# COMPUTING AND DATA SCIENCE (TECH-UB)

**TECH-UB 1  Info Tech in Bus & Society  (4 Credits)**
*Typically offered occasionally*
Provides the background necessary to make decisions about computer-based information systems and to be an "end-user". Two major parts of the course are hands-on experience with personal computers and information systems management. Group and individual computer assignments expose students to electronic spreadsheet analysis and database management on a personal computer. Management aspects focus on understanding computer technology, systems analysis and design, and control of information processing by managers.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 23  Introduction to Programming and Data Science  (3 Credits)**
*Typically offered occasionally*
This course is recommended for undergraduate students without programming experience who are interested in building capabilities in the rapidly growing fields of data science and data analytics. This hands-on coding course does not have any prerequisites and is meant to help students acquire programming and data analysis skills that are becoming increasingly relevant for entrepreneurial, corporate, and research jobs. The course offers an introduction to programming (using Python) and databases (using SQL). We will cover topics related to collection, storage, organization, management, and analysis of data. There is a strong focus on live coding in the classroom, with discussion of examples.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 24  Projects in Programming and Data Sciences  (3 Credits)**
*Typically offered occasionally*
This course is the follow-on course to Introduction to Programming and Data Science, which is offered in the Fall. It is recommended for undergraduate students who 1) are interested in jobs in the rapidly growing fields of data science and data analytics or 2) who are interested in acquiring the technical and data analysis skills that are becoming increasingly relevant in all disciplines. Intro to Programming and Data Science forms the basis for this course, but it is not a pre-requisite. Students with basic knowledge of programming in Python and SQL are welcome to join. This course covers select topics that build on the prior course work and is largely project based. Much of the course will be project-based work, with students working on projects that utilize the skills used in this and the prior Programming and Data Science course.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 25  Introduction to Programming for Data Science using Python  (1.5 Credits)**
This course is the recommended starting point for undergraduate students who are interested in working in the rapidly growing fields of data science and data analytics or who are interested in acquiring the technical and data analysis skills that are becoming increasingly relevant in other disciplines, such as finance and marketing. It will provide a basic introduction to programming using Python with an emphasis on using Python in the context of various data science applications.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 26  Databases for Business Analytics  (1.5 Credits)**
Databases are ubiquitous in all businesses and hold significant information about the business. Every data analysis and report typically starts with an SQL query, as SQL is the lingua franca of all database systems. Therefore, SQL is necessary for anyone who needs to analyze data as part of their job. Many tech companies consider the knowledge of SQL a prerequisite for all their analysts and managers. This database class is designed for absolute beginners and teaches students how databases are structured and how to write SQL queries that retrieve data from a database. The class is heavily hands-on, focusing on developing the necessary skills for writing SQL queries. We will cover the following topics: Basics of Entity-Relationship model, and the connection to databases USE, DESCRIBE queries, to understand the structure of a database Selection queries: *, column, column AS, DISTINCT, ORDER BY, LIMIT Filtering data using "where": Boolean conditions, IN, BETWEEN, LIKE Join queries: Inner and Outer joins, self-joins Aggregation queries: GROUP BY, SUM, AVG, MAX, MIN, etc. Subqueries Window queries (if time allows) After this course, students will be able to navigate relational databases, issue queries against databases in an organization, and generate data that can be used for analyses and reports.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 31  High Tech Entrepreneurship  (2 Credits)**
High-Tech software, whether at a red-hot startup or formidable incumbent, has become the ultimate value-adding force driving much of the modern economy. There's not an exact science behind successful entrepreneurs, intrapreneurs and product managers. Identifying a genuine market need, building a product to address that need, and finding a business model to tie it all together profitably can't be automated. That said, launching successful high-tech software as a new startup or product is no Voodoo either. While there's no process that guarantees success, savvy entrepreneurs employ market-tested best practices to maximize their chances. High-tech software is built by a cross-functional team of software engineers, data scientists and/or user experience designers. Leading this team towards success requires understanding each role, how they solve problems through effective collaboration, and how to structure customers' desires into the specifications these technologists need to deliver customer-delighting software. After the software's launch, continued success means identifying the metrics which matter the most to guide the software's continued evolution continue to match changing customer tastes and maximize profit. This course will equip you with two toolsets. First, techniques for evaluating market demand on the cheap, patterns for maximizing value capture, models for creating growth from network effects, and protocols for the early identification of symptoms of failure will enable you to get the business started. Second, methods and processes for hiring, inspiring and guiding an engineering team to launch and evolve your software product will enable you to grow your business through delighting your customers. Together, these frameworks prepare you to recognize business opportunities uniquely enabled with software products and successfully launch those products, whether that launch creates your first startup or a new product for your firm.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 38  Social Media & Digital Marketing  (3 Credits)**
*Typically offered occasionally*
This course examines the major trends in digital marketing using tools from business analytics and data science. While there will be sufficient attention given to top level strategy used by companies adopting digital marketing, the focus of the course is also on business analytics: how to make firms more intelligent in how they conduct business in the digital age. Measurement plays a big role in this space. The course is complemented by cutting-edge projects and various business consulting assignments that the Professor has been involved in with various companies over the last few years. Prof Ghose has consulted in various capacities for Apple, AMD, Berkeley Corporation, Bank of Khartoum, CBS, Dataxu, Facebook, Intel, NBC Universal, Samsung, Showtime, 3TI China, and collaborated with Alibaba, China Mobile, Google, IBM, Indiegogo, Microsoft, Recobell, Travelocity and many other leading Fortune 500 firms on realizing business value from IT investments, internet marketing, business analytics, mobile marketing, digital analytics and other topics.We will learn about statistical issues in data analyses such as selection problem, omitted variables problem, endogeneity, and simultaneity problems, autocorrelation, multi-collinearity, assessing the predictive power of a regression and interpreting various numbers from the output of a statistical package, various econometrics-based tools such as simple and multivariate regressions, linear and non-linear probability models (Logit and Probit), estimating discrete and continuous dependent variables, count data models (Poisson and Negative Binomial), cross-sectional models vs. panel data models (Fixed Effects and Random Effects), and various experimental techniques that help can tease out correlation from causality such as randomized field experiments.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 50  Financial Information Systems  (3 Credits)**
*Typically offered occasionally*
The financial services industry is being transformed by regulation, competition, consolidation, technology and globalization. These forces will be explored, focusing on how technology is both a driver of change as well as the vehicle for their implementation. The course focuses on payment products and financial markets, their key systems, how they evolved and where might they be going, algorithmic trading, market structure dark, liquidity and electronic markets. Straight through processing, risk management and industry consolidation and convergence will be viewed in light of current events. The course objective is to bring both the business practitioner and technologist closer together. Topics will be covered through a combination of lectures, readings, news, case studies and projects.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 51  Risk Management in IT  (3 Credits)**
The national and economic security of the U.S. and all nations depend on the reliable functioning of critical infrastructure. This includes financial, communications, power, health and essential systems and services relying on information technology. Recent events demonstrate that governments, businesses and individuals are vulnerable to attack from external adversaries, as well as self-inflicted difficulties. Intellectual property can be stolen, customers' privacy violated and operations disrupted. Such events drive up costs, reduce revenue, impact innovation and cause reputational damage. To better address these risks, President Obama issued Executive Order 13636, "Improving Critical Infrastructure Cybersecurity," on February 12, 2013, which established that "[i]t is the Policy of the United States to enhance the security and resilience of the Nation's critical infrastructure and to maintain a cyber environment that encourages efficiency, innovation, and economic prosperity while promoting safety, security, business confidentiality, privacy, and civil liberties." This course will address the issues faced by management responsible for ensuring the security of organizational technology, communications and data infrastructure. It will address topics in operational risk, project management, cryptography and cybersecurity, including compliance with commonly accepted best practices and regulatory requirements. We will use cases, examples sourced from news and real life illustrations from guest lecturers.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 52  Robo Advisors and Systematic Trading  (3 Credits)**
*Typically offered occasionally*
This course describes how equity and derivatives markets work and the commonly employed trading strategies employed by professionals in these markets. The course focuses on how to construct indicators that measure the state of a market, the development of trading strategies based on these indicators, and the measurement and management of risk associated with the strategies. The course is useful to anyone interested in hedge funds, sales and trading, operations, and technology.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 57  Data Science for Business  (3 Credits)**
*Typically offered occasionally*
This course teaches students to formulate and solve business problems using advanced data analytics and machine learning. It has three interconnected goals: (1) To introduce students to the fundamentals of advanced analytics and machine learning, essential for extracting insights from large business datasets; (2) To provide a structured analytical framework for the successful application of these methods to data-rich business challenges; (3) To offer hands-on experience with analytics and machine learning techniques, emphasizing effective problem formulation and analysis. Students are expected to have basic programming experience, particularly in Python, as the course extensively uses Python's analytics and machine learning libraries. This prerequisite ensures that students are prepared for the programming assignments. Suitable preparatory experience includes a Python course from Stern, Courant, Tandon, or an equivalent high school course. While students need not be expert programmers, they should be ready to explore and learn advanced data manipulation methods and algorithms in Python as integral components of this course.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 60  Networks, Crowds and Markets  (3 Credits)**
*Typically offered occasionally*
This is a course on how the social, technological, and natural worlds are connected, and how the study of networks sheds light on these connections. Topics include: social network structure and its effects on business and culture; crowdsourcing; games on graphs; the propagation through networks of information, fads and disease; small worlds, network effects, and "rich-get-richer" phenomena; the power of networks for prediction; the power of the network for web search; networks and social revolutions, and the melding of economics, machine learning, and technology into new markets, such as "prediction markets" or markets for on-line advertisements.The class will be a combination of lectures based on the textbook and guest lectures from well-known experts on these topics, primarily Stern faculty (a well-known center of excellence for research on networks, crowds, and markets).One main goal of this class is to work our way through most of the new, acclaimed textbook: Networks, Crowds, and Markets: Reasoning About a Highly Connected World, by David Easley and Jon Kleinberg. http://www.cs.cornell.edu/home/kleinber/networks-book/networks-book.pdf The textbook readings will be complemented with classic and recent research papers.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 65  Introduction to Cybersecurity and Privacy Management  (2 Credits)**
The course will introduce the students to the key issues in cybersecurity and privacy management and help them to develop basic understanding of business, technical, legal and ethical issues related to cybersecurity and privacy. At the end of the course, the students will understand the set of common cybersecurity and privacy-related business challenges faced by managers and learn how managers cope with these challenges across different industries by developing robust Information Security Management Programs to maintain confidentiality, integrity and availability of the information, networks, computing systems and applications managed by the organization. After developing basic understanding of the key topics covered in the class, the students will be prepared to have incisive conversations with the cybersecurity and privacy experts and be able to ask them pertinent questions on a wide range of cybersecurity and privacy topics.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 70  Digital Innovation & Crowdsourcing  (3 Credits)**
*Typically offered occasionally*
This course explores new ways in which traditional firms as well as start-ups can become more innovative in today's global economy by tapping into digital platforms and expertise residing outside traditional firm boundaries. We will discuss new practices of digital innovation and crowdsourcing and how to evaluate risks and benefits of such practices by doing qualitative analysis of cases, applying strategic theories, learning decision making tools, and talking to industry leaders in and outside the classroom. Students will engage in real-time crowdsourcing projects ranging from outsourcing their homework to designing a social innovation challenge online. Specific topics covered include: 1) strategic considerations for taking work outside an organization; 2) evaluation of geographical sourcing locations; 3) risks and benefits of partnering for product innovation; 4) organizing crowds of customers or experts; 5) using online labor markets; 6) enabling innovation in distributed teams. The course will pay special attention to how entrepreneurs can tap into these innovative mechanisms as well as how to use design thinking for social impact. This course is designed to give students a truly multidisciplinary perspective on these issues drawing on theories and cases from strategy, technology management, and organizational behavior.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 75  Blockchain & Cryptocurrencies: Technical & Strategy Perspective  (3 Credits)**
Bitcoin has entered the mainstream media in 2011, with the WikiLeaks affair. Since then the enthusiasm for cryptocurrencies and blockchains went beyond libertarians and has also captured the markets and also corporate world. Unfortunately, while the hopes for the technology is high, the technology itself is poorly understood. With that, it is difficult to devise a successful business strategy that leverages the technology possibilities. And so we see a large number of failing start-ups in the space, together with under performing corporate projects. In this course, we to go beyond the headlines and equip future managers with sufficient technical background so that they would be able to assess what type of blockchain or related technologies will be useful for their business application. We will study how the technology can be designed to meet the strategic needs, and how the strategy can be adjusted to take advantage of the unique features provided by the technology. We will learn that often the real features are different than the ones touted in the media headlines.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 94  Ind Study in Info Sys  (1 Credit)**
*Typically offered occasionally*
Students work one-on-one with a faculty member on a topic selected by the student and approved by the supervising faculty member. Students are expected to spend as much time on the independent study as would be spent on a regular course, and the topic selected may not replicate an existing course.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** Yes

**TECH-UB 9001  Info Technology in Business & Society  (4 Credits)**
Provides the background necessary to make decisions about computer-based information systems and to be an "end-user". Two major parts of the course are hands-on experience with personal computers and information systems management. Group and individual computer assignments expose students to electronic spreadsheet analysis and database management on a personal computer. Management aspects focus on understanding computer technology, systems analysis and design, and control of information processing by managers.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No

**TECH-UB 9038  Social Media & Digital Marketing  (3 Credits)**
This course examines the major trends in digital marketing using tools from business analytics and data science. While there will be sufficient attention given to top level strategy used by companies adopting digital marketing, the focus of the course is also on business analytics: how to make firms more intelligent in how they conduct business in the digital age. Measurement plays a big role in this space. The course is complemented by cutting-edge projects and various business consulting assignments. Students will learn about statistical issues in data analyses such as selection problem, omitted variables problem, endogeneity, and simultaneity problems, autocorrelation, multi-collinearity, assessing the predictive power of a regression and interpreting various numbers from the output of a statistical package, various econometrics-based tools such as simple and multivariate regressions, linear and non-linear probability models (Logit and Probit), estimating discrete and continuous dependent variables, count data models (Poisson and Negative Binomial), cross-sectional models vs. panel data models (Fixed Effects and Random Effects), and various experimental techniques that help can tease out correlation from causality such as randomized field experiments.
**Grading:** Ugrd Stern Graded
**Repeatable for additional credit:** No