# Yarmouk University

## Faculty of Information Technology and Computer Sciences

## Department of Computer Information Systems

# Study Plan for the Bachelor Degree in Computer Information Systems (CIS)

## 2016/2017

# Table of Contents


| Topic | Page |
|---|---|
| **Introduction about Department of CIS** | **3** |
| **Vision** | **3** |
| **Mission** | **3** |
| **Objectives** | **4** |
| **Competencies and Learning Outcomes for the bachelor Degree in Computer Information Systems** | **5** |
| **Study Plan for the Bachelor Degree in Faculty of Information Technology and Computer Sciences** | **7** |
| **Study Plan for the Bachelor Degree in Computer Information Systems** | **11** |
| **Course Description in English** | **14** |
| **Course Description for the Courses Offered to other Departments** | **27** |
| **Flowchart for the Compulsory Courses** | **29** |
| **Flowchart for the Elective Courses** | **30** |
| **Advisory plan** | **31** |
| **Mapping Compulsory Courses to the program Learning Outcomes** | **33** |
| **Mapping Elective Courses to the Program Learning Outcomes** | **35** |
| **Mapping Accreditation Standards to the Study Plan** | **36** |

# Course Codes used in the study Plan

| | |
|---|---|
| SE | Software Engineering |
| CS | Computer Science |
| CIS | Computer Information Systems |
| MIS | Management Information Systems |
| NIS | Network and Information Security |
| AL | Arabic Language |
| EL | English Language |
| PS | Political Sciences |
| MILT | Military |
| STAT | Statistics |
| MATH | Mathematics |
| BA | Business Administration |
| MKT | Marketing |

# Introduction about Department of CIS

CIS department was established in 2002 in line with the establishment of the Faculty of Information Technology and Computer Sciences at Yarmouk University, and started granting bachelor degree in computer information systems since then. The undergraduate program aims to produce graduates with distinct skills and competencies to enable them to succee in their practical life. At the beginning of 2003, CIS department established the first graduate program to grant master's degree in computer information systems in accordance with the comprehensive exam path (course based). Additionally, in 2011 the CIS department started to offer the thesis path (research based) to master students.

The department contains group of faculty specialists in a variety of areas. It seeks to attract the largest possible number of faculty members who hold the doctoral degree. Also, there are a number of scholars funded by the department to earn a doctoral degree from prestigious universities in different disciplines to serve the department future aspirations. In 2008, the department has reconsidered the Bachelor Study Plan and introduces a new comprehensive study plan to keep pace with the market requirements and needs. The new study plan was focusing on the areas of software engineering, Internet applications, databases and data mining. Moreover, the department works always on updating and developing the plan each year in accordance with the needs of students for modern courses, to keep pace with the labor market requirements and needs. A set of sophisticated and modern computer labs are available for the department and are used in the teaching and research fields. Additionaly, specialized laboratories was established such as: information retrieval lab, data mining lab, multimedia lab and software engineering lab. The department also provides academic requirements relating to the use of computer skills to various faculties and departments at the university.

# Vision:

Achieving excellent and a leading position among other universities departments of computer information systems in the region in various fields of information systems.

# Mission

Empower the market with equipped graduates with the necessary knowledge and skills to solve problems in various fields of computerized information system, by providing distinct courses and positive leadership learning environment that contribute to build a personal alumni and build knowledge society.

# Objectives:

Department of Computer Information Systems seeks to achieve the following objectives:

**A. In the field of teaching:**

1) Provide students with general and specialized knowledge and practical skills necessary to enable them to use and develop modern applications in computer information systems in order to increase graduates competency in getting the right job opportunities.
2) Prepare and qualify students technically by focusing on the practical and applied aspects through complementary and interactive environment in modern laboratories. This will be done by offering a variety of theoretical and practical courses concerning both basic and applied computer information systems at the undergraduate and graduate levels. Courses combine both excellence and modernity, and respond to the needs of the local community and local and regional market.
3) Develop student's skills of thinking, creativity, problem solving and self-learning.
4) Develop the student's personality and upgrade his/her skills to fit market requirements.
5) Encourage department students on self-learning.
6) Develop teaching and learning strategies to improve the levels of students' performance.

**B. In the field of research:**

1) Raise the level of scientific research for faculty members and graduate students and link it with teaching and the needs of the local and regional community to serve the development.
2) Encourage the publication of faculty members' research in specialized international journals and participation in local and international conferences and workshops.
3) Disseminate knowledge and promote research cooperation with local, regional and international institutions

**C. In the field of community service:**

1) Cooperate with local and regional community by contributing in establishing specialized computer information systems workshops.
2) Contribute in providing studies to determine the local community needs of computer information systems.
3) Contribute in building intelligent computer information systems to serve local and regional sustainable development, using various data analysis techniques.

**D. In the field of quality:**

1) Achieve quality in all the educational, research and administrative practices in the department.
2) Update study plans to keep up with the rapid development in the market in different computer information systems sectors.
3) Adopt a specific methodology for quality assurance in the department aligned with the college and university vision.

# Competencies and Learning Outcomes for the Bachelor Degree in Computer Information Systems

The BSc program in Computer Information Systems aims to prepare distinct graduates qualified for different IT jobs by providing them with the basic knowledge and practical skills required to develop traditional and smart information systems.

After finishing the requirements for the Bsc program in CIS, the graduates are expected to earn the following skills:

1. **General Skills and Basic Knowledge**
   - 1.1. Understand and use the basic mathematical theories required for developing information systems.
   - 1.2. Understand the basics for information technologies and information systems.
   - 1.3. Adherence to the ethical issues regarding using and developing information systems.
   - 1.4. Ability to communicate with others.
   - 1.5. Possess the required skills for ensuring the quality of the developed systems.
   - 1.6. Possess research and analysis skills.
   - 1.7. Ability to work effectively within a team.

2. **Developing Skills**
   - 2.1. Ability to write computer programs using different languages.
   - 2.2. Ability to analyze practical problems and identify the basic requirements for solving these problems.
   - 2.3. Ability to design, implement and test information systems.
   - 2.4. Understand the basic operations that support the decision making process.
   - 2.5. Ability to use new technologies and practical skills to develop and maintain information systems.
   - 2.6. Ability to develop systems using different methodologies.
   - 2.7. Ability to analyze and develop applications using software engineering principles.

3. **Data Management Skills**
   - 3.1. Understand the basics of databases, their mathematical operations and the ability to design and develop database systems using different software and tools.
   - 3.2. Ability to work with files and understand the basic operations of indexing.
   - 3.3. Understand the basic operations of information retrieval and data mining techniques.

4. **Web development skills**
   - 4.1. Ability to develop a web based systems using the appropriate tools and languages.
   - 4.2. Understand the basic multimedia concepts and their design and construction methods.

5. **Network and security skills**
   - 5.1. Understand the basics of computer networks and data transmission techniques.
   - 5.2. Ability to develop client-server applications.
   - 5.3. Understand the basics of information security and the main threats for information systems.

# The study plan for Bachelor degree in Computer Information Systems / Faculty of Information Technology and Computer Sciences

The faculty of Information Technology and Computer Sciences offers many Study Plans that lead to bachelor's degrees in the following departments:

- **Department of Computer Sciences.**
- **Department of Computer Information Systems.**
- **Department of Management Information Systems.**

The Bachelor Degree in Computer Information Systems/Faculty of Information Technology and Computer Sciences is granted upon the completion of the following requirements:

1. The fulfillment of the conditions stated in by the set of Instructions for Awarding the Bachelor Degree at Yarmouk University number (2) for the Year 1991 and its amendments according to the Law Governing the Granting of Scientific Degrees and Certificates at Yarmouk University No. 118 for the year 2003.
2. Minimum of credit hours required for a bachelor's degree at the college of Information Technology and computer sciences is (134) credit hours.
3. Study Plan includes the following requirements for each department and distributed as in table 1:
    A. University course requirements as specified in the above mentioned regulations (27 credit hours).
    B. Faculty course requirements as specified in the study plan for the Bachelor's Degree in the Faculty of information technology and computer sciences (22 credit hours).
    C. Department course requirements (85 credit hours).

Table (1) Credit hours distribution for Single Major in CIS

| Requirements | Compulsory | Elective | Total |
|---|---|---|---|
| **University** | 12 | 15 | **27** |
| **Faculty** | 22 | - | **22** |
| **Department** | 61 | 24 | **85** |
| **Total** | | | **34** |

# A. University Course Requirements

University course requirements as specified in the above mentioned regulations have (**27**) credit hours including:

A) ***Compulsory Courses*** which have 12 credit hours distributed as follows:

| **Course Code** | **Course Name** | Credit Hours |
|---|---|---|
| AL101 | Arabic Language1 | 3 |
| EL101 | English Language Skills | 3 |
| PS102 | National Education | 3 |
| MILT 100 | Military Sciences | 3 |
| EL 099 | Conditional- English Language Skills | Conditional |
| AL 099 | Conditional- Arabic Language | Conditional |
| COMP 099 | Conditional- Computer Skills | Conditional |

B) ***Elective Courses*** which have 15 credit hours Chosen from the following courses (the students are allowed to select them out of their faculty in any of the following areas):

| **Course Code** | **Humanities Courses** | **Credit Hours** |
|---|---|---|
| Hum 101 | Media Culture | 3 |
| Hum 102 | Citizenship and Belonging | 3 |
| Hum 103 | Islamic Thought and Civilization | 3 |
| Hum 104 | Art and Behavior | 3 |
| Hum 105 | Jordan Contributions to Civilizations | 3 |
| Hum 106 | Introduction to the Study of Human Culture | 3 |
| Hum 107 | Human Rights | 3 |
| HUM 108 | Thinking Skills | 3 |
| **Course Code** | **Scientific Courses** | **Credit Hours** |
| Sci 101 | Environment and Public Health | 3 |
| Sci 102 | Information Technology and Society | 3 |
| Sci 103 | Fitness For All | 3 |
| Sci 104* | Effective Communication Skills | 3 |
| Sci 105 | Renewed Energy | 3 |
| Sci 106 | Management and Social Development | 3 |
| Sci 107 | Scientific Research | 3 |

* Sci 104 is similar to the (MIS 106 Communication Skills for IT) and thus IT students are not allowed to take both.

## B. Faculty Course Requirements

Faculty course requirements as specified in the above mentioned regulations have (22) credit hours distributed as follows:

| Course Code | Course Name | Cr. Hr. | Weekly Hours | | Pre- Requisites |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| CS 110 | Programming in a selected Language | 3 | 3 | 0 | --- |
| CS 110L | Programming in a selected Language Lab | 1 | 0 | 3 | Co-requisite: CS 110 |
| CIS 103 | Introduction to Information Technology | 3 | 3 | 0 | --- |
| CS 130 | Operating Systems Essentials | 3 | 3 | 0 | CS 110, CIS 103 |
| CIS 260 | Database Systems | 3 | 3 | 0 | CIS 103, CS 210 |
| MIS 106 * | Communication Skills for Information Technology | 3 | 3 | 0 | --- |
| Stat 111 | Probabilities Principles 1 | 3 | 3 | 0 | --- |
| Math 101 | Calculus I | 3 | 3 | 0 | --- |
| **Total** | | **22** | **21** | **3** | |

Notice that, the following table assotiates the tens number in the course codes to the knowledge area of the Computer Information Systems department

| Number | Knowledge Area |
|---|---|
| 0 | Basic Courses |
| 1 | Programming Languages |
| 2 | Human Computer Interaction |
| 3 | Information Networks |
| 4 | System Design and Management |
| 5 | Data and File Structures |
| 6 | Database and Information Retrieval |
| 7 | Intelligent Systems |
| 8 | System Applications and New Technologies |
| 9 | Project and Special Topics |

# C. Department Course Requirements

Department course requirements as specified in the above mentioned regulations have (85) credit hours distributed as follows:

### *1. Compulsory Courses (61 Credit hours):*

| Course Code | Course Name | Cr. Hr. | Weekly Hours | | Pre-Requisites |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| CIS 240 | Introduction to Software Engineering | 3 | 3 | 0 | CIS 103 ،CS 210 |
| CIS 311 | Internet Application Programming | 3 | 3 | 0 | CS 110 ،CIS 103, CIS260 |
| CIS 340 | Object Oriented Analysis and Design | 3 | 3 | 0 | CIS 240 ،CS 210 |
| CIS 340L | Object Oriented Analysis and Design Lab | 1 | 0 | 3 | CIS 340 or Co-requisite: CIS 340 |
| CIS 256 | Files Structures | 3 | 3 | 0 | CS 250 |
| CIS 260L | Database Systems Lab | 1 | 0 | 3 | CIS 260 or Co-requisite: CIS 260 |
| CIS 281 | Multimedia Systems | 3 | 3 | 0 | CIS 103 ,CS 210 |
| CIS 360 | Developing Database Applications | 3 | 3 | 0 | CIS 311 ،CIS 260 |
| CIS 367 | Data Warehousing | 3 | 2 | 2 | CIS 360 |
| CIS 433 | Data and Communication Networks | 3 | 3 | 0 | CS 332 |
| CIS 442 | Security and Privacy of Information | 3 | 3 | 0 | CIS 240 ،CIS 260 |
| CIS 464 | Information Retrieval Systems | 3 | 3 | 0 | CIS 256 ،CIS 260 |
| CIS 467 | Data Mining | 3 | 3 | 0 | CIS 260 |
| CIS 467L | Information Retrieval and Mining Lab | 1 | 0 | 3 | CIS 464 ، CIS 467 ( or with) |
| CIS 498 | Practical Training | 3 | 3 | 0 | MIS 106, Complete successfully 98 credit hours |
| CIS 499 | Graduation Project | 3 | 3 | 0 | CIS 498, Complete successfully 98 credit hours |
| CS 142 | Discrete Mathmatics | 3 | 3 | 0 | Math 101 |
| CS 210 | Object Oriented Programming | 3 | 3 | 0 | CS 110 ،CIS 103 |
| CS 210L | Object Oriented Programming Lab | 1 | 0 | 3 | CS 210 or Co-requisite: CS 210 |
| CS 250 | Data Structcure | 3 | 3 | 0 | CS 210 |
| CS 351 | Analysis and Design of Algorithms | 3 | 3 | 0 | CS 250, CS 142 |
| CS 332 | Data Communication and Networking | 3 | 3 | 0 | CS 130 |
| CS 360 | Wireless Networks | 3 | 3 | 0 | CS 332 ،Stat 111 |
| **Total** | | **61** | **56** | **14** | |

## *2. Elective Courses (24 Credit hours):*

2.1 (*18 Cr. Hrs.) Chosen from the following courses (at least 12 credits from the major)*

| Course Code | Course Name | Cr. Hr. | Weekly Hours | | Pre- Requisites |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| CIS 227 | Human Computer Interaction | 3 | 3 | 0 | CS 210 |
| CIS 244 | User Interface Design and Development | 3 | 3 | 0 | CIS 103, CS 210 |
| CIS 341 | Website Design | 3 | 3 | 0 | CIS 240 |
| CIS 380 | Information System Applications | 3 | 3 | 0 | CIS 360 |
| CIS 411 | Client-Server Programming | 3 | 3 | 0 | CIS 360, CS 332 |
| CIS 412 | Semantic Web Technologies | 3 | 3 | 0 | CIS 311 |
| CIS 431 | Internet Services | 3 | 3 | 0 | CS 332 |
| CIS 466 | Information Search Engines | 3 | 3 | 0 | CIS 464 |
| CIS 468 | | 3 | 3 | 0 | CIS 360 |
| CIS 471 | Intelligent Information System | 3 | 3 | 0 | CIS 360 |
| CIS 480 | Distributed Systems Applications | 3 | 3 | 0 | CIS 311 .CS 332 |
| CIS 492 | Special Topics | 3 | 3 | 0 | CIS 360 |
| CS 315 | Game Programming | 3 | 3 | 0 | CS 210 |
| CS 411 | Mobile Applications Programming | 3 | 3 | 0 | CS 210 |
| MIS 222 | Entrepreneurship in IT | 3 | 3 | 0 | --- |
| CIS 344 | Software Project Management | 3 | 3 | 0 | MIS 360 Or CIS 240 |
| MIS 421 | Legal Issues In Information Management | 3 | 3 | 0 | CIS 103 |

2.2 *(6 Cr. Hrs.) Chosen from the following courses:*

| Course Code | Course Name | Cr. Hr. | Weekly Hours | | Pre- Requisites |
|---|---|---|---|---|---|
| | | | Theory | Practical | |
| BA 101 | Management Principles (1) | 3 | 3 | 0 | --- |
| MKT 210 | Marketing Principles (1) | 3 | 3 | 0 | --- |
| Stat 101 | Statistics Basics (1) | 3 | 3 | 0 | --- |
| Stat 201 | Statistics Basics (2) | 3 | 3 | 0 | Stat 101 |

# Description of courses offered by Computer Information Systems Department

### CIS 103: Introduction to Information Technology 3 Cr. Hrs.

The main objective of this course is to provide students with the main concepts of information and communications technologies, Information Systems and their applications. The course covers a range of topics including: data processing technologies, telecommunications and network technologies, social and global issues of IT, future trends, numbering systems, Problem solving techniques, Data, Information, and system concepts, information requirements in modern organizations and businesses, introducing different types of information systems, exploring the systems development life cycle, developing information systems methods, managing information systems resources, knowledge management, quality and evaluation of information systems, ethical and security issues of information systems.

### Learning Outcomes

By the end of this course, student should be able to:

1. Know the concepts of information and communication technologies and Information Systems.
2. Identify the different techniques of data processing, telecommunications and network technologies.
3. Identify the global and social aspects of Information Technology.
4. Understand the problem solving techniques
5. Identify the system development life cycle and its development methods.
6. Manage the information systems resources and knowledge.
7. Evaluate the different types of information systems and select the appropriate ones.

### CIS 311: Internet Application Programming 3 Cr. Hrs. Prereq.: CS110, CIS103, CIS260

This course is designed to provide students with the basic principles and technical aspects required to program internet applications. This course involves several topics including: a quick review of the internet fundamentals and the programming concepts; Web servers; applications server; client-side Programming; server-side programming; active Webserver pages; connecting applications with databases; adding dynamic content to Web applications; and programming of user interfaces (GUI) for Web applications. At the end of this course, the student shall be able to program and build different internet applications. The practical part of the course involves using an appropriate software tool or programming language to implement the concepts of internet-based applications.

### Learning Outcomes

After completion of this course the student should be able to:

1. Show the importance of analysis and design principles in developing internet applications.
2. Grasp the basic principles and technical aspects to program internet applications.
3. Implement GUI for internet applications.

4. Develop client-side web applications.
5. Develop server-side web applications.
6. Connect internet applications with databases.
7. Use necessary tools to develop internet applications.

### CIS 227: Human Computer Interaction 3 Cr. Hrs. Prereq.: CS 210

This course aims to provide students with the concepts and knowledge of interaction between humans and computers with focus on presentation of data and designing suitable interfaces for the user. It covers a range of topics including: basic concepts, human information processing (cognition, perception, movement, culture, communication, human diversity, motivation for computer interaction, human performance models, etc.), user interface design principles, information presentation, visual, auditory and tactile displays, speech communication, data entry, control, tools and feedback, human factors in computer programming, workspace design, environmental and legal considerations.

### Learning Outcomes

After completing this course, students should be able to:

1. Define the basic principles and terminology that are necessary for the interaction between human and computer.
2. Define the basic principles for human-computer interface analysis and design.
3. Analyze and design of human-computer interface.
4. Know the basics of user interface design.
5. Display information (auditory, tactile, visual, communication, data entry, control, tools and feedback observation methods).
6. Represent and display human elements in computer programming.
7. Workspace design (environmental, legal, and differences in personal capabilities, taking into account the various types of disabilities).
8. Use the latest scientific findings of software and computer-based electronics in designing interfaces between human and different computer-based electronics, to suit different environments, differences in personal capabilities, and various types of disabilities.
9. Implement locally, regionally and internationally known standards.
10. Implement projects by groups of students to analyze and design interfaces between human and different computer-based electronics needed by normal, abnormal, and disabled human.

### CIS 244: User Interface Design and Development 3 Cr. Hrs. Prereq.: CIS 103, CS 210

This course introduces students to the basic principles and technical aspects needed to design and build interfaces for different software. This course covers a range of topics including: types of graphical user interface (GUI), operating systems support for graphical user interface, user requirements, graphical user interfaces, elements of graphical user interfaces, interact with the user interface, models and methods of design and testing graphical user interface, design and program graphical user interfaces (GUI), programming graphical user interfaces for database applications and internet applications. The practical part of this course is to apply the main concepts of this course by using a suitable software tool, or a programming language.

### Learning Outcomes

After completing this course, the student should demonstrate the knowledge and ability to:

1. Define the concepts of graphical user interface design and development.

2. Show the different types of user interfaces.
3. Assess the design quality for different types of systems interfaces.
4. Determine design models for graphical user interface.
5. Develop high quality systems interfaces to achieve user demands
6. Familiarity with a visual programming language to design different interfaces.

### CIS 256: Files Structures 3 Cr. Hrs. Prereq.: CS 250

This course aims to provide students with the main principles that are needed to understand and deal with different kinds of files, their structures, and techniques. It covers a range of topics including: file concepts and principles, basic file operations, file organization and compression techniques, external sorting techniques, searching techniques, sequential file structures, hashing and direct organization structures, indexed structures, list file structures (inverted, multi-key, etc.), tree structures (B trees, B+ trees,... etc.). The practical part for this course is covered through exercises and writing programs using one of the programming languages.

### Learning Outcomes:

After completing this course, the student should demonstrate the knowledge and ability to:

1. Know the importance of file structures in the data storage and manipulation.
2. Know different kinds of storage media and their internal structure.
3. Know the basic operations in file processing
4. Deal with data compression techniques.
5. Know various indexing techniques and their working mechanism.
6. Implement File based applications.

### CIS 260: Database Systems 3 Cr. Hrs. Prereq.: CIS103, CS 210

This course aims to provide students with the basics of databases, how to create and deal with them, and their theoretical and mathematical foundations. Topics covered by the course include: basic principles and concepts, database architecture, database users, relational algebra, the relational data model, basics of the query language (SQL), the normalization process, dependencies between relation's attributes, object-oriented database approach. This course has a practical side part that focuses on teaching students how to use a special tool for the design and creation of databases.

### Learning Outcomes

After completing this course students should be able to demonstrate the knowledge and ability to:

1. Define the main concepts and terms of database systems.
2. Define the main concepts of the database analysis and design.
3. Build the Conceptual Schema using ER-Diagrams, EER-Diagrams, and UML-Diagrams.
4. Implement the structural constraints on relationships.
5. Distinguish between the different types of Entities' attributes, primary keys, foreign keys, and super keys.
6. Map the ER schema to Relational Schema.
7. Use the Relational Algebra to query the database.
8. Use the SQL to construct, modify and query the database
9. Perform the normalization process of relations using different normal forms.

**CIS 260L: Database Systems Lab** **1 Cr. Hrs.** **(Pre/Coreq.): CIS 260**

This course aims to provide students with a range of practical skills related to the contents of the Database Systems course (CIS 260). The course covers a wide range of topics, including: using one of the available design tools such as (ERWin or DBDesigner 4 ... etc) for database design, using SQL to create, manipulate and query databases using one of the available query tools such as (Oracle-SQL* Plus, MySQL ... etc.), practical introduction to database programming languages such (Oracle-PL / SQL), practical introduction to the techniques used for linking databases using JDBC or ODBC. The course includes exercises and practical examples that fit the topics covered by CIS 260 course.

**Learning Outcomes:**

After completing this course students should be able to:

1. Understand the basics of relational databases.
2. Construct and maintain database structures using SQL.
3. Add and update records using SQL.
4. Retrieve information from one or more tables using SQL
5. Link between tables in the database using SQL.
6. Use library functions.
7. Use sub-queries.
8. Develop a database model.
9. Use PL/SQL to build procedures and functions.

**CIS281: Multimedia Systems** **3 Cr. Hrs.** **Prereq.: CIS 103, CS 210**

This course is intended to provide students with the basic concepts and skills needed for understanding, using, and upgrading multimedia systems. It covers a range of topics including: Multimedia concepts and terminologies, interactive multimedia technologies, multimedia data types and formats (graphics, images, animation, audio, video, etc.), desktop publishing tools, hypermedia, media presentation, integrated multimedia authoring techniques, techniques for designing and producing multimedia applications, using multimedia-authoring tools, industry standards, future directions in interactive multimedia technology. This course is supplemented by a practical component covered by different assignments.

**Learning Outcomes:**

After successful completion of this course, the student should be able to:

1. Know the basic concepts in multimedia systems
2. Know different types of multimedia systems.
3. Know different types of images.
4. Use different multimedia authoring tools and know how to design them.
5. Know and use different multimedia software like: Adobe Flash, Adobe Photoshop, and Adobe Illustrator.

**CIS 341 : Website Design** **3 Cr. Hrs.** **Prereq.: CIS 240**

This course is intended to provide students with the knowledge and skills necessary for building and evaluating WebPages and web sites. It covers a range of topics including: internet browsers, internet applications, fundamentals of Website design, tools and languages for building WebPages, basics of HTML (text, fonts, colors, images, lists, tables, forms, …), Cascade style sheet (CSS) basics, Scripting Languages (such as VB Script and Java Script), Website publishing, principles and tools for Website evaluation, website design case studies. The practical part includes applications using Web design tools (such as Adobe Dreamweaver and MS SharePoint).

**Learning outcomes**

After completing this course students should be able to:

1. Show the importance of systems analysis and design in building websites and web applications.
2. Recognize the difference between Web Engineering approach and the traditional systems analysis and design approach.
3. Explain the importance of modeling and how to use a Web Engineering modeling language to represent Web apps from several perspectives.
4. Building the different models (including use case diagrams, class diagrams, Navigation Access Model and Presentation Models).
5. Differentiate various theories and principles of Web design.
6. Use necessary technology to develop websites (including HTML, CSS, and Javascript)
7. Use several common Web softwares and Webtools (Dreamweaver, MS SharePoint).

**CIS360: Developing Database Applications** **3 Cr. Hrs.** **Prereq.: CIS211, CIS260**

The main objective of this course is to provide students with the characteristics of Database development languages, and how to use them to build Database Applications and Information Systems. It covers a range of topics including: Programming languages vs. Database Development Languages, software engineering life cycle, features of Database Development Languages (data dictionary, interactive nonprocedural queries, report generator, screen formatter, data analysis and modeling tools, macros, reusable code, backup and recovery, security and privacy procedures, links to other DBMS, links to High Level languages, records and file maintenance, etc), system portability, application and program generators, examples of Database development languages like Oracle, SQL/Server, Ingress, as well as others. This course is supplemented by a practical component covered in Database Laboratory.

**Learning outcomes:**

After the completion of this course, the student should be able to:

1. Apply the basic concepts of database analysis and design.
2. Build Databases with the ability to identify proper fields, keys, and relations.
3. Build different Forms to deal with databases using one of the database development languages like Oracle.
4. Build different Queries to deal with databases using one of the database development languages like Oracle.
5. Build Reports to extract data from databases using one of the database development languages like Oracle.

6. Build a complete Integrated Database Application for chosen cases using one of the database development languages like Oracle.

**CIS 367: Data Warehousing** **3 Cr. Hrs.** **Prereq.: CIS360**

This Course aims to introduce the students to data warehouse basics and concepts. Topics covered: data modeling, datawarehouse design and datawarehouse access, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, OLAP query processing, star and snowflake schemes, ETL, fact tables. Emphasis on Multidimensional datawarehouses. Issues in data warehouses such as: planning, design, and implementation. The practical part of this course requires using a suitable language or tool (such as ORACLE) to cover the different concepts of data warehouses.

**Learning outcomes:**

After the completion of this course, the student should be able to:

1. Understanding Data modeling.
2. Data warehousing design.
3. Access and query data warehouses.
4. Data cleansing.
5. Data transformation and loading.
6. Work with multi dimensional data.
7. Design Multi dimensional datawarehouse.
8. Materialized view selection
9. OLAP query processing
10. Understand and build different schemas for data warehouse, such as: snowflake and star schemas
11. Understand the different functionalities of ETL.
12. Understand fact tables.
13. Discuss Issues in data warehouse planning, design, and implementation.
14. Use a suitable language or tool (such as ORACLE) to cover the different concepts of data warehouses.

**CIS 380: Information System Applications** **3 Cr. Hrs.** **Prereq.: CIS360**

This Course aims to introduce the students on how to build and construct different applications in one of the system information fields. The course contains but not limited to analysis and design processes, and to implement the system with its different interfaces that fit the information system. In case of the availability of specific tools or applications, the student would be trained on these tools and applications. The field of information system will be determined by the CIS department board. The selection of the field will be mainly based on the market need. This course has a practical part at which several tools will be used in constructing information system applications.

**Learning outcomes:**

After completing this course, the student should be able to:

1. Determine the models of information system application building in specific fields.
2. Analyze the necessary functions to construct information system applications in specific fields.

3. Show the tool collections available to construct application of information systems.
4. Apply the analysis, design and programming skills required to implement information system applications.

### CIS 411: Client–Server Programming 3 Cr. Hrs. Prereq.: CIS 360, CS 332

The main objective of this course is to enhance students understanding of systems that are connected with a network with concentration on the role of both server and client in sending and receiving data. It covers a range of topics including: Client/Server Systems Architecture, System planning and Design, Data Access Protocols, issues with Concurrent Access to shared data, Client/Server Technologies (Connection-Oriented, Connectionless, Interactive, etc), Workgroup Servers, Application Servers, Client-Side Programming, Server-Side Programming, Database Connectivity, remote procedure call(RPC), Security issues. The practical part of this course includes applying the concepts studied in this course using a suitable programming tool.

### Learning Outcomes:

By the end of this course student should be able to:

1. Define the terminology of the client-server architecture.
2. Compare between systems designs and compare between data access protocols.
3. Evaluate security issues for interactive websites.
4. Determine methods for connecting databases using connectivity models by one of the programming languages such as PHP.
5. Develop interactive websites using one of the programming languages such as PHP.
6. Show different types of tools used to develop interactive websites using one of the programming languages such as PHP.

### CIS 412: Semantic Web Technologies 3 Cr. Hrs. Prereq.:CIS 311

This course is designed to familiarize students with Web technologies (WWW) and how to extract knowledge from data provided by focusing on the Semantic Web. This course covers the following basic subjects: introduction to different Web technologies, representation of data on the Web, organized documents using (XML), the concept of the Semantic Web, describing Web sources by RDF, OWL language to build structures that represent knowledge (Ontology), methods and rules for knowledge representation, extraction and retrieval using languages like (OWL), and practical applications.

### Learning outcomes:

After completion of this course the student should be able to:

1. Understand various Web technologies and how to extract knowledge from data.
2. Understand the Semantic Web technologies.
3. Represent data on the Web .
4. Grasp the concepts of using XML documents.
5. Describe the Web sources using (RDF).
6. Handle programming language (i.e., OWL) to build knowledge structures (Ontology).
7. Using methods and rules for knowledge representation and retrieval using proper tools and programming languages.

**CIS 431: Internet Services 3 Cr. Hrs. Prereq.:CS 332**

This course aims to provide students with advanced concepts related to the Internet, especially those that relate to the techniques, methods and protocols used to transfer all kinds of data. This course involves the following subjects: Internet communication; modern Internet protocols; application layer services, transport networks and support service layer; algorithms that support multimedia contents and communications; scalable World Wide Web services; Internet telephony; instant messaging; and other emerging techniques and services; evaluation of internet services; applications; security considerations; techniques in terms of their operations and management requirements; the design of new Internet services (scalable, robust, and effective). The practical part of the course covers dealing directly with online internet services through exercises and applications in the lab.

**Learning outcomes:**

After completion of this course the student should be able to:

1. Understand data networks applications
2. Know the main components and various types of networks.
3. Understand the functions of network layers
4. Know and apply normative standards for networks.
5. Understand different architectural applications for types of relationships in a network, such as: server and client networks, Cloud computing, and peer-to-peer networks.
6. Realize the importance of TCP / IP network protocols.
7. Distinguish between Orchestration and Choreography.

**CIS 433: Data and Communication Networks 3 Cr. Hrs. Prereq.: CS 332**

This course aims at introducing communication networks, their types, and the different techniques to design, construct, operate, and maintain such networks. It also provides an introductory material on different networking techniques and the requirements of hardware, software protocols and other networking standards. In addition, it discusses the existing TCP/IP-based networks, the static and dynamic assignment of IPs, user administration, Manage and connect different network equipments, domain administration (DNS), Network setup and security. This course has a practical part that aims to provide students with the necessary practical skills to setup and manage a communication network and use it to exchange files.

**Learning outcomes:**

After completion of the study of this course the student should be able to:

1. Define the basic principles of communication networks and their categories.
2. Understand how to design, create, deploy, and maintain communication networks.
3. Understand different networking technologies and network connectivity approaches.
4. Understand the protocols of TCP/IP-based Networks, subnet masking, static and dynamic IP assignments.
5. Manage network users.
6. Manage network devices and connect them and mangage DNS.
7. Understand the basic concepts of network security.

**CIS 442: Security and Privacy of Information 3 Cr. Hrs. Prereq.: CIS 260, CIS 240**

The main objective of this course is to expose students to the importance of security in exchanging information and the basic principles of security and intrusion prevention techniques. It covers a range of topics including: ethical uses of information and information systems,

privacy considerations, policies and standards, security measures (protection, detection and reaction, attacks and threats, intrusion prevention, encryption and credentials identification and authentication, hacking security, access controls, identity management, etc.), security tricks and the human factor, disaster recovery, security risk analysis and assessment, security management. The practical part involves applying the techniques learned in this course, such as encoding, using a suitable language along with exercises and practical applications.

**Learning outcomes:**

After completion of the study of this course the student should be able to:

1. Understand different types of attacks and maleware applications that may harm Information Systems.
2. Understand rights and responsibilities in dealing with privacy and information systems and especially through the interconnected Internet world.
3. Specify the tools and programs that can be used to protect information systems and discover and deal with vulnerabilities.
4. Use data encryption systems and algorithms. Suggest new encoding algorithms or discover vulnerabilities in exsisting algorithms.
5. Understand, design, and propose data Encryption and Anonymization techniques that are used to protect information against unauthorized access.
6. Become familiar with some ethical hacking strategies which that are used to discover known vulnerabilities of information systems.
7. Understand the concepts of Phishing attack and Spam and recognize their role in user's information theft and the financial and moral loss that results .
8. Analyze and create different types of security policies such as formal security policies.
9. Use privacy algorithms which are used to achieve data privacy while preserving data quality.
10. Understand databases' hacking techniques and how to mitigate such hacking attempts using appropriate security measures.
11. Understand websites' hacking techniques and how to protect websites against such threats using specific countermeasures.
12. Understand security threats on new computing infrastructure such as threats in cloud computing and mobile apps.

## CIS 464: Information Retrieval Systems 3 Cr. Hrs. Prereq.:CIS 260, CIS 256

The main objective of this course is to provide students with the basic concepts of information retrieval systems, their types and different techniques in storing, manipulating and retrieving data. It covers a range of topics including: Functional view of information retrieval, types of IRS, design issues of IRS (keyword-based retrieval, file structures, thesaurus construction, etc.), IR data structures and algorithms (lexical analysis, stemming, term weighting, associative indexing, Boolean operations, string searching and matching techniques, etc.), relevance feedback and query modification, applications and case studies. The practical part includes applications and exercises that suit the concepts and techniques covered in this course.

**Learning Outcomes:**

By the end of this course students should be able to:

1. Understand Indexing and inverted index files
2. Differentiate between the Boolean Model, Vector Space Model, and Probabilistic Model.
3. Recognize some query optimizations techniques
4. Understand retrieval utilities.

5. Define the efficiency of IR systems
6. Evaluate IR systems

**CIS 466: Information Search Engines** **3 Cr. Hrs.** **Prereq.: CIS 464**

The main objective of this course is to introduce students to information search engines found in the internet. This course covers the following topics: search engines nature, types of search engines, how to design search engines, how search engines work, indexing in search engines, types of retrieval and how they work, similarities and differences between different search engines, information management in search engines, ranking of retrieved documents in search engines, methods used in collecting, management and retrieval of data, methods of crawling. The practical part includes applications and exercises related to the work and types of retrieval.

**Learning Outcomes:**

By the end of this course students should be able to:

1. Know types and nature of search engines
2. Be familiar with the basics of how to design search engines.
3. Be familiar with how search engines work and their indexing types
4. Know types of data management and retrieved document ranking.
5. Know different methods used in data collection, management and retrieval.
6. Know data crawling methods.

**CIS 467: Data Mining** **3 Cr. Hrs.** **Prereq.:CIS 260**

The main objective of this course is to provide students with the basic concepts, methods, and new techniques of extracting knowledge from data. It covers a range of topics including: Knowledge discovery fundamentals, data mining concepts and functions, data pre-processing, data reduction, mining association rules in large databases, classification and prediction techniques, cluster analysis algorithms, data visualization, mining complex types of data (text mining, multimedia mining, Web mining), data mining languages, data mining applications and new trends. The practical part includes applications and exercises using a data mining tool such as WEKA.

**Learning Outcomes:**

After completing this course, the student should demonstrate the knowledge and ability to:

1. Define and understand the main concepts and terms of Data Mining and KDD.
2. Differentiate between different data mining concepts, tasks and techniques.
3. Understand how to generate Frequent Item sets from a given dataset.
4. Generate Association Rules from Frequent Item sets.
5. Classify Data using different classification techniques.
6. Cluster data using some clustering techniques.
7. Preprocess the data using several data preprocessing techniques.
8. Apply data mining techniques on text and web data.
9. Use some data mining tools to analyze data of different types.
10. Apply the data mining techniques on real world cases.

**CIS 467L: Information Retrieval and Mining Lab 1 Cr. Hrs. Prereq.: CIS 464, CIS 467(or concurrent with CIS 467)**

The main objective of this course is to provide students with the basic skills related to Information retrieval course (CIS 464) and Data Mining course (CIS467). It covers a range of topics including: Using one of the available Information retrieval (IR) tools related to the contents of the CIS 464 course, Building some IR applications using a programming language, Using one or more of the Data Mining tools such as WEKA or Orange or R-Tool, Using Database and Data warehousing mining suites such as Oracle Data Mining Suite, Building some Data Mining applications using a Programming language. The course includes some exercises and case studies related to the contents of the CIS 464 and CIS467 courses.

**Learning Outcomes:**

After completing this course, the student should demonstrate the knowledge and ability to:

1. Use one of the available Information retrieval (IR) tools.
2. Build some IR applications using a programming language.
3. Use one or more of the Data Mining tools such as WEKA or Orange or R-Tool.
4. Use Database and Data warehousing mining suites such as Oracle Data Mining Suite.
5. Build some Data Mining applications using a Programming language.
6. Solve real problems using Data Mining methods.

**CIS 468: Big Data Management 3 Cr. Hrs. Prereq.: CIS 360**

This course introduces students to the fundamental concepts of the techniques used for big data storage, analysis and management. This course concentrates on dealing with horizontal databases and map reduction in order to write efficient algorithms to manipulate large data. This course also covers concepts of different big data applications in several fields such as medical data and social networks data analysis. Anotherr topics covered are: Introduction to Big Data problem, current challenges, trends, applications, column store, distributed database, Hadoop and MapReduce Programming Patterns, Locality Sensitive Hashing, directions reduction, stream data, processing of unsorted data, NoSQL, and NewSQL.

**Learning Outcomes**

After completing this course, the student should demonstrate the knowledge and ability to:

1. Understand the nature of big data analysis and their various contexts.
2. Write efficient algorithms to manipulate big data.
3. Know the basics of applying big data in different fields.
4. Deal with several big data applications in different scientific fields.
5. Deal with current challenges and future trends with big data applications.
6. Know how big data help in distributed databases.
7. Know how to deal with big data and HADOOB system.
8. Deal with some big data concepts such as: Locality Sensitive Hashing, directions reduction, stream data, unsorted data processing

**CIS 471: Intelligent Information System 3 Cr. Hrs. Prereq.: CIS 360**

This course is intended to provide students with concepts, techniques, and methods that can be used to develop systems with special, non-traditional characteristics that simulate human intelligence. It covers a range of topics including: intelligence in natural and artificial systems,

framework and theoretical foundations of Intelligent Information Systems, knowledge representation, design and architecture, goals and value judgments, artificial systems and learning, planning of actions, programming for Intelligent Information Systems, applications and case studies.

**Learning Outcomes:**

After completing this subject, students should be able to:

1. Determine the concepts and techniques required to build intelligent systems.
2. Develop systems to simulate human intelligence.
3. Assess actions paths and compare between them.
4. Develop applications to solve specific artificial intelligence problems.

### CIS 480: Applications of Distributed Systems 3 Cr. Hrs. Prereq.:CS 332, CIS 311

This course aims to provide students with the basic concepts, knowledge and skills related to distributed information systems, their types and how to program and evaluate these systems. This course involves the following subjects: principles of distributed systems; design and programming issues of distributed applications; enterprise client-server architectures, distributed objects architecture; Object request broker (ORB), software performance engineering and its activities; principles and techniques of distributed applications (workload, efficiency, localization, resource sharing, databases, parallelism); types of distributed applications (middleware and performance, architecture and design for high performance) (average of efficiency, high structural efficiency) efficiency (performance) tools, database technologies, data replication, data warehousing, transaction monitors and managers.

**Learning outcomes:**

After completion of this course the student should be able to:

1. Understand the basic terminology and concepts related to distributed systems and applications development.
2. Understand the communication techniques between basic processes(operations) in distributed systems using a particular programming language.
3. Grasp the concept of control and monitoring processes in distributed systems and how to share resources.
4. Know the most prominent protocols, such as TCP/IP.
5. Understand the principles and techniques of designing protocols used in distributed systems.
6. Identify at least one of the frameworks used to develop distributed applications.

### CIS 492 Special Topics 3 Cr. Hrs. Prereq.: CIS 240

The main objective of this course is to empower students with the hot and latest knowledge of a topic that is not covered in any of the CIS courses listed above, with the approval of the department board.

**Learning outcomes**

The learning outcomes of this course are related to the topic that will be selected by the lectures and approved by the department board in that semester where the course offered in.

**CIS498: Practical Training 3 Cr. Hrs. Prereq.: MIS106, Passing 90 Cr. Hrs**

The main objective of this course is to provide students with the chance to get trained and obtain the needed experience for the market before graduation through spending an (8) weeks period in one of the CIS department accredited training establishmenst. During the training period, students will be asked to apply whatever learned and earned skills from their study and having in mind requests by companies and establishments offering the training and in coordination with the training supervising faculty member and the training granting establishment in line with the learning outcomes set by the program in Computer Information Systems.

**CIS 499: Graduation Project 3 Cr. Hrs. Prereq.:CIS 498, Pass 98 Cr. Hrs.**

This course aims to provide students with the ability to develop an information system and document it properly. The student is supposed to select a problem and apply the knowledge and skills learned from other courses so that the student can develop a complete system and write a report that documents the problem, the analysis method, the algorithms used in solving the problem, the designs used, the code, the execution, and how the system works.

## Describtion of courses Computer Information Systems Department offers to other departments.

### CIS 116: Principles of Programming for GIS (Geography Dept requirement) 3 Cr. Hrs.

The course aims to teach students basic concepts of programming using one of the visual programming languages (such as VB.net or C#.net) to build GISs. The course includes: programming principles, Variable definition and simple control statements, building programs and error detection and correction, building Classes and call their components, creating forms and adding different tools to them, screen definition, use different lists (menus) for programming, Program execution, and practical examples. This course has a practical part that concentrates on providing students with necessary skills to use a programming language in the GIS field.

#### Learning Outcomes

At the end of this course students should:

1. Understands the concept of visual programming.
2. Understands the process of problem analysis using computers.
3. Understands the principles and guidelines for GUI design.
4. Be able to model solutions of problems using flowcharting technique.
5. Be familiar with Visual Basic programming environment and tools.
6. Understand the concept of variables, constants and data types in Visual Basic.
7. Be able to build simple applications especially for GIS databases that contain event handlers.
8. Be able to debug programs and fix encountered errors
9. Be able to enhance the design of the GUI by applying international design standards.

### CIS 160: Databases for geographical information systems (Geographic Dept requirement) 3 Cr. Hrs.

The main objective of this course is to provide students with the main concepts of geographical databases and their use in the specialized geographical information systems software. The course covers a range of topics including: basic principles and concepts, data types, types of databases, database architecture, data collection and data organization using the GIS databases, database users, relational model, the basics of database query language (SQL), basic principles of normalization, practical examples. The practical part of this course focuses on how to use a special software (such as MS-Access) to create and use databases in entering data, querying, and creating reports.

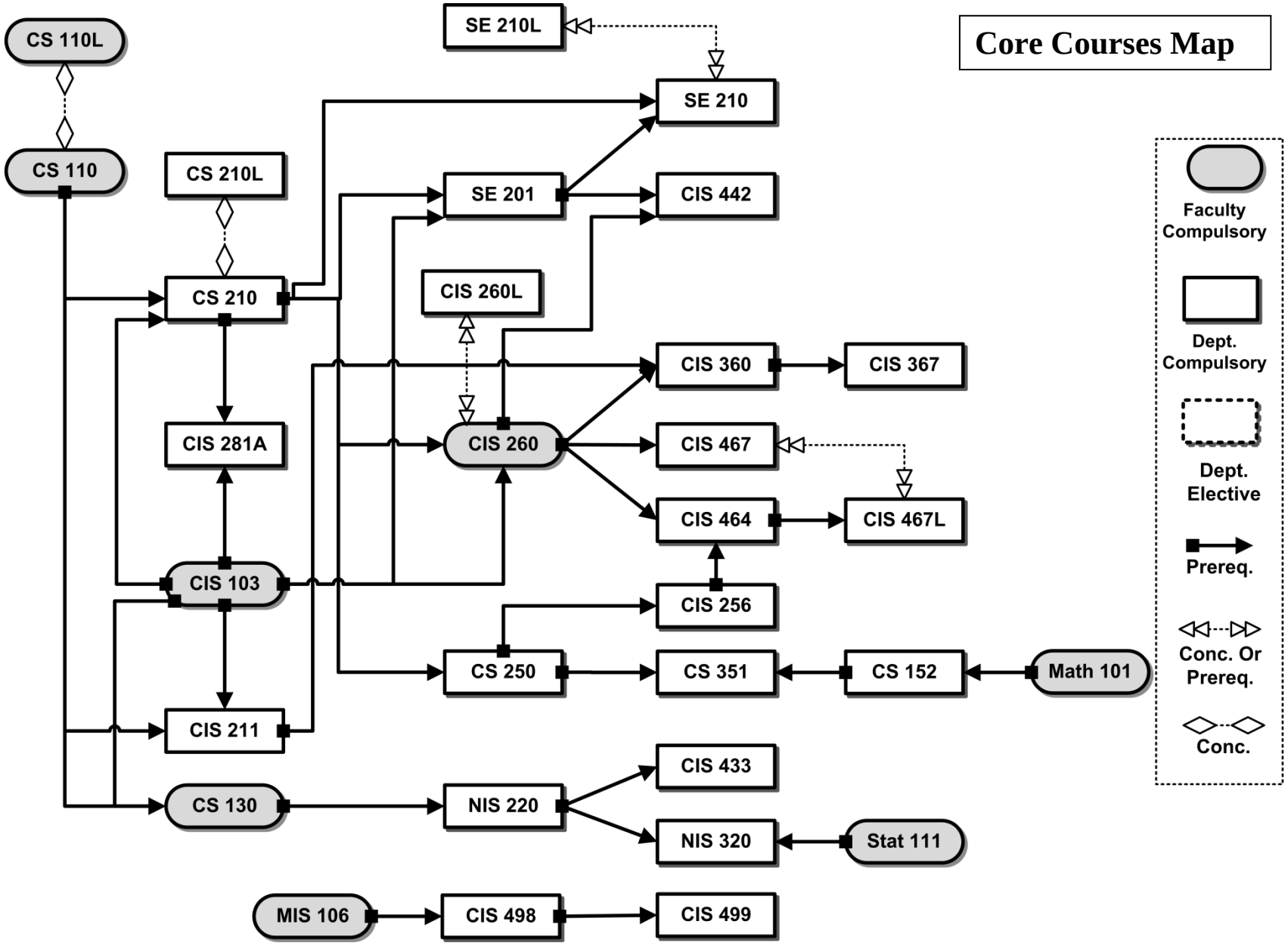
#### Learning Outcomes:

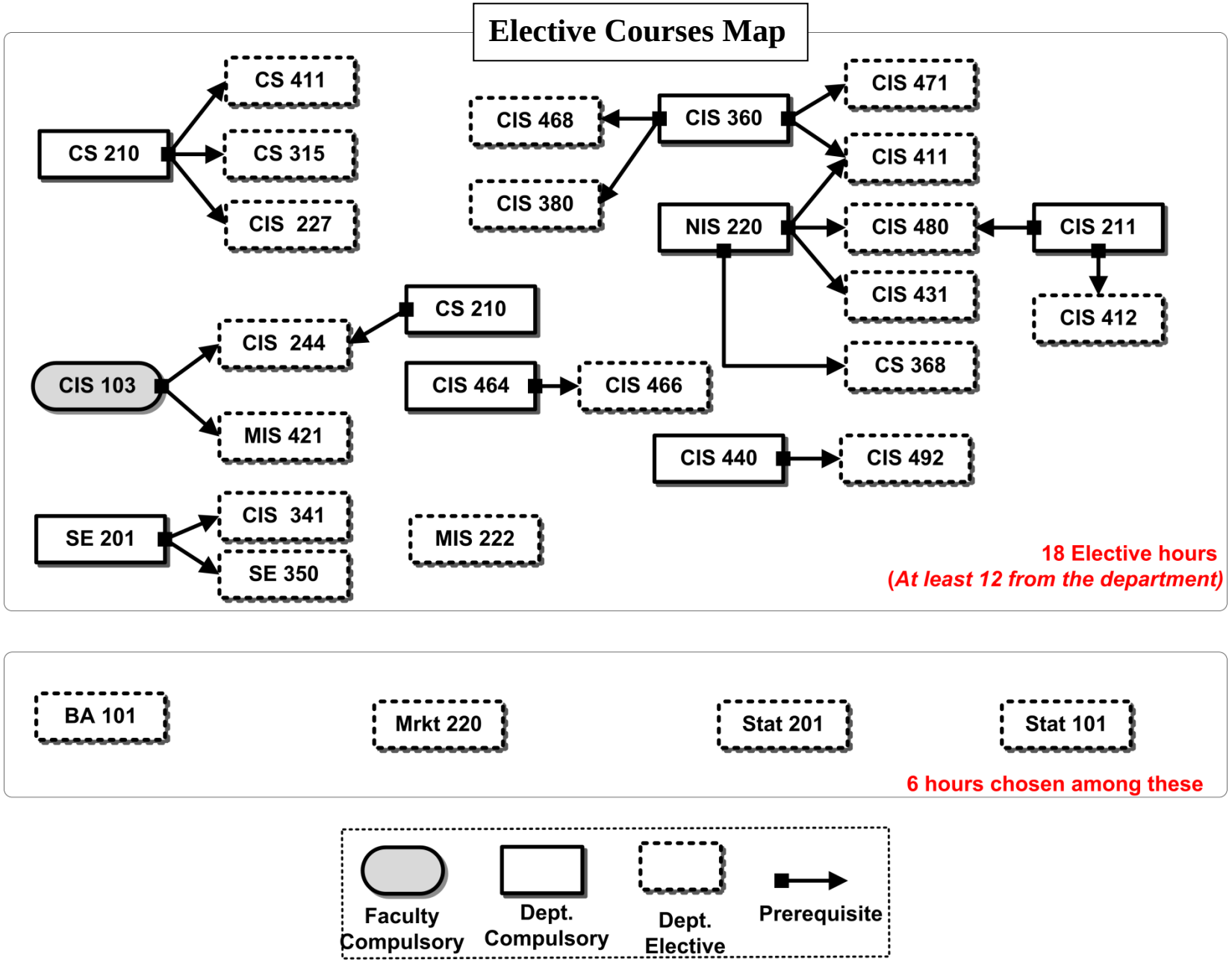
By the end of this course, student should be able to:

1. Know the main concepts of geographical databases.
2. Know the advantages of using database over the traditional file system in designing geographical databases.

3. Describe the typical database components, especially geographical databases.
4. Describe the aim of database analysis, design and implementation.
5. Draw a simple data model for the used database
6. Draw the Entity Relationship Diagram (ERD).
7. Know how to use the subtype model in data modeling.
8. Use the supertype hierarchy model.
9. Convert an ER or EER diagram to Logical diagram.
10. Create the relational tables with referential integrity constraints.
11. Use the SQL language to create a geographical database.
12. Use the SQL DML commands (insert, update and delete).
13. Write queries (Select commands) to retrieve data from tables.

# Core Courses Map




Elective Courses Map
CS 411
CS 210
CS 315
CIS 227
CIS 468
CIS 360
CIS 471
CIS 411
CIS 380
NIS 220
CIS 480
CIS 211
CIS 431
CIS 412
CS 210
CIS 244
CIS 103
CIS 464
CIS 466
CS 368
MIS 421
CIS 440
CIS 492
SE 201
CIS 341
MIS 222
SE 350
18 Elective hours
(At least 12 from the department)
BA 101
Mrkt 220
Stat 201
Stat 101
6 hours chosen among these
Faculty Compulsory
Dept. Compulsory
Dept. Elective
Prerequisite

# Guidance plan for students in Computer Information Systems Department

| First year: First Semester | | |
|---|---|---|
| **Course Code** | **Course Type** | **Credit Hours** |
| AL 100 | University Req./ Compulsory | 3 |
| MILT 100 | University Req./ Compulsory | 3 |
| CIS 103 | Faculty Req./ Compulsory | 3 |
| Math 101 | Faculty Req./ Compulsory | 3 |
| --- | University Req./ Elective | 3 |
| --- | University Req./ Elective | 3 |
| | | |
| Total | | 18 |

| First year: Second Semester | | |
|---|---|---|
| **Course Code** | **Course Type** | **Credit Hours** |
| CS 110 | Faculty Req./ Compulsory | 3 |
| CS 110L | Faculty Req./ Compulsory | 1 |
| CS 130 | Faculty Req./ Compulsory | 3 |
| MIS 106 | Faculty Req./ Compulsory | 3 |
| --- | Faculty Req./ Elective | 3 |
| --- | University Req./ Compulsory | 3 |
| | | |
| Total | | 16 |

| Second Year: First Semester | | |
|---|---|---|
| **Course Code** | **Course Type** | **Credit Hours** |
| CS 210 | Department Req./ Compulsory | 3 |
| CS 210L | Department Req./ Compulsory | 1 |
| CIS 311 | Department Req./ Compulsory | 3 |
| Stat 111 | Faculty Req./ Compulsory | 3 |
| --- | University Req./ Compulsory | 3 |
| --- | University Req./ Elective | 3 |
| Total | | 16 |

| Second Year: Second Semester | | |
|---|---|---|
| **Course Code** | **Course Type** | **Credit Hours** |
| CIS 240 | Department Req./ Compulsory | 3 |
| CS 250 | Department Req./ Compulsory | 3 |
| CIS 260 | Department Req./ Compulsory | 3 |
| CS 142 | Department Req./ Compulsory | 3 |
| CIS 260L | Department Req./ Elective | 1 |
| --- | Department Req./ Elective | 3 |
| Total | | 16 |

| Third Year: First Semester | | |
|---|---|---|
| Course Code | Course Type | Credit Hours |
| CS 351 | Department Req./ Compulsory | 3 |
| CIS 281A | Department Req./ Compulsory | 3 |
| CIS 360 | Department Req./ Compulsory | 3 |
| CIS 256 | Department Req./ Compulsory | 3 |
| --- | Department Req./ Elective | 3 |
| --- | Department Req./ Elective | 3 |
| Total | | 18 |

| Third Year: Second Semester | | |
|---|---|---|
| Course Code | Course Type | Credit Hours |
| CIS 367 | Department Req./ Compulsory | 3 |
| CS 332 | Department Req./ Compulsory | 3 |
| CIS 340 | Department Req./ Compulsory | 3 |
| CIS 340L | Department Req./ Compulsory | 1 |
| --- | Department Req./ Elective | 3 |
| --- | Department Req./ Elective | 3 |
| Total | | 16 |

| Fourth Year: First Semester | | |
|---|---|---|
| Course Code | Course Type | Credit Hours |
| CIS 433 | Department Req./ Compulsory | 3 |
| CIS 442 | Department Req./ Compulsory | 3 |
| CIS 464 | Department Req./ Compulsory | 3 |
| CS 360 | Department Req./ Compulsory | 3 |
| CIS 498 | Department Req./ Compulsory | 3 |
| --- | University Req./ Compulsory | 3 |
| Total | | 18 |

| Fourth Year: Second Semester | | |
|---|---|---|
| Course Code | Course Type | Credit Hours |
| CIS 467 | Department Req./ Compulsory | 3 |
| CIS 467L | Department Req./ Compulsory | 1 |
| CIS 499 | Department Req./ Compulsory | 3 |
| --- | Department Req./ Elective | 3 |
| --- | Department Req./ Elective | 3 |
| --- | Department Req./ Elective | 3 |
| Total | | 16 |

## Compulsory Courses and Learning Outcomes Mapping Matrix

| Course | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 3.1 | 3.2 | 3.3 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIS 103 | | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | |
| CIS 311 | | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | | | ✓ | | |
| CIS 256 | | | | | | | | | | | | | | | | | ✓ | | | | | | | |
| CIS 260 | | | | | ✓ | | | | ✓ | ✓ | | | | | | ✓ | | | | | | | | |
| CIS 260L | | | | | | | | | | | | | | | | ✓ | | | | | | | | |
| CIS 281A | | | | | | | | | | | | | | | | | | | | ✓ | | | | |
| CIS 360 | | | | | | | ✓ | ✓ | | ✓ | ✓ | | | | | ✓ | ✓ | | | | | | | |
| CIS 367 | | | | | | | | | | ✓ | | | ✓ | | | ✓ | | | | | | | | |
| CIS 433 | | | | | | | | | | | | | | | | | | | | | ✓ | | | |
| CIS 442 | | | | | | | | | | | | | | | | | | | | | | | ✓ | |
| CIS 464 | | | | | | | | | | | | | | | | | | ✓ | | | | | | |
| CIS 467 | | | | | | | | | | | | | | | | | | ✓ | | | | | | |
| CIS 467L | | | | | | | | | | | | | | | | | | ✓ | | | | | | |
| CIS 498 | | | | ✓ | | | ✓ | | | | | | | | | | | | | | | | | |
| CIS 499 | | | | ✓ | | | ✓ | | | | | | | | ✓ | | | | ✓ | | | | | |
| CIS 240 | | | | | ✓ | | | | ✓ | ✓ | | ✓ | | | ✓ | | | | | | | | | |
| CIS 340 | | | | | ✓ | | | | ✓ | ✓ | | ✓ | | ✓ | ✓ | | | | | | | | | |
| CIS 340L | | | | | | | | | | | | | | ✓ | | | | | | | | | | |
| CS 110 | | | | | | | | ✓ | | | | | | | | | | | | | | | | |
| CS 110L | | | | | | | | ✓ | | | | | | | | | | | | | | | | |
| CS 130 | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | |

| Course | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 3.1 | 3.2 | 3.3 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CS 142** | ✓ | | | | | | | | | | | | | | | | | | | | | | | |
| **CS 210** | | | | | | | | ✓ | | | | | | ✓ | | | | | | | | | | |
| **CS 210L** | | | | | | | | ✓ | | | | | | ✓ | | | | | | | | | | |
| **CS 250** | | | | | | | | | ✓ | | | ✓ | | | | | | | | | | | | |
| **CS 351** | | | | | | | | | ✓ | | | | | | | | | | | | | | | |
| **CS 332** | | | | | | | | | | | | | | | | | | | | | ✓ | | | |
| **CS 360** | | | | | | | | | | | | | | | | | | | | | ✓ | | | |
| **MIS 106** | | | | ✓ | | ✓ | | | | | | | | | | | | | | | | | | |
| **Math 101** | ✓ | | | | | | | | | | | | | | | | | | | | | | | |

## Compulsory Courses and Learning Outcomes Mapping Matrix

| Course | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 3.1 | 3.2 | 3.3 | 4.1 | 4.2 | 5.1 | 5.2 | 5.3 | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIS 227 | | | | ✓ | ✓ | | ✓ | | | ✓ | | | | | | | | | | | | | | |
| CIS 244 | | | | | | | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | | | | | | | |
| CIS 341 | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | | | | | | |
| CIS 380 | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | | | | | | | |
| CIS 411 | | | | | | | | ✓ | | | | ✓ | ✓ | | | | | | | | ✓ | ✓ | | |
| CIS 412 | | ✓ | | | | | | | | | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | | | | |
| CIS 431 | | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | |
| CIS 466 | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | | |
| CIS 468 | | | | | | ✓ | | | ✓ | | | ✓ | | | | ✓ | ✓ | ✓ | | | | | | |
| CIS 471 | | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | | | | | | | |
| CIS 480 | | | | | | | | | | | ✓ | | | | | | | | | ✓ | ✓ | ✓ | | |
| CIS 492 | | | | | | | | | | | | | | | | | | | | | | | | ALL |
| CS 315 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | ✓ | | | | | | |
| CS 411 | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | ✓ | | | | | | |
| MIS 222 | | | ✓ | ✓ | ✓ | | ✓ | | | | | | | | | | | | | | | | | |
| MIS 361 | | | | | | | | | | ✓ | | ✓ | | | ✓ | | | | | | | | | |
| MIS 421 | | | ✓ | | ✓ | | | | | | | | | | | | | | | | | | ✓ | |