Computer Programming and Information Systems

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School of Business

Bachelor of Science Degree

Demand continues to be strong for students skilled in Information Technology. Of the top 10 degrees in demand for bachelor's degree levels, four are computer related. They include the following degrees:

- Computer Science
- Information Science and Systems
- Computer Engineering
- Management Information Systems/Business Data Processing

As reported in the United States Department of Labor Occupational Outlook Handbook, employment of programmers, web developers, systems analysts and network architects is projected to grow in the range of 22 – 30 percent from 2010 to 2020, faster than the average projected growth for overall occupations.

The Computer Programming and Information Systems baccalaureate degree program requires a set of core courses that all graduates must take. The Core courses provide the diverse but fundamental foundation in technology necessary to create a technology savvy individual. In addition, the student selects one of five tracks with concentrations in Programming, Systems Development, Networking, Web Development or Database. Each track offers the student a skill set in one discipline of Information Technology and enables him/her to study a particular area in depth.

This program touches on all aspects of computer programming and information systems. It provides a practical hands-on approach to programming with an emphasis on solving business problems.

Typical Employment Opportunities

- Computer Support Specialists
- Information Technology Specialists
- Data Communications Analysts
- Quality Assurance Technicians
- Systems Analysts
- Programmer/Analysts
- Data Base Analysts
- Web Developers
- Network Administrators
Programmers convert project specifications, addressing problem statements and procedures, into detailed coding in a computer language. They will also develop and write computer programs to store and retrieve documents, data and information.

The Systems Analyst analyzes business, scientific and technical problems for application to computer-based systems.

For those interested in networking, our program offers courses in conjunction with the Cisco Networking Academy. Students taking and passing these courses receive training certifications for each course directly from Cisco. These courses prepare each student for taking the Cisco Certified Network Associate (CCNA) exam.

Web Development professionals are in demand due to the growth of the Internet and the expansion of the World Wide Web (the graphical portion of the Internet). This rapid growth has generated a variety of occupations related to the design, development, and maintenance of Web sites and their servers.

Database professionals will be prepared to design and administer the advanced databases that industry relies on.

**Computer Programming & Information Systems (BS) Program Outcomes:**

- Graduates will be trained as technical problem solvers and will receive the knowledge and skills necessary to function and grow in this high-demand workforce.
- Graduates will have had experiential learning opportunities such as internships and/or capstone projects.
- Graduates will have an understanding of social and ethical issues as it relates to information technology.
- Graduates will be effective communicators and work successfully in teams.

Fall 2018: Subject to Revision

<table>
<thead>
<tr>
<th>Liberal Arts and Sciences</th>
<th>(61-63 credits)</th>
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<tbody>
<tr>
<td>EGL 101 Composition I: College Writing (GE)</td>
<td>3</td>
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<tr>
<td>EGL 102 Composition II: Writing About Literature</td>
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<tr>
<td>EGL 310 Technical Writing or PCM 324 Report Writing and Technical Communications</td>
<td>3</td>
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<tr>
<td>Communications (SPE130, SPE202, SPE330 or SPE331) (GE)</td>
<td>3</td>
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<td>The Arts (GE)</td>
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<td>Foreign Language (GE)</td>
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<td>Humanities (GE)</td>
<td>3</td>
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<tr>
<td>ECO 156 or ECO 157 (GE)</td>
<td>3</td>
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<tr>
<td>PSY 101 or SOC 122</td>
<td>3</td>
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<tr>
<td>American/Other World/Western Civilization History (GE)</td>
<td>3</td>
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<tr>
<td>Natural Science (GE)</td>
<td>6/8</td>
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<tr>
<td>MTH 130 Calculus I w Applications (GE)</td>
<td>4</td>
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</tbody>
</table>
**MTH 390 Prob Methods in Operations Research** 3

**300 level Arts & Science Electives** 3

**Arts and Science Electives** 15

*Note:
9 credits from this group must be 300-level or higher

Please refer to the General Education and Writing-Intensive Requirement Sections of the College catalog and consult with your advisor to ensure that graduation requirements are satisfied.

<table>
<thead>
<tr>
<th>Required: Business &amp; Computer Systems (48 credits)</th>
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<tr>
<td>BCS 120 Foundations of Computer Programming I</td>
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<tr>
<td>BCS 160 Computers, Society, and Technology</td>
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<td>BCS 230 Foundations of Computer Programming II</td>
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<td>BCS 215 UNIX Operating System</td>
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<td>BCS 260 Introduction to Database Systems</td>
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<td>BCS 262 Data Communications</td>
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<td>BCS 300 Management Information Systems</td>
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<td>BCS 301 Systems Analysis and Design</td>
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<td>BCS 345 Java Programming</td>
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<td>BCS 430W Senior Project</td>
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<tr>
<td>*BCS Elective</td>
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<tr>
<td>*BCS/BUS Elective</td>
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<tr>
<td>BCS 3XX 300-level elective or above</td>
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<td>BCS/BUS 3XX 300-level elective or above</td>
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<tr>
<td>BUS 101 Accounting I</td>
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<tr>
<td>BUS 109 Management Theories and Practices</td>
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*Note:
BCS102 cannot be used to meet these electives

**Programming Track (12 Credits)**
Students must complete BCS120 and BCS230 for this track

| BCS 370 Data Structures                             | 3 |
| BCS 316 Perl Programming                            | 3 |
| BCS 360 Programming in SQL                          | 3 |
BCS 410 Computer Architecture or BCS 415 – Operating Systems Internals and Design 3

**Systems Track (12 Credits)**
Students must complete BCS 301 as a prerequisite(s) for this track

- BCS 302 Systems Analysis and Design II 3
- BCS 378 Information Security 3
- BUS 3XX 300-level elective or above 3
- BCS 405 IS Development Project Management 3

**Networking Track (12 Credits)**

- BCS 208 Introduction to Networks 3
- BCS 209 Routing and Switching Essentials 3

Choose two of the following four courses:

- BCS 311 Local Area Networking 3
- BCS 320 Scaling Networks 3
- BCS 321 Connecting Networks 3
- BCS 378 Information Security 3

**Web Track (12 Credits)**

Students must complete BCS 130 as a prerequisite(s) for this track

- BCS 240 Website Development II 3
- BCS 235 JavaScript and jQuery 3
- BCS 303 XML 3
- BCS 350 Web Database Development 3

**Database Track (12 Credits)**

- BCS 360 Programming in SQL 3
BCS 380 Advanced Database Programming 3
BCS 390 Database Administration and Security 3
BCS 425 Business Intelligence & Data Warehousing 3
Total Credits: 121-123

Degree Type: BS
Total Required Credits: 121-123

1: No student will be permitted to remain in the Computer Programming and Information Systems Program if he/she has received three “F’s” in any BCS course or courses. Candidates for graduation will be required to have a minimum average GPA of 2.0 in BCS courses.

2: For all BCS courses that require a BCS prerequisite, the BCS prerequisite must be completed with a grade of C or better.

3: Students must complete at least 18 credits with BCS designation at Farmingdale.

4: Students with life experience may challenge up to 3 courses (9 credits via credit-by-evaluation).

Course Descriptions

EGL 101 Composition I: College Writing (GE)
This is the first part of a required sequence in college essay writing. Students learn to view writing as a process that involves generating ideas, formulating and developing a thesis, structuring paragraphs and essays, as well as revising and editing drafts. The focus is on the development of critical and analytical thinking. Students also learn the correct and ethical use of print and electronic sources. At least one research paper is required. A grade of C or higher is a graduation requirement. Note: Students passing a departmental diagnostic exam given on the first day of class will remain in EGL 101; all others will be placed in EGL 097. Prerequisite is any of the following: successful completion of EGL 097; an SAT essay score (taken prior to March 1, 2016) of 7 or higher; an SAT essay score (taken after March 1, 2016) of 5 or higher; on-campus placement testing. Credits: 3

EGL 102 Composition II: Writing About Literature
This is the second part of the required introductory English composition sequence. This course builds on writing skills developed in EGL 101, specifically the ability to write analytical and persuasive essays and to use research materials correctly and effectively. Students read selections from different literary genres (poetry, drama, and narrative fiction). Selections from the literature provide the basis for analytical and critical essays that explore the ways writers use works of the imagination to explore human experience. Grade of C or higher is a graduation requirement. Prerequisite(s): EGL 101 Credits: 3

EGL 310 Technical Writing or PCM 324 Report Writing and Technical Communications
A detailed study of the fundamentals of writing technical reports and other technical communications. Topics emphasized include the elements of a technical report, the interpretation of statistics and data, and the composition of letters, memos, and informal reports containing technical information. Assignments and student exercises are drawn from the student’s technical area. Prerequisite(s): EGL 102 with a grade of C or higher Credits: 3

ECO 156 or ECO 157 (GE)
This course is designed to introduce classic macroeconomic issues such as unemployment, inflation, national income and economic growth. The course will provide a unified framework to address these issues and to study the impact of different
policies, such as monetary and fiscal policies, on the aggregate behavior of the economy. Analytical tools will be used to understand the experiences of the United States and other countries, and to address how current policy initiatives affect their macroeconomic performance. Credits: 3

**PSY 101 or SOC 122**
This course is designed to present basic psychological concepts and to introduce students to the scientific study of behavior. Core topics include methods of psychological research, the biological bases of behavior, principles of learning, memory and cognition, personality, and psychopathology. Other selected topics to be covered would include the following: motivation and emotion, life-span development, social psychology, health psychology, sensation and perception, intelligence, human sexuality, statistics, and altered states of consciousness. Credits: 3

**MTH 130 Calculus I w Applications (GE)**
This is a calculus course for those not majoring in Mathematics, Engineering Science or Computer Science. Topics include the derivative, differentiation of algebraic, trigonometric, exponential and logarithmic functions, applications of the derivative and the definite integral. Applications are taken from technology, science, and business. Problem solving is stressed. A graphing calculator is required. Note: Students completing this course will not receive credit for MTH 150. Prerequisite(s): MP4 or MTH 117 or 129 Credits: 4

**MTH 390 Prob Methods in Operations Research**
This course is intended to focus on understanding, formulating and solving deterministic models in operations research. Maximum and Minimum Linear Programming problems will be studied graphically and theoretically. The Simplex Method, Sensitivity Analysis and Duality will be covered and an in-depth analysis of the reasoning on which these topics are based will be given. Instruction in computer software techniques will be presented to solve Linear Programming problems, using the simplex method and sensitivity analysis. Transportation Problems, Integer Programming, or Markov Chains will be covered. In order to enhance quantitative reasoning, the course emphasizes the formulation of mathematical models commonly used by operation research analysts, as well as the theoretical and computer software solutions to these models. Prerequisite(s): MTH 130 or MTH 150 Credits: 3

**BCS 120 Foundations of Computer Programming I**
This course introduces the C++ Programming Language as a means of developing structured programs. Students will be taught to develop algorithms using top-down stepwise refinement. Students will be introduced to the concept of Object Oriented programming. In addition, students will get a thorough exposure to C++ syntax and debugging techniques. Credits: 3

**BCS 160 Computers, Society, and Technology**
This is an introductory course that provides students with the knowledge to stay current and informed in a technology-oriented, global society. Students will receive instruction in basic computer concepts and terminology, the fundamentals of the Windows operating system and have hands-on experience at the beginning to intermediate level using Microsoft Excel and Access. The Internet will be used to supplement textbook and lecture materials. Note: Students taking this course may not receive credit for BCS 102 or 202. Credits: 3

**BCS 230 Foundations of Computer Programming II**
This course expands the knowledge and skills of Foundations of Computer Programming I. Among the topics covered are: arrays, pointers, strings, classes, data abstraction, inheritance, composition and overloading. Prerequisite(s): BCS 120 with a grade of C or higher Credits: 3

**BCS 215 UNIX Operating System**
This course develops the fundamental knowledge of computer operating systems using UNIX. Topics include basic understanding of the UNIX system, utilizing the file system, programming language and security system. BCS 120 may be taken as a Prerequisite or Corequisite. Prerequisite(s): BCS 120 Corequisite(s): BCS 120 Credits: 3

**BCS 260 Introduction to Database Systems**
This course provides the fundamental knowledge of database concepts. Topics studied will include the history and advantages of database systems, and the process of database design including entity-relationship diagrams and database normalization. Students will have hands-on experience using SQL (Structured Query Language). Prerequisite(s): BCS 120 and BCS 160 all with a grade of C or higher Credits: 3

**BCS 262 Data Communications**
This course is an introduction to the concepts and applications of computer networking and its role in the business world today. Topics include: history of networking and applications, voice and data communications, hardware, transmission, network topologies, network analysis, the OSI model, design, implementation and management issues. Credits: 3

**BCS 300 Management Information Systems**
Managers have increasing responsibility for determining their information system needs and for designing and implementing information systems that support these needs. Management information systems integrate, for purposes of information requirements, the accounting, finance, and operations management functions of an organization. This course will examine the various levels and types of software and information systems required by an organization to integrate these functions. Prerequisite(s): BUS 109 or BUS 111 Credits: 3

**BCS 301 Systems Analysis and Design**
This course explores the major issues in the analysis and design of a system, including methods of data collection, information requirements analysis, and the analysis process are discussed. Emphasis is placed on the importance of the user in the design process and focuses on approaches that improve the successful implementation of a computer system. Topics include general systems theory, Systems Development Life Cycle, data flow diagrams, data dictionary, hardware and software evaluation, feasibility analysis, CASE tools and prototyping. Students are required to demonstrate their skill in using project management and diagramming application software. Note: Credit cannot be given for both BCS 265 and BCS 301. Prerequisite(s): BCS 120 with a grade of C or higher and Junior Level Status. Credits: 3

**BCS 345 Java Programming**
This course is designed for students with some experience with programming. The syntax of the Java programming language, object-oriented programming, creating graphical user interfaces (GUI), exceptions, file input/output (I/O), and how to create Java applications and applets will be covered. Prerequisite(s): BCS 230 with grade of a C or higher. Credits: 3

**BCS 430W Senior Project**
The primary objective of this course is to give Computer Programming and Information Systems students an opportunity to integrate techniques and concepts acquired in their other courses. Elements will be drawn primarily from BCS301 (Systems Analysis and Design) and BCS260 (Database), in addition to other courses in the student's selected track of study. The course is experiential in nature i.e. the student will be required to produce results for use by real individuals and will be evaluated both on process and product. In addition to prerequisites, a second level programming course with a grade of C or better, and Senior level standing is required. This is a writing-intensive course. Note: Students cannot get credit for BSC 430 and 430W; BCS 430W can be used to fulfill the writing intensive requirement. Note: Offered at the discretion of the Computer Programming and Info Systems Department. Prerequisite(s): EGL 101, BCS 260, BCS 230 and BCS 301 all with a grade of C or higher Credits: 3

**BUS 101 Accounting I**
Fundamental accounting concepts and principles are covered through an understanding of the following topics: accounting as an information system; analyzing a transaction; the accounting cycle; accounting for both service enterprises and merchandising businesses; deferrals and accruals; reversing entries; systems design; accounting for cash, receivables, temporary investments and inventory; payroll accounting. Students apply concepts to the preparation of special journals, subsidiary ledgers, worksheets and financial statements. Credits: 3

**BUS 109 Management Theories and Practices**
This introductory course covers management principles pertaining to human resources, individual behavior in organizations, employee motivation and performance, and business ethics. Topics also include managing and the manager's job; planning and decision making; employee performance appraisal and feedback; leadership and influence processes; interpersonal relations and communication; and managing work groups and teams. Credits: 3

**BCS 370 Data Structures**
This course will present sequential and linked representations of various built-in and abstract data structures including arrays, records, stacks, queues and trees. Algorithms will be developed relating to various sorting and searching techniques, merging and recursion. A high-level structured programming language, such as C, using both static and dynamic storage concepts, will be used in exploring and developing these algorithms. Prerequisite(s): BCS 230 with a grade of C or higher. Credits: 3

**BCS 316 Perl Programming**
This course provides an introduction to programming in the Perl language. Students will learn the Pearl syntax, the basics of using regular expressions, how to use Pearl data types, and how to access and manipulate files. Students are also introduced to database connectivity and debugging techniques. Prerequisite(s): BCS 215 and BCS 230 all with a grade of C or higher. Credits: 3

**BCS 360 Programming in SQL**
The second in a two course sequence applies the knowledge of BCS260 to administer and implement relational database systems. Topics covered may include: embedded SQL and other mixed language mechanisms; PL/SQL; advanced/optimized SQL queries; transaction management including concurrency and recovery; schema refinement; higher-level normal forms; integrity; security; and database administration. Prerequisite(s): BCS 230, BCS 260 with a grade of C or higher. Credits: 3

**BCS 410 Computer Architecture or BCS 415 – Operating Systems Internals and Design**
Computer Architecture is the study of hardware and software components of business information systems. Thorough understanding of the workings of the digital computer system is expected. Topics include: hardware components, the machine cycle, binary arithmetic, systems software, and assembly language. These topics are evaluated with respect to their impact on the development of business information systems. Two semesters of a programming language required. Prerequisite(s): Two semesters of a programming language required with a grade of C or higher and BCS 262 with a grade of C or higher. Credits: 3

**BCS 302 Systems Analysis and Design II**
This is an advanced course in Systems Analysis and Design. Students will utilize the tools covered in BCS 301 to analyze system designs. Topics covered in the design phase will include input, output, and database and user interface design. A CASE Tool and/or other rapid application development tools will be used to create the interfaces. Additional topics in the implementation and maintenance phases will include testing, implementation and maintenance. Object-oriented systems and UML will also be covered. Students will analyze and prepare various case projects and will present and document their results. Prerequisite(s): BCS 301 with a grade of C or higher. Credits: 3

**BCS 378 Information Security**
This course introduces students to the principles and practices of computer and network security. Topics covered include fundamental concepts and principles of computer security, basic cryptography, public key infrastructure, authentication and access control, threats and vulnerabilities, intrusion detection/prevention systems and network security, operating system security, software and data security, web security, and managerial and ethical issues in computer security. Prerequisite(s): BCS 262 and BCS 230 all with a grade of C or higher Credits: 3

**BCS 405 IS Development Project Management**
This course will cover Project Management tools and techniques for Systems Development projects. Students will learn Project Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resource Management and Communications Management all in the context of running successful information systems development and implementation projects. MS project will be used as a tool to managing all of these areas. Prerequisite(s): BCS 300 with a grade of C or higher. Credits: 3

**BCS 208 Introduction to Networks**
This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IPv4 and IPv6 addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LAN’s, perform basic configurations for routers and switches, and implement IP addressing schemes. The laboratory component of this course will give the students hands-on experience configuring equipment needed to build a LAN. Prerequisite(s): Sophomore standing Credits: 3

**BCS 209 Routing and Switching Essentials**
This course describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks. The laboratory component of this course will give the students hands-on experience configuring routers, switches and basic WAN connectivity. Prerequisite(s): BCS 208 with a grade of C or higher Credits: 3

**BCS 240 Website Development II**
In this course, students will learn how to create websites that deliver a seamless experience across a diverse range of desktop, mobile, and handheld devices. In addition, students will learn how to perform forms validation, create navigation and menuing systems, build responsive layouts with flexible content, code media queries, and create and modify template and child pages. Students will use CSS 3 and a Content Management System to create user interfaces with toolbars, animations, buttons, forms, lists, events, and themes. Prerequisite(s): BCS 130 with a grade of C or higher Credits: 3

**BCS 235 JavaScript and jQuery**
This course introduces students to JavaScript and jQuery. Students will learn how to write their own scripts in JavaScript, learn jQuery syntax, and use the jQuery and jQuery UI libraries. Students will learn how to devise jQuery and jQuery UI scripting techniques such as effects, animation, tabbed panels, menus, accordions, content sliders, drag and drop, tooltips, date pickers, custom tooltips, dialogs and portlets, and interactive image sliders and carousels. Students who have taken BCS 250 cannot receive credit for this course. Prerequisite(s): BCS 130 with a grade of C or higher Credits: 3

**BCS 303 XML**
Students will be introduced to the basic intermediate concepts of XML, the Extensible Markup Language. Students will learn how to create the XML document, work with name- spaces, Document Type Definitions, and XML schemas. In addition, students will also use the advanced features of XML, such as XPath and the XSLT stylesheet language to transform XML documents. Prerequisite(s): BCS 130 and BCS 120 all with a grade of C or higher Credits: 3
BCS 350 Web Database Development
This advanced course prepares the student to use database management systems with web server software to develop and maintain the information content of a web site. Students in the course should have prior knowledge of programming and database management systems. Prerequisite(s): BCS 260 with a grade of C or higher. Credits: 3

BCS 360 Programming in SQL
The second in a two course sequence applies the knowledge of BCS260 to administer and implement relational database systems. Topics covered may include: embedded SQL and other mixed language mechanisms; PL/SQL; advanced/optimized SQL queries; transaction management including concurrency and recovery; schema refinement; higher-level normal forms; integrity; security; and database administration. Prerequisite(s): BCS 230, BCS 260 with a grade of C or higher. Credits: 3

BCS 380 Advanced Database Programming
This course will provide a detailed examination of a relational database management system and its procedural language such as Oracle and PL/SQL or SQL Server and T-SQL. General programming concepts such as conditional and iterative control, error handling and built-in exceptions will be discussed. Covered in more detail will be topics such as cursors, triggers, and the stored functions, procedures and packages. These topics will then be explored through laboratory assignments using a RDBMS such as Oracle or SQL server. Prerequisite(s): BCS 360 with a grade of C or higher Credits: 3

BCS 390 Database Administration and Security
This course provides the knowledge necessary to handle database administration and database security. Topics studied may include installation and configuration of a database, managing and securing user resources and privileges, data integrity, networking, optimization, and backup and recovery. Hands-on activities with a major commercial DBMS will be assigned to complement the lectures and written work and to develop practical skills. Prerequisite(s): BCS 260 and BCS 215 with a grade of C or higher. Credits: 3

BCS 425 Business Intelligence & Data Warehousing
Business Intelligence is the transformation of data into actionable information. This information is used by businesses to drive high-level decision making. This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used for decision making. Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses. Students will design and construct dynamic reports using the data warehouse and multi-dimensional online analytical processing (OLAP) cubes as the data source. Prerequisite(s): BCS 260 with a grade of C or higher. Credits: 3

Admission to Farmingdale State College - State University of New York is based on the qualifications of the applicant without regard to age, sex, marital or military status, race, color, creed, religion, national origin, disability or sexual orientation.