

Bachelor of Science in Computer Science Program Outline

The BSCS is a 120 Cr program, where teaching is provided through Synchronous and Asynchronous lectures, practical zoom classes and supervisions.

In Years 1 and 2, assessment is currently by three-hour examinations taken in the final term of each year. In Year 3, students are assessed by coursework and three-hour examinations. Practical work is undertaken and assessed in all years of the degree program.

Year 1

Year 1 covers four topics within various courses including three compulsory Computer Science courses covering topics such as foundations of computer science, Java and object-oriented programming, operating systems, and digital electronics, graphics, interaction design and Mathematics

Year 2 and Year 3

Year 2 and 3 cover four more core topics within various courses including

- theory – including logic and proof, computation theory
- systems – including computer design, computer networking
- programming – including compiler construction, advanced algorithms
- applications and professionalism – including artificial intelligence, graphics, security

Student will undertake a group project which reflects current industrial practice.

Year 4

The fourth year is designed for any missing courses not completed as well as completion of the concentration courses, the suggestion is for two in each term as students will undertake a substantial research project due by end of year demonstrating their computer science skills. Projects are often connected with current research, and many utilize cutting-edge technology.

Successful completion of the full curriculum will qualify for the BSCS degree attainment at the end of the program.

Program Outline

GENERAL ED	
COM 101	Communication 1
COM 102	Communication 2
COM 200	Communication 3
COM 300	Communication 4
ECO 100	Microeconomics
ENC 101	English Composition 1

ENC 102	English Composition 2
ENC 201	Research and Writing 1
ENC 202	Research and Writing 2
ENC 350	Writing Internship Reports
LDR 200	Leadership and Innovation
MAN 410	Organizational Behavior
MAT 100	College Mathematics
PSY 100	Psychology 1
STA 102	Statistics 1
CORE COURSES	
ADM 200	Advanced databases management
AI 300	Artificial Intelligence
ALG 100	Algorithms and programming
ALG 200	Advanced algorithms and data structures
BDA 300	Big data analytics
CC 300	Cloud Computing
CPC 200	Compiler and Complexity
CSA 100	Computer architecture
CSI 200	Cryptography and IS Security
CSN 100	Computer networks
FPJ 200	Frameworks programming: Java & Java JEE
IOT 300	Internet of Things
ISD 100	Information systems and databases
MAD 400	Mobile application development
OOP 200	Object Oriented Programming (C#)
OOP 300	Object Oriented Programming (UML)
OSP 100	Operating systems and systems programming
PSP 100	Python Programming (supervised project)
SDM 200	Software Development methodologies
SEN 200	Software engineering
WED 100	Web development
Concentration 1: Big Data Technologies	
BDD 400	Big Data and databases NoSQL

BI 400	Business Intelligence
DTM 400	Data Mining and Text Mining
ML 400	Machine learning
Concentration 2: Web and Mobile App Technology	
ADM 400	Advanced Mobile application development
AMS 400	Architecture micro-services
AWP 400	Advanced web programming
WAD 400	Web Architecture and Distributed Systems
Concentration 3: Cyber Security	
BC 400	Block chains
NS 400	Computer network security
ISA 400	Information systems auditing
DSV 400	Data center & Servers virtualization

Course Description

Numbering System

- **100–300** Undergraduate General Education and Core Courses
- **301–499** Undergraduate upper level and Concentration Courses
- **PA:** Courses with Proctored Assessment.

ADM 200 **Advanced databases management**

This course covers advanced aspects of Database Management Systems including their architectures and their evolution. The sessions are organized into two elements. The first element is mainly devoted to PL/SQL, the object model, the object-relational model and the evaluation and optimization of queries. The second element is dedicated to advanced administration of Oracle DBMS, internal architecture, storage techniques and query evaluation techniques. Other important aspects such as maintenance, logging, recovery, security and data privacy are also taught in this course.

ADM 400 **Advanced Mobile application development**

Prerequisite: ADM200

This course will teach students how to set up a hybrid development environment, to develop a mobile application based on Ionic and Angular, master the productivity tools offered by Node, integrate a Mobile Backend and will conclude by students preparing the build and deployment of an application.

AI 300 Artificial Intelligence

This course consists of two elements: Functional Programming (with LISP) and Logic Programming (with PROLOG). It provides students with the basic elements of functional programming (everything is a function, everything is a list, everything is an expression, etc.) and logic programming (predicate logic, fact base and rule base, unification, resolution, backtracking, etc.). The second element offers students the elements of Artificial Intelligence: intelligent system and intelligent agent, ontology, knowledge base and knowledge representation, problem solving, reasoning, expert system, case-based system, natural language processing and multi-agent system.

ALG 100 Algorithms and programming

This course introduces computational thinking and programming. It covers two elements' Algorithms and C programming. In the first element of this course, students will explore the fundamentals of algorithms, and look into their description and analysis using pseudocode, going through variables, control structures and arrays.

The second element of this course will introduce students to the world of C programming, how to make simple computations, how to store values in variables and use logical statements and arrays in C and implement some fundamental algorithms to search and sort data.

ALG 200 Advanced algorithms and data structures

Prerequisite: ALG100

An overview of data structure concepts, arrays, stack, queues, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run-time representations. The course will also examine algorithms for sorting, searching, graph algorithms & some greedy algorithms.

AMS 400 Architecture micro-services

Prerequisite: ADM400

In this course, architecture based on microservices will be studied, its use, its attributes and design. By developing and consuming REST services, setting up microservices using a Java framework and deploying microservices in Docker containers. Students will need to administer and monitor microservices at the end of this class.

AWP 400 Advanced web programming

Prerequisite: WED100 and ADM400

This course further applies student learning about web programming by developing a multi-page web application (SIA/SPA), developing the Front-End of an application with generic Frameworks: Angular/React, implement server-side JavaScript processing and add a data persistence layer via a NoSQL approach.

BC 400 Block chains

Prerequisite: DSV400

This course will allow students to know the concepts of blockchain technology, to differentiate between private, public, with/without crypto currency blockchains. Course will cover different consensus algorithms, write smart contracts in GO language, and integrate blockchain technology into the architecture of own IS.

BDA 300 Big data analytics

This course offers advanced lessons on the techniques of business analytics on big data as well as the techniques of visualization, analysis and interpretation of data. This course aims to introduce students to different concepts: web data analysis and data visualization through dashboards and KPIs. This course allows students to learn how data analysts describe, predict, and inform business decisions in the specific areas of marketing, human resources, and finance.

BDD 400 Big Data and databases NoSQL

Prerequisite: BDA300

This course is designed to understand why the era of Big Data was born. It will help the student become familiar with the terminology and fundamental concepts behind Big Data problems, applications, and systems. It allows one to begin thinking about how Big Data could benefit one's business or career.

The course discusses Big databases and NoSql architectures by looking at different examples and introducing one of the most common frameworks that allowed for more accessible Big Data processing.

BI 400 Business Intelligence

The Business Intelligence and Analytics Course provides a fundamental understanding of data management and data analytics. Gain skills in applying correct statistical techniques for decision making and more importantly learning how to develop state-of-the-art predictive models and how to make decisions that optimize business objectives.

CC 300 Cloud Computing

This course covers the basics of cloud computing: what it is, what it supports, and how it is delivered. Students will look at storage services, cloud economics, managed infrastructure tiers, compare some of the cloud computing platforms and architectures, discuss the future of cloud computing, cloud computing deployment models and hosting scenarios.

COM 101 Communication 1

COM 102 Communication 2 Prerequisite : COM 101

Communication 1 and 2 represent a General Education foundation. In these classes, you will learn important concepts and skill sets that translate across disciplines. Both COM 101 and COM 102 provide information that is relevant to students of all majors and disciplines. Their goal is to

introduce students to the foundations of communication, a skill we all use regardless of our career.

COM 200 Communication 3

Students will learn to write a variety of documents characteristic of the business world including letters, memos, short reports, and formal reports. The course will focus on techniques for writing clearly, concisely, and persuasively. The course will also help students develop skills in presentations, Interviews, Speeches.

COM 300 Communication 4

Introduces students to the basic corporate communication, what it encodes and promotes, the external communications, media relations, external events, company profiling, and introduction to internal communication.

CPC 200 Compiler and Complexity

This course will cover a compiler for a programming language, teach students how to use compiler construction tools, such as generators of scanners and parsers and become familiar with compiler analysis and optimization techniques. This course will have students work on a software project.

CSA 100 Computer architecture

The computer architecture course introduces students to the design of computer systems and its components, work through different CPU design, ISA, and address as well as understand different memory management and I/O strategies and techniques.

CSI 200 Cryptography and IS Security

Prerequisite: CSA100 and CSN100

This course focuses on the fundamentals of information security that are used in protecting both the information present in computer storage as well as information traveling over computer networks. Interest in information security has been spurred by the pervasive use of computer-based applications such as information systems, databases, and the Internet.

CSN 100 Computer networks

Prerequisite: CSA100

The course aims at introducing four major concepts pertaining to computer networks: data communications, networking, protocols and standards, and networking models. The course will go through how computers networks work by understanding the data communication components and how different types of data can be represented, and how to create a data flow.

DSV 400 Data center & Servers virtualization

In this course, Server Virtualization is the main topic, its architecture, its actions - both in the datacenter and on desktop. Students will learn how companies are using tools to move applications running in physical hosts to virtual machines and will explore how to test and deploy server virtualization. This course will have a concentration project where students will build a server virtualization of their own.

DTM 400 Data Mining and Text Mining

Prerequisite: MLA00

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. Student will learn the various techniques for analyzing text to extract useful insights and patterns to support decision making. They will also learn about text classification, detection of topics in documents, and methods to group them into similar topics.

ECO 100 Microeconomics

Examines economic decision-making process, theory of consumer behavior, economics of the firm, and market structure. Discusses major issues of welfare economics, comparative systems, and other microeconomics topics.

ENC 101 English Composition 1

ENC102-PA English Composition 2

Prerequisite: ENC101

Introduces practice and applies structure through the development of a wide range of topics dealing with literature, economics, health care, and life-style. Reading, exercises, writing are integral aspects of these courses.

ENC 201 Research and Writing 1

ENC 202 Research and Writing 2

Prerequisite: ENC201

These writing courses introduce students to discourse, research, and research writing for the purpose of proposing solutions to problems and have the opportunity to enter into important discussions and ultimately create a digital portfolio that enables them to publish and share their research and writing.

ENC 350 Writing Internship Reports

This special writing course introduce students to writing specific reports, including Internship and job-related reports.

FPJ 200 Frameworks programming: Java & Java JEE

This course focuses on the fundamentals of Java programming. Java is one of the most in-demand object-oriented programming languages and the foundation of the Android operating system. In this course, students will get to know the history of Java and learn the basics of java programming, they will learn to create conditional statements, functions, loops and arrays to process information and solve problem. This course is also intended to help students gain an in-depth understanding of the concepts of Multithreading, Java collections, Graphical interfaces and Networking.

IOT 300 Internet of Things

The Internet of Things is transforming our physical world into a complex and dynamic system of connected devices on an unprecedented scale. Clearly, IoT-enhanced systems have many advantages such as ubiquitous network connectivity, real-time response, better situational awareness, and process optimization. This course will provide an overview of the exciting and relevant technical areas essential for computer science students to scale up the concepts around the IoT and allow integration with the different skills acquired in their engineering curriculum.

ISA 400 Information systems auditing

This course will cover the general framework for IT risks and control. By Identifying the unique elements of computer environment and discussing how they affect the audit process, students will be able to describe the controls and audit issues related to computer operations, understand the audit objectives and procedures used to test data management controls as well as confer the stages in the Systems Development Life Cycle and describe the change management controls.

ISD 100 Information systems and databases

«Information Systems and Databases» course offers students an introduction to Database systems with a focus on the relational analysis and design. It also covers the MERISE Method and its various components and models.

In this course, students also learn basic SQL «Structured Query Language», which is shown as an industrial variant for practical database querying and transformation.

LDR 200 Leadership and Innovation

This course explores innovation theory and practice in relation to theories and processes of change. It includes the opportunity to explore leadership techniques relevant to change management, entrepreneurship and innovation.

MAD 400 Mobile application development

The course will cover the notions of mobile programming under Android and the constraints of using mobile resources, to present the specificities of mobile systems and the resulting software needs.

MAN 410 Organizational Behavior in Business

Prerequisite: LDR200

Presents the fundamental concepts of organizational behavior. Emphasizes the human problems and behaviors in organizations and methods of dealing with these problems. Focuses on motivation, informal groups, power and politics, communication, ethics, conflict resolution, employment laws, technology and people, and managing change.

MAN 450 Project Management

Presents the fundamentals of the project management process and examines application of the process. Reviews the stages and activities in the project life cycle, the organization for project management, and various project control and evaluations processes. Introduces considerations for negotiation and human resource management concerns in project management

MAT 100 College Mathematics

Emphasizes representations and operations of high degree polynomials and rational expressions, functions, and the graphing of linear functions. Methods of solving linear and quadratic equations are discussed. Graphs, rational, logarithmic, and exponential functions.

ML 400 Machine learning

This course covers advanced concepts of machine learning, where students will understand and apply ensemble learning (e.g., bagging, boosting, and stacking) as well as deep learning techniques.

NS 400 Computer network security

Security is vital in computing this course will teach about the core principles and concepts of a security network, ranging from appropriate password creation to complex network security principles. An advanced practical skill set in assuring network security against all threats including - advanced hackers, trackers, exploit kits, Wi-Fi attacks and more. Students will need to discover security vulnerabilities across an entire network and must be able to configure firewalls on all platforms including Windows, MacOS, and Linux for all types of attack scenarios.

OOP200 Object Oriented Programming (C#)

This course will introduce several programming paradigms including Object Oriented Programming, Generic Programming, Design Patterns. To show how to use these programming schemes with the C# programming language to build programs.

OOP 300 Object Oriented Programming (UML)

Prerequisite: OOP200

This course covers all the fundamentals of object-oriented design, analysis and programming with UML (Unified Modeling Language). You will learn how to analyze and design classes, and their relationships. You will also learn to use common UML diagrams such as use-case, class, activity & other diagrams. The diagrams will be created through a free tool.

OSP 100 Operating systems and systems programming

This course presents the basic elements that make up an operating system (processes, input/output, memory, files, etc.). The problems of management of these elements by the operating system are explained: how do the processes share access to the processor? How do they synchronize and what mechanisms allow them to exchange data? How are memory and I/O managed?

PSP 100 Python Programming (supervised project)

This course is an intermediate-level course in Python. Students are expected to be comfortable with Algorithmic. Topics covered will include lectures on the Python language and development environment as well as coverage of some select Python modules that demonstrate the versatility of the Python language.

PSY 100 Psychology 1

Introduces psychology as a human and scientific endeavor. Includes examination of concepts and methods in learning, motivation, development, personality, and social behavior.

SDM 200 Software Development methodologies

This course covers the fundamentals of software engineering, including understanding system requirements, finding appropriate engineering compromises, effective methods of design, coding, and testing, team software development, and the application of engineering tools.

SEN 200 Software engineering

This course will cover the use of engineering approach to computer software development process. It will present software engineering concepts and principles within the software

development life cycle (SDLC). The course will also cover the 5 major steps for SDLC: Requirements gathering, requirements analysis, design, implementation and Testing.

Students work in teams on projects for real clients. This class will include a feasibility study, requirements analysis, object-oriented design, implementation, testing, and delivery to a potential client.

STA 102 Statistics 1

Concentrates on the art of describing and summarizing data. Includes the topics of experimental design, measures of central tendency, correlation and regression, and probability and chance variability. Demonstrates statistical applications to a wide variety of subjects, such as the social sciences, economics, and business.

WAD 400 Web Architecture and Distributed Systems

Prerequisite: AWP400

This course will cover the concepts of web technologies, familiarize students further with developed infrastructures and services of the Internet, as well as discover new client-side and server-side technologies. Students will learn about new architectures and their security.

WED 100 Web development

This course will cover the essentials of web development application and its architecture. It will provide a practical understanding of web page designing techniques, embedded dynamic scripting on both client and server-side web page development.

The course will also cover several technologies such as Hypertext Markup Language (HTML), Cascading Style Sheets (CSS) and JavaScript.