insert, update, and delete). **Week 8. Lab Practice Session and Review:** **Week 9. Midterm:** **Week 10. Structured Query Language using MySQL - II:** Demonstrate SQL capabilities such as multiple-table data retrieval (join and other operators such as difference, union, and intersection), explicit and implicit joining, built-in functions, differences between the joining and subquery approaches, triggers, stored procedures, ACID property. **Week 11. Lab Practice Session and Group Project Allocation:** **Week 12 and 13. MYSQL Workbench:** Understanding roles (architects, developers, and DBAs), unified visualization, visual design, data modeler, creating complex ER models, creating, executing, optimizing SQL queries, syntax highlighting, auto-complete, reuse of SQL snippets, execution history, standard connections, migration, change management, documentation **Week 14. Group Project Preliminary Presentation:** **Week 15. Lab Practice Session** **Week 16. Client/Server and Internet Database Environment:** Advantages and disadvantages of different architectural structures, tiered architectures, client/server computing, conceptual underpinnings of connections to remote databases, clients pull up remote applications and data, internet database environment, web-enabled database. **Week 17. Group Project Final Presentation:**

	<u>Week 18. Concluding Discussions:</u>
Evaluation	This course includes weekly practice homework mainly to apply concepts discussed, review material, and engage students in mini-quizzes in class. Along with these small quizzes, there is a midterm written exam, and a final project. Grades will be based on individual and project performance. Individual grades come from class attendance, homework performance, a midterm examination, and a final group project. **This is an English taught course, student presentation in English is highly recommended alternatively oral presentation is Chinese allowed, however the PowerPoint slides and final report word file has to be in English only.** Attendance: 10% Class interactions and quiz: 10% Midterm: 25% Homework: 30% Group project – 25%
Course website	Lecture notes (TBU)