Salisbury University Department of Mathematical Sciences

MATH 490
Syllabus (Tentative)

Description: This course is an introduction to quantum computing. The course will build mathematical and theoretical frameworks to study quantum algorithms and computation.

Prerequisites: MATH 202 or permission of the instructor.

Textbooks: **Required:** *Introduction to Classical and Quantum Computing*, by Thomas G. Wong. **Optional/Recommended:** *Quantum Computation and Quantum Information*, by Michael A. Nielsen and Isaac L. Chuang.

	Weeks
One quantum bit	1.5
Superposition, measurement, Bloch sphere mapping, physical qubits, quantum gates, quantum circuits.	
Linear algebra	1.5
Quantum states, inner products, quantum gates, outer product.	
Multiple quantum bits	3
States and measurements, entanglement, quantum gates, quantum adders, universal quantum gates, quantum error correction.	
Quantum programming	2
IBM Quantum, quantum assembly language, Qiskit.	
Entanglement and quantum protocols	3
Measurements, Bell inequality, monogamy of entanglement, superdense coding, quantum teleportation, quantum key distribution.	
Quantum algorithms	3
Circuit vs query complexity, parity, discrete Fourier transformation, factoring, and other topics as time allows.	
Total	**14**

Evaluation

Projects	40%
Homework	50%
Final Project	10%

- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.
- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**
- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.