
Bachelor in Computer Science for Business (CSB)

UG Course Description Guides

BOSTON

Sample Program Structure*

YEAR 1	Lo-code App Development Challenge	Insight Engine: Launch a Consumer Trend Dashboard Challenge
	Intro to Programming & AI Thinking Data Analytics Business Basics & Entrepreneurship	Algorithms & Data Structures Data Management & Visualization Marketing & Branding
	Skill/Career Course Skill/Career Course	Skill/Career Course Skill/Career Course
	Enrichment Elective	Enrichment Elective
	Coaching	
YEAR 2	Autonomous AI: Design & Deploy a GenAI Agent Challenge	Robotics & Quantum for the Real World Challenge
	Applied Machine Learning Generative AI & Predictive Analytics Business Basics & Entrepreneurship	Networks & Distributed Systems Decision Automation Strategy
	Skill/Career Course Skill/Career Course	Skill/Career Course Skill/Career Course
	Enrichment Elective	Enrichment Elective
	Coaching	
	Electives or Internship	Electives or Internship
		Capstone Project
	Coaching	

*Reflects the academic experience of a first-year university student. Individual timelines and courses may differ depending on transfer credits.

Core Challenges

Lo-code App Development Challenge

Dive into the world of app creation with minimal coding. This challenge empowers students to rapidly develop practical applications using low-code and no-code platforms. Emphasis is placed on logic, intuitive user-interface design, and agile prototyping-perfect for aspiring product managers and digital innovators.

Insight Engine: Launch a Consumer Trend Dashboard Challenge

Students harness real-time social media data to spot emerging consumer trends, analyse their business impact, and propose actionable strategies. It's a hands-on challenge in data storytelling, market foresight, and driving business change.

Autonomous AI: Design & Deploy a GenAI Agent Challenge

Step into the future of artificial intelligence. Students create and deploy a generative AI agent-like a chatbot or virtual advisor-for a real-world application using cutting-edge tools such as OpenAI and LangChain. Students learn about AI product development and real-world tech deployment. This challenge focuses on AI agents that optimize warehouse logistics, streamline operations, or support internal workflows.

Robotics & Quantum for the Real World Challenge

Merge innovation and intelligence in this multidisciplinary challenge. Teams develop prototypes for intelligent systems using simulated robotics combined with quantum-inspired algorithms to solve real world logistics or automation problems. This challenge provides students the opportunity to learn about next-gen tech applications in robotics and AI.

Core Courses

Intro to Programming & AI Thinking

Learn the foundations of programming and the mental models behind modern AI. Using Python, you'll practice variables, control flow, functions, and basic data structures while framing problems with computational and probabilistic thinking. You'll also get hands-on with simple ML libraries and APIs, prompt design, and responsible-AI basics. By the end, you'll build a small AI-enabled app that solves a real business task.

Introduction to Data Analytics

This course covers the essentials of how businesses create, deliver, and capture value. Topics include market sizing, customer discovery, competitive analysis, revenue models, unit economics, and basic financial statements. You'll use lean startup methods to validate a problem-solution fit and craft a go-to market plan. The capstone is a concise pitch deck supported by data-driven assumptions.

Business Basics & Entrepreneurship

This course covers the essentials of how businesses create, deliver, and capture value. Topics include market sizing, customer discovery, competitive analysis, revenue models, unit economics, and basic financial statements. You'll use lean startup methods to validate a problem-solution fit and craft a go-to market plan. The capstone is a concise pitch deck supported by data-driven assumptions.

Algorithms & Data Structures

Develop the toolkit to write efficient, reliable code. You'll implement core data structures (arrays, lists, stacks, queues, trees, hash tables, graphs) and classic algorithms for sorting, searching, and pathfinding, while analyzing time/space complexity. Emphasis is on clarity, performance trade-offs, and testing. Coding labs in Python (with optional Java/C++ parallels) connect theory to practice.

Data Management & Visualization

Master the data lifecycle from ingestion to insight. You'll model relational data, write SQL, design ETL pipelines, and address data quality, governance, and privacy. Using Python and a BI tool, you'll transform datasets into clear visuals and dashboards that tell a compelling story. The course culminates in a stakeholder-ready analytics report with actionable recommendations.

Marketing & Branding

Explore how brands win hearts and drive growth. We cover segmentation, targeting, positioning, brand architecture, messaging, and digital channels. You'll design experiments (A/B tests), read key metrics (CAC, LTV, conversion), and translate insights into creative briefs and campaigns. A team project builds a coherent brand strategy and launch plan backed by data.

Applied Machine Learning

A practical survey of supervised and unsupervised learning for business problems. You'll handle feature engineering, model selection, evaluation (cross-validation, ROC/AUC), and bias/fairness considerations. Projects include classification, regression, and clustering with scikit-learn, plus lightweight deployment and monitoring concepts. Focus is on making models useful, understandable, and ethical.

Generative AI & Predictive Analytics

Understand how generative models and predictive methods create value. We cover LLM fundamentals, embeddings, prompt engineering, retrieval-augmented generation, and evaluation; alongside time-series and classic predictive techniques. You'll prototype a gen-AI workflow and a forecasting model, compare performance, and address governance, privacy, and IP risks. Deliverables focus on accuracy, reliability, and user impact.

Business Models & Finance

Connect strategy to numbers. We examine revenue engines, pricing, cost structures, unit economics, and cash flow, then link them to forecasting, breakeven, and valuation basics (DCF and multiples). You'll build a simple financial model to assess viability and scenario risk. The outcome is a decision-ready view of what it takes for a business to sustain and scale.

Networks & Distributed Systems

Learn how modern applications communicate and scale. Topics include the Internet stack (TCP/IP, HTTP, DNS), concurrency, messaging, and the principles behind distributed systems-replication, consistency, CAP trade-offs, and fault tolerance. Labs introduce containerization and cloud primitives for building resilient services. By the end, you'll design and reason about a simple, scalable service architecture.

Decision Automation

Translate policies and analytics into automated actions. You'll model decision logic with rules, decision tables, and workflows, integrate predictive scores, and design human-in-the-loop safeguards. We compare options across APIs, event streams, and RPA, with attention to auditability and compliance. The final project automates a real process, measuring impact on speed, accuracy, and risk.

Business Strategy

"The Business Strategy" provides an introduction to the core principles of strategic thinking and decision making in business and organizations. Students will explore key frameworks, including competitive analysis, industry positioning, resource-based strategy, and corporate advantage. Through case studies and real-world applications, the course emphasizes critical thinking and problem-solving skills essential for formulating and implementing effective strategies. Suitable for students interested in management, consulting, and entrepreneurship, this course lays the foundation for understanding how organizations achieve and sustain competitive success.

Skills/Career Courses

Collaboration

Collaboration is an essential competency in contemporary academic, professional, and organizational environments. This highly experiential course focuses on hands-on learning through interactive exercises, simulation work, and dynamic team projects. Students will engage in a range of activities that develop practical skills in communication, teamwork, conflict resolution, and leadership. Emphasizing applied learning over theoretical study, the course will challenge students to navigate complex team dynamics, foster inclusive collaboration, and leverage collective intelligence to achieve common goals. By the conclusion of this course, students will have the practical tools and strategies necessary to excel in collaborative settings.

Communication (Oral)

This interactive course equips students with the confidence and skills to communicate effectively in professional and personal settings. Through hands-on activities, discussions, and real-world applications, students will refine verbal and nonverbal communication, adapt messages for different audiences, and develop active listening and questioning techniques. They will also learn to overcome common barriers like nervousness and misunderstandings while practicing presentations, role-playing, and peer feedback. By the end of the course, students will be prepared to speak with clarity, confidence, and impact in meetings, interviews, and daily conversations.

Communication (Writing)

The skill of written communication is crucial for academic, professional, and personal success. This highly practical course focuses on developing clear, concise, and impactful writing. Through interactive exercises, peer feedback, and iterative revision, students will refine their ability to craft compelling arguments, structure ideas effectively, and adapt their writing to diverse audiences and contexts. Emphasizing clarity over complexity, this course equips students with tools to enhance their writing process, strengthen their critical thinking, and build confidence in their written expression. By the end of the course, students will be proficient in producing coherent, persuasive, and purposeful writing.

Foundation of Career Success

This course introduces students to the foundational skills necessary for career exploration, professional development, and the job search process. Students will learn how to research industries, develop strong application materials, build a personal brand, and establish professional communication habits. Through hands-on exercises, they will create resumes, LinkedIn profiles, and a Professional Development Plan (PDP) to guide their early career growth.

Learning to Learn

The ability to learn effectively is a foundational skill that influences academic, professional, and personal success. This highly experiential course explores practical techniques for enhancing learning, retention, and critical thinking. Through interactive exercises, self-reflection, and applied practice, students will develop personalized strategies to improve focus, motivation, and problem-solving. Emphasizing active learning over passive consumption, this course equips students with tools to adapt to new challenges, refine their cognitive skills, and foster a mindset of continuous growth. By the end of the course, students will be empowered with strategies to become more effective and autonomous learners.

Critical Thinking

In today's rapidly changing world, the ability to think critically is more essential than ever. With the constant influx of information, it's crucial to discern what's accurate and reliable. This course is designed to equip students with the skills to analyze information objectively, recognize biases, and make well-informed decisions. By understanding logical reasoning, evaluating evidence, and effectively using tools like artificial intelligence, students will be better prepared to navigate the complexities of modern life. Developing these critical thinking skills not only enhances academic performance but also fosters personal growth and adaptability in an ever-evolving world.

Creative Thinking

Creative thinking is a vital skill for success in an era of constant innovation. This highly interactive course explores techniques for generating ideas, solving problems, and thinking beyond conventional boundaries. Through hands-on exercises and collaborative projects, students will develop their ability to approach problems with flexibility, curiosity, and originality. Emphasizing experimentation and adaptability, this course provides students with practical tools to cultivate creativity, challenge assumptions, and develop innovative solutions. By the end of the course, students will be equipped with strategies to enhance their creative potential and apply it across academic, professional, and personal contexts.

Advanced Career Strategies

This course builds on the fundamentals learned in Careers 1, focusing on advanced career research, strategic job searching, and professional branding. Students will refine their resumes and LinkedIn profiles, strengthen their networking skills, and develop expertise in interviewing and negotiation. The course also emphasizes long-term career planning through an advanced Professional Development Plan (PDP).

Sample Electives

Supervised Machine Learning

This course provides a comprehensive introduction to supervised machine learning, covering key regression and classification techniques such as Decision Trees, K-Nearest Neighbors (KNN), Support Vector Regression (SVR), Logistic Regression, Naïve Bayes, Random Forests, and XGBoost. Students gain hands-on experience in feature selection methods (KBest, LASSO, Decision Tree-based selection) to enhance model performance. Emphasis is placed on model evaluation and optimization, where students apply regression metrics (MSE, RMSE, MAE, R2) and classification metrics (Confusion Matrices, ROC curves, Precision, Recall, F1-score) to assess predictive accuracy. The course also explores hyperparameter tuning, model regularization, and the bias-variance trade-off, ensuring students can improve model generalization and robustness. Through practical sessions, real-world case studies, and Python-based implementations using Scikit-learn, students will build, optimize, and interpret predictive models. Applications include customer segmentation, financial risk modeling, fraud detection, predictive maintenance, and recommendation systems. Upon completion, students will be equipped to effectively communicate machine learning insights, optimize model performance, and apply predictive analytics across diverse industries.

Unsupervised Machine Learning

This course provides a comprehensive introduction to unsupervised machine learning techniques, focusing on their practical applications in business analytics. Students will develop expertise in dimensionality reduction, learning to use Principal Component Analysis (PCA) to simplify high dimensional datasets and enhance interpretability. The course covers clustering methods, including K Means, Hierarchical Clustering, and DBSCAN, enabling students to discover hidden structures within data. Students will also explore cluster evaluation techniques such as Silhouette Score, Davies-Bouldin Index, and Discriminant Analysis, ensuring they can assess model quality effectively. Beyond clustering, the course introduces Market Basket Analysis (MBA) and Recommendation Systems, teaching students how to uncover consumer behavior patterns and optimize business decision-making. Students will gain hands-on experience with Natural Language Processing (NLP) for text clustering and topic modeling, as well as an introduction to deep learning approaches like Autoencoders and Generative Adversarial Networks (GANs) for unsupervised learning tasks. Practical sessions emphasize real-world business applications, including customer segmentation, fraud detection, recommender systems, and text analytics. Through hands-on coding, group projects, and interactive discussions, students will strengthen their ability to analyze data, evaluate models, and communicate insights effectively. Upon completion, students will be equipped to apply advanced unsupervised learning techniques to solve complex analytical challenges in various industries, from finance and marketing to healthcare and retail.

Cloud Computing & DevOps Engineering

Build, ship, and run applications reliably in the cloud. Topics include cloud primitives (compute, storage, networking), containers and Kubernetes, microservices, and Infrastructure as Code (Terraform). You'll implement CI/CD pipelines, observability (logging/metrics/tracing), and reliability practices (SLOs, incident response) while managing cost and security. By the end, you'll deploy a production-style service with automated testing, rollouts, and monitoring on a major cloud.

Digital Marketing Analytics

For business analytics students who wish to gain practical skills in web analytics and digital marketing. It bridges the technical aspects of search engine optimisation (SEO) with real-world business strategy, providing students with the tools to analyse, optimise, and measure the effectiveness of web marketing campaigns. The course covers key topics such as keyword research, SEO techniques (including Panda and Penguin algorithms), backlink strategies, and how to use web analytics tools like Google Analytics to assess marketing performance. Students will also learn to integrate SEO insights with business analytics to inform strategic decisions, track conversions, and optimise business outcomes. Ethical considerations, privacy issues, and the connection between social media and SEO will also be explored. By the end of the course, students will be able to apply SEO and web analytics to improve digital marketing efforts, enhance user experience, and support data-driven decision-making in business. While primarily aimed at business analytics students, the course is also relevant for marketing students seeking a deeper understanding of the technical side of digital marketing and analytics.

Data Storytelling & Visualization

This course develops students' ability to translate complex data into impactful visual narratives. Students explore foundational principles such as visual perception, cognitive processing, narrative structures, and effective visual design to craft engaging, clear, and informative data stories. Through practical sessions, students will gain hands-on experience with leading visualization software (e.g. Tableau / Power BI) enabling them to create interactive dashboards tailored to diverse audiences. Throughout the course, students critically evaluate existing visualisations to improve their clarity, accuracy, and persuasive impact. Learning is further enhanced through structured external certifications, aligning skill development closely with industry standards and expectations. A strong emphasis on practical skills ensures students are well-prepared to produce visualisations that drive informed decision-making across diverse business contexts. Assessments are designed to reinforce practical skill development, including individual visualisation critiques, redesign tasks, and a major storytelling project that integrates both theoretical knowledge and applied visualisation skills. Students complete the course by assembling a professional portfolio, demonstrating their expertise in communicating data-driven insights effectively to technical and non-technical stakeholders alike.

Developing Software for Mobile Platforms

Create user-centric apps for iOS and Android with a cross-platform framework (Flutter or React Native). We cover mobile UI/UX patterns, accessibility, device capabilities (camera, GPS, notifications), data sync and offline-first design, and integration with cloud APIs. You'll profile performance, harden security (auth, secure storage, OWASP MASVS basics), and navigate app-store distribution. The final deliverable is a polished MVP with analytics and crash reporting.

Quantum Computing

Understand what quantum computers are good for-and what they aren't. You'll learn qubits, superposition, entanglement, quantum gates and circuits, plus noise, NISQ constraints, and error mitigation basics. We implement canonical algorithms (Deutsch-Jozsa, Grover, VQE) using Qiskit or Cirq on simulators and available cloud backends, then compare against classical approaches. The project evaluates a real use case (optimization, chemistry, or ML) and proposes a hybrid quantum-classical workflow.

Advanced Machine Learning

This advanced machine learning course dives deeply into sophisticated methods and cutting-edge techniques beyond foundational models, emphasizing both theoretical rigor and practical Python implementations. Students will explore advanced neural network architectures, including Transformers and Graph Neural Networks, and master generative modeling techniques such as Variational Autoencoders, GANs, and Diffusion Models. The curriculum incorporates representation learning through contrastive and self-supervised methods, advanced optimization algorithms, and robust reinforcement learning approaches, providing a comprehensive understanding of machine learning frontiers.

Quantitative Decision Making for Business

This course introduces quantitative decision-making methods critical for informed, data-driven management and strategic decisions. Students will engage deeply with four essential analytical frameworks: Markov Chain analysis, Time Series forecasting, Linear Optimization, and Nonlinear Optimization. Through Markov Chains, students will master modeling stochastic processes, steady-state predictions, and decision processes, emphasizing real-world business scenarios. Time Series analysis covers forecasting techniques, including smoothing methods, ARIMA models, and seasonal decomposition, equipping students with the ability to anticipate market trends and operational needs.

Automation & Robotics

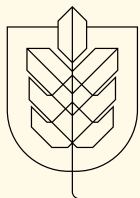
Design and program intelligent machines that sense, decide, and act. You'll cover robot kinematics, motion planning, perception with cameras/LiDAR, and control of sensors and actuators. Labs use ROS 2 with Python/C++ on microcontrollers and single-board computers to build and simulate mobile and manipulator robots. We discuss safety, ethics, and business cases in manufacturing, logistics, and services. The project delivers a working robot (or high-fidelity simulation) that executes a real task with measurable performance.

Advanced Excel: Data Modeling and Automation for Business

Microsoft Excel remains one of the most widely used analytical tools across industries, and mastery of its advanced capabilities is essential for any business analytics professional. This course is designed to deepen students' proficiency in Excel, moving beyond basic functionality into powerful techniques that support robust data analysis, modeling, and decision-making. Students will develop advanced spreadsheet skills including logical and statistical functions, financial modeling, array formulas, dynamic dashboards, and pivot tables. The course emphasizes applied learning through realistic business problems that require efficient spreadsheet design, data wrangling, and scenario-based modeling. In doing so, students will not only improve their technical command of Excel, but also learn how to structure and audit spreadsheets that stand up to real-world business scrutiny. In addition, the course introduces automation concepts through the use of macros and an optional introduction to Python tools such as OpenPyXL and xlwings, preparing students to bridge Excel workflows with larger-scale analytics environments. This forward-looking component empowers students to improve efficiency, reduce error, and understand the role of Excel in modern analytics ecosystems. Throughout the course, students will be expected to apply their skills to complex, data-rich business scenarios, culminating in the development of models and reports that support key decisions. By the end of the course, students will be able to confidently build, optimize, and communicate advanced Excel-based analyses across various business domains.

Blockchain Technologies & Smart Contracts

Explore how distributed ledgers enable trust at scale. You'll learn consensus (PoS), wallets, tokens, and the EVM, then write and test Solidity smart contracts with attention to security (reentrancy, overflow), gas costs, and upgrade patterns. We examine enterprise use cases-payments, supply-chain provenance, identity-and integration via web3 and oracles, plus governance and compliance considerations. The capstone deploys a contract to a test-net and connects it to a simple App.



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