Course number and name:	**CS 06210: Advanced Computing Technologies**
Credits and contact hours:	3 credits. / 3 contact hours
Instructor's or course coordinator's name:	Patrick McKee
Text book, title, author, and year:	None

Specific course information

Catalog description: This course is designed to expose students to various key knowledge areas of computer science which may not have in-depth coverage in the other required courses of the computer science program. Students will expand their scope of understanding of these areas through a number of technology focus areas, which could include such domains as systems fundamentals, information assurance and security (including cybersecurity practices and principles), information management, networking and communication, and parallel and distributed computing. This course also lays the groundwork for students to experience the breadth of computer science disciplines to prepare them for specialization when selecting advanced program electives.

Prerequisites: CS 04114 Object Oriented And Data Abstraction **and** CS 06205 Computer Organization

Type of Course: ☒ Required ☐ Elective ☐ Selected Elective

Specific goals for the course

1. **Parallel and distributed programming.** Students have developed problem solutions using concurrent, parallel and distributed programming techniques.

   Outcomes:
   - An ability to apply knowledge of task abstraction to produce problem solutions that invoke parallelism.
   - An ability to use current techniques in programming to distribute workloads to individual tasks.

   - ABET (2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

2. **Data models and database querying.** Students have designed effective data models and communicated with them through some query language.

   Outcomes:
   - An ability to apply knowledge of information management concepts to develop and reference database systems.
   - An ability to design, implement, and utilize a data model in a supported query language.

   - ABET (2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

   - ABET (6) Apply computer science theory and software development fundamentals to produce computing-based solutions.

3. **Networking**. Students have demonstrated an understanding of communication protocols used by computer systems.

   Outcomes:
   - An ability to explain key networking protocols, and their hierarchical relationship in the context of a conceptual model, such as the OSI and TCP/IP framework.
   - An ability to articulate the data communications concepts that allow networked hosts and applications to communicate across the internet.
   - An ability to analyze a problem and offer solution recommendations in a network domain.

   - ABET (1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

4. **Cybersecurity**. Students have demonstrated an understanding of foundational concepts in cybersecurity.

   Outcomes:
   - An ability to explain the concepts of confidentiality, availability, and integrity (CIA)
   - An ability to articulate the threats to CIA and to analyze a system, discern vulnerabilities, and recommend solutions to mitigate the threats

   - ABET (1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

Required list of topics to be covered

1. Information assurance and security, for example:
   a. Foundational concepts in security
   b. Principles of secure design
   c. Threats, Attacks, and Vulnerabilities

2. Networking and communication, for example:
   a. Fundamental Principles of Computer Networks
   b. Network Models
   c. Network Protocols and Technologies

3. Parallel and distributed computing, for example:
   a. Parallelism fundamentals (e.g. mutual exclusion, deadlocking)
   b. Parallel decomposition (i.e., need for communication and coordination/synchronization; independence and partitioning)
   c. Parallel communication and coordination
   d. Parallel architectures (microservices)
   e. Distributed systems

4. Information Management, for example:
   a. Information management concepts
   b. Database systems
   c. Database modeling (high-level)
   d. Relational databases
   e. Query languages

Optional list of topics that could be covered

1. Quantum Computing