Course Title: **Quantum AI for Threat Detection**

Credit Hrs: **3**

Prerequisites: Machine learning background

Course Description:

The course enhances cybersecurity threat detection by combining the computational power of quantum computing with AI's pattern recognition abilities. The synergy allows for faster processing of large, complex datasets, identifying anomalies and predicting sophisticated attacks more effectively than traditional methods.

Course Objectives:

1. Integrate quantum computing with artificial intelligence
2. Develop quantum machine learning algorithms for security applications
3. Apply quantum advantage to pattern recognition and threat analysis

Course Learning Outcomes: Students will be able to:

1. Implement quantum machine learning algorithms
2. Design quantum neural networks
3. Apply quantum algorithms to cybersecurity problems
4. Develop quantum-enhanced threat detection systems

Course Contents:

Week	Contents
1-2.	Introduction to quantum machine learning
3-4.	Quantum feature maps and kernels
5-6.	Variational quantum classifiers
7-8.	Quantum neural networks and training
9-10.	Quantum anomaly detection algorithms
11-12.	Quantum reinforcement learning
13-14.	Cybersecurity applications
15-16.	Real-time threat detection systems

Textbooks/ References:

1. Schuld, M. & Petruccione, F. "Supervised Learning with Quantum Computers" (2018)
2. Biamonte, J. "Quantum Machine Learning" (2017)

Assessment:

3. Assignments: 10%
4. Quizzes: 10%
5. Midterm Exam: 30%
6. Final Exam: 50%