**Multidisciplinary Studies Curriculum and Course Outline**

**Degree:** BA **Major:** MultidisciplinaryStudies  **Concentration:** Physics and Computer Science **Major Requirements:** 39 credit hours (plus 9 credit hours of related coursework)

Core 2 (18 credit hours)

Computer Science

Core 1 (18 credit hours)

Physics

CSCI 140 – Discrete Structures

CSCI 161 – Introduction to Programming 1

CSCI 162 – Introduction to Programming 2

CSCI 362 – Data Structures

CSCI 370 – Computer Architecture

PHYS 231 – Physics 1 with Calculus

PHYS 232- Physics 2 with Calculus

PHYS 233 – Wave-Particle Theory

PHYS 321 – Electromagnetic Fields 1

PHYS 331 – Fundamentals of Optics

PHYS 351 – Intermediate Physics Lab 1

Capstone (2 credits each)

Relative Elective Courses (9 credit hours)

PHYS 492 and PHYS 498: Capstone

MATH 161 – Calculus I

MATH 211 – Calculus II

MATH 311 – Calculus III

**Course Descriptions**

**Core One Descriptions:**

**PHYS 231 Physics 1 with Calculus:** An introductory course in classical physics dealing with mechanics, fluids, waves, and thermodynamics.

**PHYS 232 Physics 2 with Calculus:** Continuation of PHYS 231. An introductory course in classical physics dealing with electricity, magnetism, and optics.

**PHYS 233 Wave-Particle Theory:** Selected topics from the areas of waves and optics, special relativity, an introduction to the concepts and development of modern physics and single-particle quantum mechanics.

**PHYS 321 Electromagnetic Fields 1:** Electrostatic and magnetic fields in vacuum and in dielectric and magnetic materials. Maxwell’s equations are developed.

**PHYS 331 Fundamentals of Optics:** Lab-based course in physical optics, including applications of geometrical optics such as image formation by mirrors and lenses, microscopy, reflection, refraction, and basic phenomena in wave and quantum optics such as interference, diffraction, color mixing and filtration, polarization, birefringence, absorption, dispersion, scattering, laser properties and laser application.

**PHYS 351 Intermediate Physics Lab 1**: Selected experiments in classical and modern physics introducing a variety of experimental techniques.

**Core Two Descriptions:**

**CSCI 140 Discrete Structures:** Discrete mathematical structures and their application to computer science, including formal mathematical notation and proofs, algorithms, computer-related arithmetic, propositional logic, predicate logic, set theory, graphics, relations and databases, functions, matrices and combinatorics.

**CSCI 161 Introduction to Programming:** Introduction to computer programming for the student intending to major in computer science or related fields. Emphasis on developing ability to apply problem-solving strategies to design and implement algorithms in a modern programming language.

**CSCI 162 Introduction to Programming 2:** Continuation of CSCI 161 covering advanced computer programming techniques. Emphasis on object-oriented programming, specification, design, elementary data structures, and proper use of programming language and development tools. Abstract data types, classes and objects, recursion, linked lists, queues, stacks and binary trees.

**CSCI 362 Data Structures:** Abstract data types, objects, algorithm design and analysis, trees, graphs, sorting and searching. Emphasis on ADT-based and object-oriented design, incremental development and testing, and comparison of data structure implementations.

**CSCI 370 Computer Architecture:** Structure of digital computers, including register transfer notation, instruction set architecture, computer arithmetic, pipelining and parallel processors.

**Related Elective Courses:**

**MATH 161 Calculus I:** Introduces concepts and techniques of calculus, beginning with limits. Major emphasis is on the theory and applications of limits, continuity, derivatives, antiderivatives and the definite integral. Includes introductory calculus of trigonometric, inverse trigonometric, exponential, and logarithmic functions.

**MATH 211 Calculus II:** Continuation of MATH 161. Techniques of integration, applications of the definite integral, improper integrals, parametric equations, polar coordinates, sequences and infinite series.

**MATH 311 Calculus III:** Continuation of MATH 211. Vector calculus, functions of several real variables, partial differentiation, implicit functions, multiple integrals, line and surface integrals, and applications.

**Capstone Course:**

PHYS 492 and PHYS 498: Capstone Experience