



Katz
Katz School
of Science and Health

M.S. in Biotechnology Management and Entrepreneurship

Course Descriptions

BTM 1500 Foundations of Biotechnology

Get a top-level understanding of the interdisciplinary scientific foundations of biotechnology. Topics include the molecular foundations of biotechnology, molecular microbiology, receptor pharmacology, drug development processes, biotech process development and scale-up, drug approval and regulatory affairs, genomics, microarray analysis, proteomics, computational biology, molecular modeling, analytical biotechnology, bioterrorism and biotechnology.

Industry Application: A broad understanding of biotechnology's scientific foundations is essential for professionals navigating the rapidly evolving life sciences industry. In pharmaceutical companies like Pfizer, Merck and Novartis, knowledge of molecular microbiology, genomics and proteomics informs drug discovery and development processes. Biotech firms, such as Genentech, Amgen and CRISPR Therapeutics, apply these principles to scale-up biomanufacturing and advance gene therapies. Regulatory agencies, including the FDA and EMA, require this foundational expertise for evaluating bioterrorism risks and approving analytical biotechnology methods. Mastery of these interdisciplinary topics equips graduates to contribute immediately to innovative teams and excel in technical interviews.

BTM 5200 Biotechnology Management

Get an overview of the activities and knowledge required to lead and administer biotechnology and pharmaceutical companies. Topics include health technology assessment and cost-effectiveness analysis; personalized medicine, pharmacogenomics, and companion diagnostics; drug pricing and reimbursement; governmental payers; patents and intellectual property; and information in health care.

Industry Application: Expertise in managing biotechnology enterprises is critical for leadership roles in an industry driven by innovation and regulatory complexity. Pharmaceutical giants, such as Johnson & Johnson, AstraZeneca and Eli Lilly, rely on health technology assessment and pharmacogenomics knowledge for personalized medicine strategies and drug pricing decisions.

Biotech startups, such as Moderna, BioNTech, and Vertex Pharmaceuticals, use intellectual property management and reimbursement expertise to gain market share, secure funding and navigate governmental payers. Consulting firms, including McKinsey and Deloitte, apply these concepts when they advise on commercialization pathways in healthcare. This course prepares graduates to lead cross-functional teams and drive success for firms in competitive markets.

BTM 5300 Pharmacology Product Development and Commercialization

Obtain a working knowledge of the policies, processes and procedures for drug discovery, development and commercialization. Topics include drug development from bench to bedside, portfolio and pipeline management and health economics research.

Industry Application: Proficiency in drug development and commercialization processes is a cornerstone for careers in pharmaceutical innovation and market access. Major pharmaceutical companies, such as Pfizer, GSK and Sanofi, employ portfolio management techniques to advance drugs from bench to bedside and conduct health economics research for reimbursement strategies. Biotech firms, such as Regeneron, Gilead and Biogen, use pipeline management to prioritize candidates and optimize clinical development. Regulatory and market access teams at organizations, including the FDA and CMS, apply these policies for approval and pricing decisions. The course equips students with the strategic skills to accelerate product launches and enhance career trajectories in high-stakes roles.

BTM 5400 Applications of Biotechnology

Get an overview of the many different applications of biotechnology in medicine and the fundamental science underlying these products and techniques. Topics include DNA sequencing, immunology, microscopy, culture and differential staining, and pharmacogenomics.

Industry Application: A comprehensive grasp of biotechnology applications in medicine is vital for professionals developing cutting-edge therapies and diagnostics. Genomics companies, such as Illumina, 23andMe and Thermo Fisher Scientific, utilize DNA sequencing and pharmacogenomics for personalized treatment development. Pharmaceutical firms, such as Roche, Bristol-Myers Squibb and AbbVie, apply immunology and microscopy techniques in oncology and infectious disease research. Diagnostic companies, including Quest Diagnostics and Labcorp, leverage culture staining and sequencing for clinical testing. This knowledge equips graduates to use the most advanced technologies in product development, stay at the cutting edge of the field, and stand out in hiring processes at leading organizations.

BME 5500 Intellectual Property, Regulation, and Compliance for Biotechnology

This course is an introduction to the legal system, including contract and intellectual property law, an understanding of the key regulatory agencies and areas of compliance impacting biotechnology activities, and a strong foundation in the ethical issues concerning the development and commercialization of biotechnology products. Topics include criminal and civil liability; laws that govern the use, testing, development and licensing of biotechnology; regulatory agencies; quality assurance; and ethics of research.

Industry Application: Mastery of intellectual property, regulatory compliance, and ethical frameworks is indispensable for ensuring legal and ethical advancement in biotechnology. Pharmaceutical companies like Merck, Novartis, and Bayer rely on IP law and quality assurance to protect innovations during drug development and licensing. Regulatory agencies such as the FDA, EMA, and WHO use these principles for overseeing clinical testing and ethical research conduct. Biotech firms including CRISPR Therapeutics, bluebird bio, and Intellia Therapeutics apply compliance strategies to navigate civil liability and bioterrorism regulations. The course provides graduates with the expertise to mitigate risks and advance to compliance leadership roles. This is a great introduction to the legal side of the industry, preparing students for IP focused industries and provides an introduction to IP Law at large.

BTM 6500 Capstone in Biotechnology Management and Entrepreneurship

Integrate the skills developed in previous classes into a comprehensive body of knowledge and provide tangible evidence of competencies in Biotechnology Management and Entrepreneurship. The capstone includes four components: 1) a brief proposal and project schedule; 2) the main project deliverable; 3) a final presentation; and 4) a reflection of your knowledge of biotechnology operations, commercialization and product development.

Industry Application: The capstone project synthesizes comprehensive knowledge in biotechnology management, offering tangible proof of professional competencies. At biotech companies like Moderna, Genentech, and Regeneron, professionals must deliver end-to-end projects encompassing operations, commercialization, and product development. Venture capital firms such as Andreessen Horowitz and Flagship Pioneering evaluate business opportunities and ventures on their ability to propose, execute, and present innovative deliverables. Consulting groups including BCG and Accenture assess similar holistic skills through case studies. This experience creates a strong portfolio that demonstrates readiness for entrepreneurial and commercial roles and facilitates hiring at top organizations.

BTM 5000 Survey of Life Sciences

Explore a survey of biochemistry, cellular and molecular biology. Topics include the structure of cells; proteins, carbohydrates, lipids, and nucleic acids; DNA, genetics and gene expression; cell growth and cancer; and metabolism-energy generation and their implications for disease and drugs.

Industry Application: A solid foundation in biochemistry, cellular, and molecular biology is fundamental for careers in drug discovery and disease research. Pharmaceutical companies like Pfizer, Eli Lilly, and AstraZeneca apply knowledge of proteins, DNA, and metabolism to develop therapies for cancer and metabolic disorders. Biotech firms such as Amgen, Biogen, and Vertex Pharmaceuticals use these concepts for gene expression analysis and drug targeting. Research institutions including the NIH and Broad Institute leverage cellular structures for studying disease implications. This survey equips graduates with the scientific vernacular to contribute to interdisciplinary teams and pass rigorous technical assessments in the life sciences sector.

BTM 5600 Applied Biologics

This course focuses on how biologics and biosimilars therapeutics are developed and evaluated for a company's commercial pipeline. Each module examines the technologies behind this drug class such as; DNA sequencing and recombinant DNA technology, imaging, screening and characterization techniques, in-vitro and in-vivo models, immunology and pharmacology. In parallel students learn 'Search and Evaluation' and development methods for this drug class.

Industry Application: Expertise in advanced biologic technologies like DNA sequencing, proteomics, and gene editing is highly sought after in the burgeoning field of precision medicine. Genomics companies apply sequencing and metabolomics for biomarker discovery. Pharmaceutical firms like use immunology in immunotherapy development. The modular approach prepares graduates to better understand the use of these technologies effectively and gain a competitive edge in specialized roles in the laboratory and business. 'Search and Evaluation' and development methods for this drug class can be applied to various roles within the pharmaceutical industry in-licensing and other related roles. Skills from this course can even be applied to equity research, consulting, and even intellectual property roles.

BTM 6000 Biostatistics and Informatics

Learn the fundamental principles of experimental design and statistical and exploratory data analysis and visualization, with an emphasis on research related to human health and clinical settings. Statistical topics include descriptive statistics; hypothesis testing; analysis to variance; correlation; regression; chi-square test; and nonparametric methods. Design topics include population selection; inclusion/exclusion criteria; strengths and limitations of respective study designs; and interpretation of study results.

Industry Application: Fundamental skills in biostatistics and experimental design are essential for data-driven decision-making in clinical and health research. Pharmaceutical companies like Merck, Pfizer, and Johnson & Johnson use hypothesis testing, regression, and ANOVA for analyzing pre-clinical and clinical data and interpreting results. Contract research organizations such as IQVIA, PPD, and ICON apply these methods to study design, population selection, and visualization in drug development. Healthcare analytics firms including Optum and Cerner leverage nonparametric methods for correlation and chi-square analysis in population health studies. This course enables graduates to maximize the scientific method, ensure study validity and excel in analytical positions across the industry.

BTM 6100 Clinical Trials and Research Management

Get an interdisciplinary, state-of-the-art scientific introduction to clinical trials and research management for biotechnology. Topics include designing and managing clinical trials; trials documentation; pediatric trials; risk management; IRB and FDA guidelines for clinical trials; NIH and NSF grants management; and clinical trials data management and protocols.

Industry Application: Interdisciplinary expertise in clinical trials management is crucial for advancing biomedical research and regulatory compliance. Pharmaceutical giants such as Novartis, GSK, and Sanofi rely on trial design, IRB guidelines, and data management for efficient drug development. Contract research organizations apply risk management and

protocols to oversee pediatric trials and documentation. Funding agencies including the NIH and NSF use these principles for grants management and FDA compliance. The course prepares graduates to lead trial operations and contribute to successful regulatory submissions in demanding environments.

BTM 5700 Finance for Startups and Entrepreneurial Ventures

Create a foundation for making financial decisions in startups and entrepreneurial ventures. Topics include basic accounting principles; financial statement analysis (income statements, balance sheets, and statement of cash flows); strategic planning; capital budgeting and forecasting; expectations of investors; methods of valuation; dilutive and non-dilutive sources of funding; developing investor pitches; negotiating term sheets; and evaluating exit strategies.

Industry Application: Financial acumen tailored to any business decision, including startups, is a key differentiator for entrepreneurs and managers in high-growth biotech firms. Venture capital firms like Sequoia Capital, Kleiner Perkins, and ARCH Venture Partners use financial statement analysis and valuation methods when assessing investment opportunities. Biotech companies like Moderna, BioNTech, and Ginkgo Bioworks use capital budgeting, forecasting for securing various forms of financing (non-dilutive, dilutive, credit, etc). Investment banks including Goldman Sachs and Morgan Stanley apply these principles in advising on exit strategies and investor pitches as it relates to return on investment. This foundation empowers graduates to gain the financial literacy, drive financial strategy and attract capital in competitive ecosystems.

MAN 5580 Project Management

This course teaches project management using several tools from the leading methodologies for managing software projects. The most effective project managers will combine methods to create a “right-sized” methodology appropriate to the organizational culture and project team members’ background and experience.

Industry Application: Proficiency in project management methodologies is vital for delivering complex initiatives in dynamic organizational settings. Pharmaceutical companies like Pfizer, AstraZeneca, and Eli Lilly employ agile and hybrid tools to manage drug development pipelines and cross-functional teams. Biotech firms such as Genentech, Regeneron, and bluebird bio use these approaches for R&D projects and regulatory submissions. Consulting firms including Accenture and Deloitte apply right-sized methodologies to align with client cultures and experience levels. The course equips graduates to foster collaboration and ensure project success, enhancing their appeal in technical management roles.

MAR 5815 Marketing Management

The purpose of this course is to provide students with a solid foundation in modern marketing from a strategic, general management perspective. The concepts and techniques presented in the class address issues such as customer insights, competitive analysis, market segmentation, positioning strategy, and marketing decisions that managers make to support an effective marketing strategy. To reflect the scope of today’s business world, the course will approach

marketing across a variety of contexts, incorporating diverse perspectives such as: domestic and international, products and services, and conventional and unconventional communications methods. Through class projects, hands-on group exercises, case studies, and class discussions, we will explore marketing strategy and its implementation through what is traditionally called the "marketing mix." As we progress, it will become apparent that each of these decisions affects the others and that they must all be framed as part of an integrated marketing strategy.

Industry Application: A strategic foundation in marketing management is essential for positioning products and services in competitive global markets. Pharmaceutical companies like Johnson & Johnson, Merck, and Novartis use customer insights, segmentation, and positioning to develop integrated strategies for drug launches. Biotech firms such as Gilead, Biogen, and Vertex Pharmaceuticals apply competitive analysis and marketing mix decisions across domestic and international contexts and sensitivities. Consumer health companies including Procter & Gamble and Unilever leverage these concepts for unconventional communications in products and services. Through hands-on projects, graduates gain the skills to implement effective marketing plans and advance in strategic roles.

BME 5800 Technology Entrepreneurship

This course offers an introduction to the critical success factors for entrepreneurial ventures and intrapreneurship within existing companies. Topics include innovation models; diffusion of innovations; growth-share matrix; identifying high value opportunities; developing a business plan; determining pricing and implementing an integrated marketing strategy; entrepreneurial leadership; innovation ecosystems and networks of innovation; hiring talent and managing incentives; financial management; and acquisition of capital.

Industry Application: Critical success factors in technology entrepreneurship are indispensable for launching and scaling innovative ventures. Venture capital firms like Andreessen Horowitz, Benchmark, and Lightspeed Venture Partners apply innovation models and business planning to identify high-value business opportunities and new ventures. High growth biotech startups such as use growth-share matrices and pricing strategies for market entry and talent management. Innovation ecosystems including Y Combinator and Techstars leverage networks for capital acquisition and leadership development. This introduction prepares graduates to build sustainable platforms within organizations and nascent companies allowing them to thrive in any entrepreneurial environments.

BTM 6450 Internship in Biotechnology Management & Entrepreneurship

This course consists of an off-campus internship supervised by a staff person at the internship site and overseen by a faculty advisor. The internship site must be approved by the program director, and the overall duration of student work must be no less than 150 hours (based on a 3-credit course). At the start of the internship, you and the faculty advisor will jointly develop specific learning objectives tailored to the nature of the internship. Over the course of the internship, you will be required to submit weekly reflections, and at the end of the internship, write a final paper that represents the culmination of the work performed.

Industry Application: Structured internships provide invaluable hands-on experience and often lead directly to employment in the biotechnology sector. Pharmaceutical companies like Pfizer, Novartis, and GSK use internship programs as talent pipelines for roles in management and commercialization. Biotech firms such as Moderna, Genentech, and Regeneron offer positions where interns apply learning objectives to real-world projects under supervision. Regulatory organizations including the FDA and consulting firms like McKinsey evaluate interns through reflections and deliverables for full-time offers. The 150-hour requirement and faculty oversight ensure professional growth that strengthens resumes and hiring prospects.

BTM 6900 Special Topics in Biotechnology Management & Entrepreneurship

This course provides the opportunity to offer boutique short-term courses on emerging phenomena, policies, processes, technologies, and techniques. The expectation is that this will be an advanced class requiring an appropriate student project and deliverable in line with the number of credits awarded for the course.

Industry Application: Exposure to emerging topics in biotechnology management offers a competitive edge in adapting to industry advancements. Pharmaceutical innovators like AstraZeneca, Sanofi, and Eli Lilly explore boutique courses on new technologies for policy and process updates. Biotech companies such as BioNTech, bluebird bio, and Intellia Therapeutics apply these to short-term projects on phenomena like gene therapies. Venture firms including Flagship Pioneering and Third Rock Ventures value advanced deliverables for staying ahead in emerging and prolific areas. The project-based format builds specialized expertise aligned with career goals and continuous professional development.

BTM 6999 Independent Study in Biotechnology Management & Entrepreneurship

This independent study course provides you with the flexibility to learn more about a topic of interest outside of the formal course setting. The subject should be chosen in consultation with a faculty advisor who acts as your supervisor, and with the permission of the program director. You will be required to submit a course contract describing the course of study and its specific learning objectives. Course credit is determined in advance of the course, by the instructor with the approval of the program director.

Industry Application: Independent study fosters self-directed learning and deep expertise in personalized topics within biotechnology. Research-focused biotech firms like CRISPR Therapeutics, Editas Medicine, and Beam Therapeutics appreciate candidates who pursue advanced subjects under faculty supervision. Pharmaceutical companies such as Merck, Pfizer, and Roche value the intellectual curiosity demonstrated through tailored contracts and objectives. Academic and entrepreneurial paths at institutions like the NIH or startups benefit from this flexibility for doctoral preparation. This experience highlights initiative in hiring processes and supports specialized career advancement.

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