INFORMATION SYSTEMS
COURSE CODE: 5377

COURSE DESCRIPTION: In the Information Systems course, students will study the flow and structure of information within a system. They will examine common techniques for managing and manipulating data such as relational and other database management systems, electronic data interchange, automated data analysis, and machine learning. Students will also gain practical skills in managing and manipulating data using some of these techniques.

OBJECTIVE: Given the necessary equipment, software, supplies, and facilities, the student will be able to successfully complete the following core standards for courses that grant one unit of credit.

RECOMMENDED PREREQUISITE: Business Data Applications

COMPUTERS REQUIRED: One computer per student

CREDIT: 1 unit (120 hours)

RECOMMENDED GRADE LEVEL: 10-12

A. SAFETY

Proficient professionals know the academic subject matter, including safety as required for proficiency within their area. They will use this knowledge as needed in their positions. The following accountability criteria are considered essential for students in any program of study.

1. Review school safety policies and procedures.
2. Review classroom safety rules and procedures.
3. Review safety procedures for using equipment in the classroom.
4. Identify major causes of work-related accidents in office environments.
5. Demonstrate safety skills in an office/work environment.

B. STUDENT ORGANIZATIONS

Proficient professionals know the academic subject matter, including professional development, required for proficiency within their area. They will use this knowledge as needed in their positions. The following accountability criteria are considered essential for students in any program of study.

1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.
3. Explain the benefits and responsibilities of being a member of a CTSO.
4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.
5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.

C. TECHNOLOGY KNOWLEDGE

Proficient professionals know the academic subject matter, including the ethical use of technology as needed in their positions. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.
2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.
3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.
4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; illegal downloading; cyberbullying; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).
5. Discuss legal issues and the terms of use related to copyright laws, Creative Commons, fair use laws, and ethics pertaining to downloading of images, photographs, Creative Commons, documents, video, sounds, music, trademarks, and other elements for personal use.
6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.
7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.

D. PERSONAL QUALITIES AND INTERPERSONAL SKILLS

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their positions. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate creativity and innovation.
2. Demonstrate critical thinking and problem-solving skills.
3. Demonstrate initiative and self-direction.
4. Demonstrate integrity.
5. Demonstrate work ethic.
6. Demonstrate conflict resolution skills.
7. Demonstrate listening and speaking skills.
8. Demonstrate respect for diversity.
9. Demonstrate customer service orientation.
10. Demonstrate teamwork.

E. PROFESSIONAL KNOWLEDGE

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their positions. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate global or “big picture” thinking.

2. Demonstrate career and life management skills and goal-making.
3. Demonstrate continuous learning and adaptability skills to changing job requirements.
4. Demonstrate time and resource management skills.
5. Demonstrates information literacy skills.
6. Demonstrates information security skills.
7. Demonstrates information technology skills.
8. Demonstrates knowledge and use of job-specific tools and technologies.
9. Demonstrate job-specific mathematics skills.
10. Demonstrates professionalism in the workplace.
11. Demonstrates reading and writing skills.
12. Demonstrates workplace safety.

F. INTRODUCTION TO INFORMATION SYSTEMS

Information managers demonstrate an understanding of the importance and global impact of information systems. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Explain the differences between Information Technology and Information Systems.
2. Summarize how and why information systems are used today.
3. Create an infographic/chart summarizing the 6 Eras of Computing.
4. Explain globalization and the role information systems have played in this evolution.
5. Research emerging technologies that enable new forms of communication, collaboration, and partnering.
6. Describe how to secure information systems resources, focusing on both human and technological safeguards.
7. Construct a model of Systems Development Life Cycle (SDLC).

G. SYSTEM COMPONENTS (HARDWARE/SOFTWARE)

Information managers are able to secure and effectively operate computer systems, related applications, hardware, and software that are used within an organization. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Explain the major components of an information systems infrastructure: computer hardware, computer software, computer networks, databases, and human resources and procedures.
2. Explain differences and similarities between elements of an IT infrastructure solution, such as clients, servers, network devices, wired and wireless network links, systems software, and specialized security devices.
3. Describe cloud computing and the advantages and disadvantages of its use in an organization.
4. Create a chart or model of an information system by identifying its major components.
5. Define the term open-source software and identify its primary characteristics.

H. ETHICAL, LEGAL ISSUES

Information managers demonstrate knowledge and understanding of information systems ethics and safeguards to protect data as well as ethics theories. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Examine and document the consequences resulting from issues involving ethics around security, privacy, identity theft, and copyright infringement.
2. Examine and debate cases of cybercrimes related to Information Systems.
3. Identify security vulnerabilities of a computer system, software, or hardware that can be exploited by the attacker to gain unauthorized access or compromise a system.
4. Examine major information security issues that organizations face, as well as resources, methods, and approaches to make firms more secure.
5. Design a model that shows the relationship between ethical, social, and political issues in an information society.
6. Describe what the term information systems ethics means and the relevance of ethics to the field of information systems.
7. Summarize the standards to safeguard system quality that protects the safety of the individual and society, and preserving values and institutions considered essential to the quality of life in an information society
8. Outline the main points of Information Communication Technology (ICT) Policies.
9. Define Information Systems Governance (ISG).
10. Compare and contrast the theories used to explain business ethics.

I. BIG DATA

Information Managers understand the challenges of capturing big data, its data storage, and analysis. The following accountability criteria are considered essential for students in the Information Systems program of study.

1. Describe the earliest use of big data since the first PC was developed by IBM.
2. Compare and contrast Big Data vs Structured Data including storage requirements, characteristics, usage, and security.
3. Explain why Big Data is important in the 21st Century and how it's impacted by the trends in computing such as the Internet of Things.
4. Explain how Big Data is used to inform decisions in a variety of settings, e.g., cybersecurity, personal, healthcare, education, retail, finance, marketing, communications, entertainment and media, and transportation.
5. Define and describe the various data collection methods, data analysis tools, and data representation tools for Big Data.
6. Describe the various data storage tools for Big Data in gaming and other industries.
7. Identify and describe gaming applications that use Big Data and how they benefit from Big Data including tracking information on gamers, revenue, usage, and other information.
8. Explain the Big Data file formats and how they are used in Industry.
9. Describe and locate a big data set that could be used to solve a real world problem.

J. DATABASE DESIGN AND NORMALIZATION

Information managers understand that industry relies on structured data and Database Management Systems (DBMS) to store their mission critical information. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Discuss how much of daily life is "data driven" including your student information, games, phone apps, and why data now is so important.
2. Identify "real world" instances where you know that your data is stored and used.
3. Research how structured data is organized so it becomes meaningful and can be easily retrieved and reported (analogy of a "messy" home).
4. Create a glossary of important database terms (i.e. character, field, record, file, primary key, foreign key, normalization, entity, relationship, attribute).
5. Identify the purpose of a Database Management System (DBMS).
6. Identify DBMS software such as, for example, Oracle, MySQL, and DB2.
7. Compare and contrast the use of spreadsheets and the use of a DBMS.
    a. Give examples of the benefits of a DBMS.
    b. Give examples of DBMS systems.
    c. Identify when it is appropriate to use a Spreadsheet vs a DBMS.
8. Transform datasets into structured normalized data using 1st Normal Form, 2nd Normal Form, and 3rd Normal form (Codd).
9. Identify the following from a raw unstructured CSV or TXT file:
    a. Extract information about ***entities*** (tables/noun) from a raw (unstructured) file such as a CSV file.
    b. Define the ***attributes*** (fields/adjective) of an ***entity.***
    c. Document the ***relationship*** (parent/child, 1-1, 1-many) between the entities.
    d. Normalize to 3NF the entities and their attributes.
10. Using a downloaded csv or txt file from a legitimate website, construct data models.
11. Draw the data model using a cloud based tool such as Draw.io using entities and their attributes and identify pk/fk pairs.
12. Implement the data models using for example, MySQL, MS Access or another DBMS tool including:
    a. normalized tables;
    b. relationships between the tables using primary keys and foreign keys;
    c. indexes to speed sorts and searching;
    d. constraints at both the table and field levels

K. DATA COLLECTION METHODS AND TOOLS

Information managers understand the tools and techniques used to collect data. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Illustrate and quantify how much time a day, a week, a month a typical high school student consumes data.

2. Categorize and research various data collection tools including:
    a. questionnaires
    b. surveys
    c. interviews
    d. tests
    e. sensors
    f. geocoding
3. Describe what should be considered to collect detailed, meaningful data.
4. Design a data collection method and specify the target audience for a real life situation.
5. Evaluate the importance of the collection objectives and design of the data collection tool.
6. Compare and contrast the difference between quantitative and qualitative information.
7. Collect data and store the data in a database.
8. Describe the various data storage tools for
    a. Spreadsheets including MS Excel;
    b. Big Data including NoSQL, Apache Hadoop, MongoDB, Azure HDInsight;
    c. Structured Databases like Oracle, MySQL, etc.;
    d. Image Hosting
9. Describe the various data storage formats in regards to:
    a. Spreadsheets;
    b. Big Data including NoSQL, Apache Hadoop, MongoDB, Azure HDInsight;
    c. Structured DBMS
10. Research various cloud based solutions for data collection and storage.
11. Implement a cloud based solution for a survey, collect the data, and pull the data into MS Access for storage and later analysis.
12. Describe the implications of the Internet of Things and the amount of data generated by "things" with sensors and time/stamped information.

L. COMPUTATIONAL MODELS

Information managers demonstrate the ability to construct computational models using large non-trivial data sets to represent real-world phenomena. The following accountability criteria are considered essential for students in the Information Systems program of study.

1. Create data sets that could be used to explore a real world phenomenon or support a claim.
2. Evaluate the use of large data sets to explore a real world phenomenon or support a claim.
3. Evaluate the limitations of a computational model and the accuracy of inferences.
4. Create a computational model using large data sets, make inferences, and address the limitations of the model.

M. DATA VISUALIZATION AND ANALYSIS

Information managers demonstrate the ability to explain ideas regarding patterns and trends in data sets using a variety of visualization methods. The following accountability-criteria are considered essential for students in the Information Systems program of study.

1. Identify a data set that could be used to solve a real-world problem.
2. Evaluate how the same data set can be visualized and reconstructed to support multiple sides of an issue.
3. Implement a variety of built-in database functions to extract, query, aggregate, filter, sort, etc. to support and explain ideas regarding patterns and trends in data.
4. Construct a data visualization to solve a real-world problem using software tools or programming (e.g., generated scatter, bar, and line charts).
5. Analyze patterns in a data visualization then select a collection tool to validate a claim or share information with a group of people.
6. Organize collected data to communicate the solution to a real-world phenomenon and support a claim.
7. Compare and contrast data visualizations for exploring real-world phenomena or supporting a claim.
8. Evaluate possible computational models for data visualizations that aid in solving a variety of problems.
9. Create a computational model for data visualization.

N. CAREER EXPLORATION

Information systems students demonstrate an understanding of the potential career paths of professionals in Information Systems and the further education required for these paths. The following accountability criteria are considered essential for students in the Information Systems program of study.

1. Research, compare, and contrast information management careers (e.g., characteristics needed, skills required, education required, industry certifications, advantages and disadvantages of information management careers, the need for information management workers, etc.).
2. Describe the variety of occupations and professions within the world of Information Management.
3. Describe job requirements for the variety of occupations and professions within the global world of information management.
4. Analyze personal skills and aptitudes in comparison with information management career opportunities.
5. Refine and implement a plan to facilitate personal growth and skill development related to information management career opportunities.

Additional Materials and Resources

Academic Standards and Indicators

Computer Science Academic Standards and Indicators