



# BACHELOR OF SCIENCE IN COMPUTER SCIENCE

## INTRODUCTION

The Neumont University Bachelor of Science in Computer Science (BSCS) program distinguishes itself with an integrated, project and problem-based curriculum that focuses on the skills most valued by today's employers. Graduates of this innovative program will be motivated, entry-level software developers who are equipped for success in the corporate world. All Computer Science projects and coursework are designed to provide Neumont University graduates with a strong foundation in technical skills and standards, an understanding of the business environment, and the ability to communicate and function well as members of teams.

Upon completing the instructional and project hours, the Neumont University graduate has a baccalaureate degree in Computer Science and a portfolio of project work.

The innovative nature of the program allows students to specialize in one or more disciplines under the computer science umbrella. Students can focus on the varying career paths that are closely tied to emerging or high demand careers in the computer science and information technology industry. Neumont University has worked closely with business and industry to develop a curriculum which will further enhance our students' skills, portfolio, and marketability.

## PROGRAM OVERVIEW

Students attend classes and work on projects generally between 8:00 am and 6:00 p.m., Monday through Friday. The program is 10 quarters in length and requires a minimum of 2.5 years to complete. Many assignments are performed in groups as part of lab and project work.

## PROGRAM OBJECTIVES

Students graduate with a BSCS and are expected to master the following:

- Develop software using modern languages and integrated development environments
- Understand and employ a variety of algorithms and data structures
- Design system architectures
- Understand and employ established and emerging software standards
- Develop applications with a variety of deployment mechanisms
- Understand software development in the context of business
- Participate in a range of software development lifecycle phases using a variety of software development methodologies
- Effectively communicate and collaborate in a software development environment
- Integrate disparate areas of technical and non-technical expertise through real-world projects
- Become effective problem solvers and critical thinkers

## GRADUATION REQUIREMENTS

*(Students enrolled in the BSCS program beginning Summer Quarter 2011)*

To qualify for graduation with a Bachelor of Science in Computer Science degree, students are required to accomplish the following:

- Complete a minimum of 180 quarter credit hours with an average grade of 'C' (Cumulative Grade Point Average of 2.0) or higher for all work taken at the University
- Complete a minimum of 104 credit hours in required degree courses, including projects
- Complete a minimum of 58 credit hours in required General Education courses
- Complete a minimum of 18 credit hours of elective courses in any area
- Abide by all University rules and regulations
- To earn credits for a course, a student must earn a passing grade.
- For required courses, a passing grade is a 'C' or better. For non-required courses, a passing grade is a 'D-' or better.
- No unresolved judicial matters
- No outstanding financial obligations to the University

Note: A coupled lecture and project course is considered to be one prerequisite and both must be passed to move into the next coupled lecture and project combination. Only one coupled lecture and project course may be taken per quarter without Provost approval.

Students who enrolled prior to Summer 2011 should refer to the prevailing *Catalog* during their initial period of enrollment.

## BSCS PROGRAM PLAN

(Students enrolled in the BSCS program beginning Summer 2011)

<b>MINIMUM GENERAL EDUCATION CREDITS REQUIRED</b>	<b>58 CREDITS</b>
Required Core General Education Courses	40 credits
Additional Required General Education Specific to Degree	18 credits
<b>MINIMUM COMPUTER SCIENCE CREDITS REQUIRED</b>	<b>104 CREDITS</b>
Required Core BSCS Courses	48 credits
Required BSCS Projects and Labs	56 credits
<b>MINIMUM ADDITIONAL ELECTIVE CREDITS REQUIRED</b>	<b>18 CREDITS</b>
<b>TOTAL REQUIRED FOR BS IN COMPUTER SCIENCE</b>	<b>180 CREDITS</b>

## GENERAL EDUCATION COURSES

### REQUIRED GENERAL EDUCATION 40 CREDITS

FAC105	Leadership and Problem Solving	4 credits
FAC120	Spoken Communications	3 credits
FAC125	Collaborative and Interpersonal Communications	3 credits
FAC299	Principles of Communication	2 credits
HUM100	Foundational English for Technical Professions	1 credit
HUM105	The Art and Science of Success	2 credits
HUM121	English Composition	3 credits
HUM150	Logic	4 credits
HUM221	Intermediate English Composition	2 credits
MAT100	Foundational Math for Technical Professions	1 credit
MAT110	Sets, Probability, and Number Systems	3 credits
MAT150	Trigonometry	3 credits
MAT250	Calculus	3 credits
SSC250	Human Relations and Personality Development	3 credits
SSC271	American Government	3 credits

### ADDITIONAL REQUIRED GENERAL EDUCATION

#### SPECIFIC TO DEGREE 18 CREDITS

BUS290	Business Fundamentals	3 credits
MAT210	Linear Algebra	3 credits
MAT305	Problem Solving	3 credits
MAT320	Numerical Analysis	3 credits
MAT410	Discrete Structures	3 credits
PSC220	Introduction to Physics	3 credits

### TOTAL GENERAL EDUCATION CREDITS 58 CREDITS

## REQUIRED CORE BSCS COURSES

(Students enrolled in the BSCS program beginning Summer 2011)

### REQUIRED CORE COMPUTER SCIENCE COURSES 48 CREDITS

CSC110	Introduction to Computer Science	4 credits
CSC120	Topics in Computer Science	6 credits
CSC130	Principles of Software Engineering	4 credits
CSC150	Object Oriented Programming and Design	6 credits
CSC230	Computational Theory	4 credits
CSC250	Algorithms and Data Structures I	4 credits

CSC252	Algorithms and Data Structures II	4 credits
DBT130	Databases I	4 credits
DBT230	Databases II	4 credits
MOA140	Information Modeling I	4 credits
MOA240	Information Modeling II	4 credits

## REQUIRED BSCS PROJECTS AND LABS

### FOUNDATIONAL COURSES AND LABS 24 CREDITS

CSC160	Developing for the Windows Platform	4 credits
PRO160	Windows Platform Lab	2 credits
CSC180	Introduction to Java Development	4 credits
PRO180	Java Lab	2 credits
CSC260	Introduction to Dynamic Web Programming	4 credits
PRO260	Dynamic Web Lab	2 credits
CSC280	Developing Scalable Web Applications with Java EE	4 credits
PRO280	Scalable Web Applications Lab	2 credits

### DEVELOPMENTAL COURSES AND LABS 12.5 CREDITS

CSC360	Introduction to Web Services	4 credits
CSC380	Service Oriented Architecture	4 credits
PRO390	Capstone Project	4.5 credits

### ENTERPRISE PROJECTS 19.5 CREDITS

PRO490	Enterprise Projects I	6.5 credits
PRO491	Enterprise Projects II	6.5 credits
PRO492	Enterprise Projects III	6.5 credits

### ADDITIONAL ELECTIVES 18 CREDITS

### TOTAL PROGRAM CREDITS 180 CREDITS

# BSCS

# COURSE DESCRIPTIONS

## BUSINESS

### **BUS290 BUSINESS FUNDAMENTALS (3 CREDITS)**

A survey of the various aspects of business including human resources, finance, client relations, and production. Students will be able to identify the type of information that is critical to each aspect of the business. Students will also learn about various organizational structures and some aspects of business law.

## COMPUTER SCIENCE

### **CSC110 INTRODUCTION TO COMPUTER SCIENCE (4 CREDITS)**

Students gain exposure to a wide variety of topics in Computer Science. While building real applications in the lab portion of this course, students also learn fundamental concepts about such topics as data storage and manipulation, object-oriented programming, and other introductory topics.

### **CSC120 TOPICS IN COMPUTER SCIENCE (6 CREDITS)**

Students gain exposure to a wide variety of topics in Computer Science. While building real applications in the lab portion of this course, students also learn about the different foci a student could have while studying Computer Science at Neumont University.

### **CSC130 PRINCIPLES OF SOFTWARE ENGINEERING (4 CREDITS)**

This course introduces students to the software development life cycle and includes discussions on software processes, process models, and methodologies. The course will also discuss support and maintenance related to software after it has been released.

### **CSC160 DEVELOPING FOR THE WINDOWS PLATFORM (4 CREDITS)**

This course introduces students to various concepts in the .NET environment and to programming standards within that environment. Topics may include Windows desktop application development, multi-user application development using ASP.NET, ADO.NET, XML, and Web Services.

*Prerequisites: DBT130 Relational Databases I (may be taken concurrently) or DBT260 Business Database Systems (may be taken concurrently); CSC150 Object Oriented Programming and Design.*

### **CSC180 INTRODUCTION TO JAVA DEVELOPMENT (4 CREDITS)**

Students are introduced to the Java core packages and APIs. Students learn skills for developing, deploying, and managing Java applications. Course content includes the language's syntax, core APIs, graphical user interface (GUI) framework(s), and platform tools.

*Prerequisites: DBT130 Databases I (may be taken concurrently) or DBT260 Business Database Systems (may be taken concurrently); CSC150 Object Oriented Programming and Design*

### **CSC230 COMPUTATIONAL THEORY (4 CREDITS)**

This course is designed to pique a student's interest in exploring and learning more about the theoretical side of computing. This course exposes students to conceptual tools that practitioners use in computer engineering. It develops critical thinking and problem solving skills by demonstrating elegant solutions to complicated problems.

*Prerequisites: CSC250 Algorithms and Data Structures*

### **CSC250 ALGORITHMS AND DATA STRUCTURES I (4 CREDITS)**

This course is designed to enhance a student's problem solving ability and enhance their skillset in developing solutions to common software problems using general algorithms and abstract data types. Students will utilize various structures such as stacks, queues, hash tables, linked lists, and trees to store data; understand and apply various searching and sorting algorithms to software; and make analyses of algorithm use and design.

*Prerequisites: CSC150 Object Oriented Programming and Design, MAT110 Sets, Probability, and Number Systems, MAT250 Calculus*

### **CSC252 ALGORITHMS AND DATA STRUCTURES II (4 CREDITS)**

Designed as a continuation of CSC250. This course will allow students to design and implement their own algorithms and data structures in an effort to improve efficiency and elegance. Students will compare and contrast algorithms and techniques to better understand the principles involved in being a good problem solver in regards to computer science.

*Prerequisites: CSC250 Algorithms and Data Structures I*

### **CSC260 INTRODUCTION TO DYNAMIC WEB PROGRAMMING (4 CREDITS)**

This course builds on students' knowledge of the .NET environment and programming standards within that environment. Topics may include Windows desktop application development, multi-user application development using ASP.NET, ADO.NET, XML, and Web Services.

*Prerequisites: CSC160 Developing for the Windows Platform and PRO160 Windows Platform Lab.*

*Corequisite: PRO260 Dynamic Web Lab*

### **CSC280 DEVELOPING SCALABLE WEB APPLICATIONS WITH JAVA EE** (4 CREDITS)

Students build upon the knowledge gained from CSC180 and begin learning the Java Enterprise Edition (Java EE) platform. Java EE technologies are introduced with an emphasis on Java Web technologies such as Servlets, Java Server Pages (JSP), the Web container, and the role of enterprise application servers. Design patterns applicable to the presentation tier will be discussed. Students learn how to put persistence strategies into practice. Applicable open-source frameworks and tools may also be introduced.

*Prerequisites:* CSC180 Introduction to Java Development and PRO180 Java Lab; MOA140 Information Modeling I

*Corequisites:* PRO280 Scalable Web Applications Lab

### **CSC360 INTRODUCTION TO WEB SERVICES** (4 CREDITS)

This course introduces students to advanced topics in the .NET environment and to programming standards within that environment. Topics may include Windows desktop application development, multi-user application development using ASP.NET, ADO.NET, XML, and Web Services.

*Prerequisites:* CSC260 Introduction to Dynamic Web Programming and PRO260 Dynamic Web Lab

### **CSC380 SERVICE ORIENTED ARCHITECTURE** (4 CREDITS)

This course focuses on the underpinnings of Java-based distributed computing. Students employ directed problem-based learning to explore the principles of distributed protocols including SOAP and REST. This course teaches these principles by solving real programming problems that give students additional experience in advanced Java programming. While this class will touch on some tools used to automate distributed processes, the course emphasizes general concepts with application generally to most Java distributed processing tools and techniques.

*Prerequisites:* CSC280 Developing Scalable Web Applications with Java EE and PRO280 Scalable Web Applications Lab

## **DATABASE TECHNOLOGY**

### **DBT130 DATABASES I** (4 CREDITS)

This course introduces students to database management systems with the emphasis on relational DBMSs. Students study the relational model of data, relational algebra, and basic SQL, as well as principles of data modeling and good database design. Students use modern relational database management systems (SQL Server and DB2) to apply their knowledge.

### **DBT230 DATABASES II** (4 CREDITS)

This course extends the previous work on relational database management systems. Topics include further aspects of data definition and data manipulation in SQL, including advanced SQL queries, triggers, and stored procedures. Students apply their knowledge using modern relational DBMSs (SQL Server and DB2).

*Prerequisites:* DBT130 Databases I

## **FINE ARTS AND COMMUNICATION**

### **FAC105 LEADERSHIP AND PROBLEM-SOLVING** (4 CREDITS)

This course introduces students to basics of leadership, business, communication, and decision-making. Students will work collaboratively to develop an understanding of unique solutions. Students will learn to understand many elements of a problem, research the problem and potential solutions, and critically think through potential solutions.

### **FAC120 SPOKEN COMMUNICATIONS** (3 CREDITS)

Students strengthen their oral presentation skills by exploring and applying appropriate techniques for preparing and delivering speeches. Students learn speech, composition, and delivery methods needed to give effective presentations for technical and non-technical audiences alike. Students gain a basic understanding of effective and ethical public speaking, as well as develop poise and confidence in delivering public presentations to a variety of audiences.

### **FAC125 COLLABORATIVE AND INTERPERSONAL COMMUNICATIONS I** (3 CREDITS)

Students actively develop and apply necessary collaborative skills for successful interpersonal interactions and group work. Students learn and use principles related to interpersonal communications, group dynamics, leadership, and the collaborative group life-cycle. Students are not just exposed to knowledge in these domains, but they develop practical skills that can be directly applied during their project work at Neumont University.

*Prerequisites:* SSC250 Human Relations and Personality Development

### **FAC299 PRINCIPLES OF COMMUNICATION** (2 CREDITS)

Students will learn about and put into practice various topics related to effective personal communication. Major course topics are effective writing including memos, emails, resumes and cover letters, effective verbal communication including conversation, interviewing techniques and negotiation, and other relevant aspects of communication.

*Prerequisites:* Instructor Permission

## **HUMANITIES**

### **HUM100 FOUNDATIONAL ENGLISH FOR TECHNICAL PROFESSIONS** (1 CREDIT)

This course is designed to give students a foundational understanding of English grammar and composition. Students will focus on the fundamentals of reading comprehension and composition, including vocabulary, grammar, mechanics, sentence structure, and paragraphing. The importance of professional writing will be addressed.

### **HUM105 THE ART AND SCIENCE OF SUCCESS** (2 CREDITS)

Helps students develop and refine necessary skills for success. Students will learn effective time management, communication, and research skills. Students will also discuss the importance of ethics, professionalism, and integrity throughout their life.

**HUM121 ENGLISH COMPOSITION (3 CREDITS)**

Students develop necessary writing skills to prepare them for college-level writing and to establish a solid foundation for business and technical communications. Students focus on key rhetorical concepts including purpose, audience, and contexts for writing, as well as a range of genres used in college and workplace writing. Students explore effective writing processes, build awareness of writing conventions, and expand critical thinking, reading, and writing abilities.

**HUM150 LOGIC (4 CREDITS)**

This course provides an introduction to propositional logic, including truth tables, truth trees, and natural deduction, with an emphasis on the application of logic to the evaluation of arguments expressed in natural language. This course will also cover full first-order predicate logic, with an emphasis on logical evaluation of arguments expressed in natural language. First-order logic topics include translation, truth trees, deduction trees, sorted logic, identity, and modal operators.

**HUM221 INTERMEDIATE ENGLISH COMPOSITION (2 CREDITS)**

This course builds on the writing skills and knowledge gained in English Composition. Persuasive writing, rhetorical analysis and strategy, style and an understanding of formal argumentation, and critical thinking and analysis will be emphasized. Collaborative project management skills will be taught and used.

*Prerequisites: HUM121 English Composition*

**MATH****MAT100 FOUNDATIONAL MATH FOR TECHNICAL PROFESSIONS (1 CREDIT)**

This course is designed to help students improve their understanding of foundational math skills such as algebraic rules, number sets, fractions, decimals, order of operations, and functions. The course will increase the students' knowledge and competency in geometry concepts, basic graphing, and in solving linear equations.

**MAT110 SETS, PROBABILITY, AND NUMBER SYSTEMS (3 CREDITS)**

Students are introduced to a variety of mathematical topics including basic set theory, practical applications in probability, and representation of numbers in floating point, binary, and other numeric representations.

**MAT150 TRIGONOMETRY (3 CREDITS)**

This introductory Trigonometry course explores functions and equations, polar coordinates, angles and triangles, similar triangles, inverse trigonometric functions, and laws of sines and cosines.

**MAT210 LINEAR ALGEBRA (3 CREDITS)**

This course gives students an opportunity to examine Linear Algebra and Geometry, Calculus and Planar/Solid Analytic Geometry.

*Prerequisites: MAT110 Sets, Probability, and Number Systems*

**MAT250 CALCULUS (3 CREDITS)**

This course examines several Calculus techniques including differentiation and integration.

*Prerequisites: MAT150 Trigonometry*

**MAT305 PROBLEM SOLVING (3 CREDITS)**

Students are introduced to a variety of problem solving techniques. Those techniques are applied to various mathematical topics including algebra, calculus and number theory. A programming project will be presented for solution.

*Prerequisites: MAT250 Calculus*

**MAT320 NUMERICAL ANALYSIS (3 CREDITS)**

This course introduces students to numerical analysis, direct and iterative methods of solving linear systems, optimization techniques, least squares methods, and numerical handling of ordinary and partial differential equations.

*Prerequisites: MAT210 Linear Algebra*

**MAT410 DISCRETE STRUCTURES (3 CREDITS)**

This course introduces students to the study of mathematics devoted to objects that are distinct or unconnected. Students will be exposed to problems which relate to logic, probability, and operations research. Discrete mathematics is a gateway and foundation for many other Computer Science courses including: algorithms, data structures, database theory, automata, formal languages, compiler theory, computer security, and operating systems.

*Prerequisite: CSC252 Algorithms and Data Structures II*

**MODELING AND ANALYSIS****MOA140 INFORMATION MODELING I (4 CREDITS)**

Students learn about modeling and querying an information system at the conceptual level and mapping between conceptual and logical (e.g. relational) levels. Object Role Modeling (ORM) is covered at an introductory level.

**MOA240 INFORMATION MODELING II (4 CREDITS)**

This course builds on students' knowledge of information modeling. Object Role Modeling (ORM) and relational mapping are covered at an intermediate level. Class modeling in UML is included, as well as mapping from ORM to UML.

*Prerequisites: MOA140 Information Modeling I*

**PHYSICAL AND BIOLOGICAL SCIENCE****PSC220 INTRODUCTION TO PHYSICS (3 CREDITS)**

This course provides an introduction to basic physics concepts. Students will examine such principles as kinematics in one and two dimensions, forces, dynamics of uniform circular motion, waves and sound, and the principle of linear superposition.

## PROJECTS

### **PRO160 WINDOWS PLATFORM LAB (2 CREDITS)**

Students work in teams on software development projects. The projects provide experience with various phases of software development, give students opportunities to perform a variety of roles on software development teams, strengthen and integrate students' existing skills, and provide motivation for the acquisition of new skills. The project role and learning goals for each student are individualized in line with their knowledge base and growth focus. Projects may include interaction and/or collaboration with external clients and other stakeholders. *Prerequisite: CSC160 Developing for the Windows Platform*

### **PRO180 JAVA LAB (2 CREDITS)**

Students work in teams on software development projects. The projects provide experience with various phases of software development, give students opportunities to perform a variety of roles on software development teams, strengthen and integrate students' existing skills, and provide motivation for the acquisition of new skills. The project role and learning goals for each student are individualized in line with their knowledge base and growth focus. Projects may include interaction and/or collaboration with external clients and other stakeholders. *Prerequisites: CSC180 Introduction to Java Development*

### **PRO260 DYNAMIC WEB LAB (2 CREDITS)**

Students work in teams on software development projects. The projects provide experience with various phases of software development, give students opportunities to perform a variety of roles on software development teams, strengthen and integrate students' existing skills, and provide motivation for the acquisition of new skills. The project role and learning goals for each student are individualized in line with their knowledge base and growth focus. Projects may include interaction and/or collaboration with external clients and other stakeholders. *Prerequisites: CSC260 Introduction to Dynamic Web Programming*

### **PRO280 SCALABLE WEB APPLICATIONS LAB (2 CREDITS)**

Students work in teams on software development projects. The projects provide experience with various phases of software development, give students opportunities to perform a variety of roles on software development teams, strengthen and integrate students' existing skills, and provide motivation for the acquisition of new skills. The project role and learning goals for each student are individualized in line with their knowledge base and growth focus. Projects may include interaction and/or collaboration with external clients and other stakeholders. *Prerequisites: CSC280 Developing Scalable Web Applications with Java EE*

### **PRO390 CAPSTONE PROJECT (4.5 CREDITS)**

Students work either in teams or individually on a project which demonstrates the overall attainment of the learning objectives of a student's academic program. The project must be approved by the instructor. Students may choose to complete a project in an interest area or career direction of their own choosing or a project can be assigned to them by the instructor. The projects provide experience unique to the end of the program and give students opportunities to perform and develop each of their skill sets in a chosen discipline. These projects strengthen and integrate students' existing skills and provide motivation for the acquisition of new skills. The project role and learning goals for each student are individualized in line with his/

her knowledge base and growth focus. Projects may include interaction and/or collaboration with external clients and other stakeholders. *Prerequisites: PRO160 Windows Platform Lab, PRO180 Java Lab, PRO260 Dynamic Web Lab, and PRO280 Scalable Web Applications Lab*

### **PRO490 ENTERPRISE PROJECTS I (6.5 CREDITS)**

Students spend 20 hours per week working as part of a team to provide solutions to real clients. Enterprise projects are designed to give students experience working on projects similar to ones they may encounter upon graduation. Placement on some projects may be competitive and may require mastery of a set of competencies. *Prerequisites: Instructor Permission*

### **PRO491 ENTERPRISE PROJECTS II (6.5 CREDITS)**

Students spend 20 hours per week working as part of a team to provide solutions to real clients. Enterprise projects are designed to give students experience working on projects similar to ones they may encounter upon graduation. Placement on some projects may be competitive and may require mastery of a set of competencies. *Prerequisites: PRO490 Enterprise Projects I*

### **PRO492 ENTERPRISE PROJECTS III (6.5 CREDITS)**

Students spend 20 hours per week working as part of a team to provide solutions to real clients. Enterprise projects are designed to give students experience working on projects similar to ones they may encounter upon graduation. Placement on some projects may be competitive and may require mastery of a set of competencies. *Prerequisites: PRO490 Enterprise Projects II*

## SOCIAL SCIENCE

### **SSC250 HUMAN RELATIONS AND PERSONALITY DEVELOPMENT (3 CREDITS)**

Students examine themselves across four dimensions of the self: their personality, the physical self, the mental self and the emotional self. Students evaluate their future expectations to strengthen their attitudes toward achievement and success and seek ways to improve how they take responsibility for what is expected of them. Students learn practical skills based on four internal components: self-awareness, motivation, self-regulation and adeptness in relationships. Students learn how respecting others creates a positive work environment. Students develop a strategy for positively dealing with change and associated stresses.

### **SSC271 AMERICAN GOVERNMENT (3 CREDITS)**

This course will introduce students to the American governmental system. Students should develop a working understanding of government institutions, political processes, and political behavior. This course will delve into the workings of the three branches of the national government and the role it plays in American society. This class will also discuss civil liberties and civil rights.