**MORGAN STATE UNIVERSITY**

**\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Computer Science Department\_\_\_\_\_\_\_\_\_\_\_\_**

*Name of academic unit*

**Curriculum Committee**

PROPOSAL FOR A COURSE

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| 1. **Course Number, Title and Number of Credits:**   **Course Number: COSC xxx**  **Course Title: Quantum Algorithms**  **Number of Credit Hours: 3** |

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| **2. Number of Contact Hours:**  **Lecture: \_\_\_\_\_3\_\_\_\_\_\_\_ Laboratory \_\_\_\_\_\_0\_\_\_\_\_\_\_** |

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| 1. **Catalog Description:**   **COSC xxx Quantum Algorithms** – *Three hours of lecture, 3 credits*.  This course goes beyond the introductory level in order to more deeply quantify the implications of quantum computation. Applications such as machine learning, solutions to linear equations, search algorithms and cryptography will be discussed. Additionally, concepts involving quantum information will be  **Prerequisite:** Introduction to Quantum Computing |

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| 1. **Course Objectives (Broad Objectives of the Course):**   Upon completion of this course, students will be able to do the following:   * **Describe** quantum circuits for implementing various quantum algorithms. * **Analyze** computational complexity of quantum algorithms * **Demonstrate** skills by implementing and coding quantum algorithms. |

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| 1. **Course Content (Statement of Subject Matter):**   **Unit 0:** Quantum computation and Qiskit review  **Unit 1:** Bernstein-Vazirani algorithm  **Unit 2:** Grover’s algorithm  **Unit 3:** Quantum Fourier transform  **Unit 4:** Addition using the QFT  **Unit 5:** Phase estimation  **Unit 6:** Shor’s algorithm  **Unit 7:** Maxcut algorithm  **Unit 8:** Subset sum algorithm  **Unit 9:** Solving linear systems of equations using HHL  **Unit 10:** Quantum machine learning |

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| 1. **Relationship to Curriculum Sequence (Elective or Required; Need):**   This is an elective course for the BS in Computer Science program. |

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| 1. **Relationship to Similar Course Offerings in Other Departments:**   None. |

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| 1. **Bibliography:**   Course deliverables: lectures, notes, tutorials will be provided according to the topics covered.   * Quantum Computation and Quantum Information, M.A. Nielsen and I.L.Chuang, 10th Anniversary Edition. Cambridge. ISBN-13 ‏ : ‎ 978-1107002173, 2011. * Numerical Recipes in Quantum Information Theory and Quantum Computing. M.S. Ramkarthik. CRC Press. ISBN-13: 978-03677592852, 2021. |

**Note: A course outline and course syllabus must be submitted with this form.**

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| **Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *Department Curriculum Chairperson Date*  **Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *Department Chairperson Date*  **Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *Chairperson, School Curriculum Committee Date*  **Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *Dean/Director Date*  **Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  *Office of the Vice President for Academic Affairs Date* |