Medical Biotechnology (MBT)

MBT 500. DNA and Proteins. 3 hours.
DNA Replication, transcription, translation and post-translational modifications. Genome structure. Viruses. Bioinformatics and microarrays. Protein structure. Enzyme mechanisms. Biochemical pathways, and regulation of biochemical pathways. Course Information: Recommended background: Basic undergraduate general and organic chemistry, biology, physics, and math.

MBT 501. Cell Biology. 2 hours.
Cellular membranes structure and transport, protein localization and vesicular transport, cell signaling, cell adhesion, junction and cell-matrix attachment, stem cells and tissue renewals, cell cycle control, apoptosis, and cancer. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Recommended background: Basic undergraduate general and organic chemistry, and basic (general) biology.

MBT 502. Immunotechnology, Microbiology and Cellular Therapy. 3 hours.
Covers antibody production principals, clinical uses of antibodies, fermentation and bioremediation and protein production principals, cellular and stem cell therapies, bioterrorism control, containment and eradication. Course Information: Prerequisite(s): MBT 500 and MBT 501.

MBT 503. Pharmacology, Toxicology and Clinical Trials. 3 hours.
Basic pharmacology, drug-receptor interactions. Basic toxicology. Drug development cycle (Preclinical work, Phase I, II, III). Design, implementation and evaluation of clinical trials. IRB issues. Ethical conduct of clinical trials. Course Information: Prerequisite(s): MBT 500 and MBT 501.

MBT 504. Principles and Techniques in Protein Biochemistry. 3 hours.
Protein structure and structure/function relationships, protein expression, purification and characterization, chemical analysis and modification of proteins, identifications of protein interactions and protein chips. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must register for one Lecture-Discussion and one Laboratory.

MBT 505. Principles and Techniques in Molecular Biology. 3 hours.
Includes underlying theory of molecular biology and its applications. Laboratory sessions will provide hands on experience in molecular biology techniques. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must register for one Lecture-Discussion and one Laboratory.

MBT 506. Principles and Techniques in Immunology. 3 hours.
Principles and methodologies involved in antigen preparation and presentation, antibody production and purification, isolation and immortalization of immune cells, immunohistochemical analyses and assays for complements and cytokines. Course Information: Animals used in instruction. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must register for one Lecture and one Laboratory.

MBT 510. Ethics in Medical Biotechnology. 2 hours.
Rationale for making ethical decisions, review of existing guidelines, considerations of the use of adult and embryonic stem cells, ethical issues on animal research, conflict of interest and misconduct in research and business. Course Information: Prerequisite(s): Graduate standing in the Medical Biotechnology program or approval of the Department of Biomedical Sciences at COM - Rockford.

MBT 511. Statistics for Biotechnology Research. 3 hours.
Reinforce an understanding of basic statistical concepts and provide basic skills in creating, manipulating, and analyzing datasets using commonly available software such as SPSS, Excel, and Minitab. Course Information: Credit is not given for MBT 511 if the student has credit for BSTT 400 or NUSC 525. Extensive computer use required. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Recommended background: Basic undergraduate statistics. Class Schedule Information: To be properly registered, students must register for one Lecture and one Laboratory.

MBT 513. Research Planning, Design and Execution. 1 hour.
Presentation of the basics of planning, designing and executing a research plan. Students prepare a project plan and defend the plan to a faculty panel and peers. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated to a maximum of 2 hours. Extensive computer use required for word processing and presentation software such as Microsoft WORD and PowerPoint. Prerequisite(s): Graduate standing in the Medical Biotechnology program or approval of the Department of Biomedical Sciences at COM - Rockford.

MBT 520. Biotechnology Product Development: Concepts, Practice and Regulatory Issues. 2 hours.
Product development and commercialization processes. Product life cycles, program management basics. Intellectual property. Regulatory affairs issues: GLP, product registration, GMP, documentation, validation, FDA inspections. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford.

MBT 521. Techniques and Processes in Biotechnology. 3 hours.
Designed to expand on the techniques learned in MBT 504, MBT 505 and MBT 506. Exposure to basics of GLP and practical experience in applications of GLP. Course Information: Animals used in instruction. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at COM - Rockford. Course Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

MBT 522. Applied Medical Biotechnology. 2 hours.
The principles and methodologies used in commercial lab assays will be analyzed and their strengths and weaknesses discussed. An array of hospital/clinical techniques will be reviewed via lecture/demonstration in typical application venue. Course Information: Prerequisite(s): MBT 500 and MBT 501 and MBT 520.

MBT 523. Biotechnology Engineering. 2 hours.
Engineering aspects of large-scale cell culture: methodologies, types of production equipment, process sensing and control, harvesting, separation and purification. Sterilization, aseptic processing, filling and finishing steps. QA/QC. Course Information: Field trips required. Prerequisite(s): Completion of the first year of the M.S. in Medical Biotechnology program.

MBT 524. Applied Microbiology. 2 hours.
Review of the basic elements of microbiology; laboratory training in culturing and identification of microbes; antibiotic susceptibility testing and applications of microbiology in biotechnology and pharmaceutical industry. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must register for one Lecture-Discussion and one Laboratory.

MBT 525. Drug Design and Discovery. 1 hour.
Lead substances, molecular recognition, bioinformatics and combinatorial chemistry in drug design. Enzymes / receptors as design targets, screening of natural products, high throughput assays and preclinical studies. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford.

MBT 526. Safety Assessment of Drugs and Devices. 1 hour.
Course will focus on the technical processes and legal requirements of pre - clinical safety assessment of drugs and devices with some discussion of clinical assessment practices. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford.

MBT 527. Design and Execution of Clinical Trials. 1 hour.
Presentation of basic concepts of clinical trials: " the question", the study population, basic study design, randomness, blindedness, sample sizing, baseline assessment, data collection and QC.Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford.

MBT 528. Basic Bioinformatics. 2 hours.
Introduction to bioinformatics covering biological databases, gene prediction, sequence alignment, phylogenetic analysis, structural bioinformatics, genomics, functional genomics and proteomics. Course Information: Extensive computer use required. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must register for one Lecture-Discussion and one Laboratory-Discussion.

MBT 529. Introduction to Flow Cytometry. 1 hour.
Covers principles of flow cytometry, choices of fluorochromes, data analysis and presentation, technical protocols for flow cytometric procedures and trouble shooting during data acquisition and analysis. Course Information: Animals used in instruction. Prerequisite(s): MBT 506.

MBT 530. Recombinant DNA Technology. 3 hours.
Covers the various tools and techniques required for creating a recombinant DNA molecule, transforming host cell and to check the expression of recombinant DNA. Course Information: Prerequisite(s): Graduate standing in the Master of Science in Medical Biotechnology Program or approval of the Department of Biomedical Sciences, College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Laboratory.

MBT 531. Advanced Statistics for Clinical Trials. 2 hours.
Applied course in statistical analysis and reporting of data for clinical trials. Course Information: 2 hours. Extensive computer use required. Prerequisite(s): MBT 511 and MBT 527. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Laboratory-Discussion.

MBT 532. Laboratory Qualification, Validation and Documentation. 2 hours.
Covers FDA regulations, GLP, USP, and industry recognized best practices in the laboratory with a focus on Qualification, Validation and Documentation. Course Information: Prerequisite(s): Graduate standing in the Master of Science in Medical Biotechnology Program or approval of the Department of Biomedical Sciences, College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory-Discussion.

MBT 533. Biotechnology Start-up Entrepreneurship. 1 hour.
Overview of new venture creation process. Includes topics such as team building, necessary skills to initiate a start-up company, seeking venture financing and protecting intellectual property. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology Program or approval of the Department of Biomedical Sciences, College of Medicine - Rockford.

MBT 534. Principles of Anatomy and Physiology. 3 hours.
Focuses on how structure relates to function and vice versa, and explore the interrelationship and interdependency of the various organ systems. Course Information: Animals used in instruction. Prerequisite(s): Graduate standing in Medical Biotechnology Program or approval of the Department of Biomedical Sciences, College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory-Discussion.

MBT 535. Biomedical Implants: Materials, Design, Characterization and Clinical and Safety Issues. 1 hour.
Biomaterials used; surface modification and coatings; biomechanics; tribocorrosion. Possible failure mechanisms that can affect the performance and longevity will also be addressed.

MBT 536. Introduction to Flow Cytometry and Confocal Microscopy. 3 hours.
Covers basic principles of flowcytometry and confocal microscopy, specimen preparation and labeling, operation, data analysis and trouble shooting. Course Information: Animals used in instruction. Prerequisite(s): Completion of MBT 501 and MBT 506. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

MBT 537. Stem Cells and Regenerative Engineering. 1 hour.
Taught by a team of experts covering topics on both human embryonic stem cells and induced pluripotent stem cells and their potential application in regenerative medicine.

MBT 538. Laboratory Animals: Use, Handling, and Care. 2 hours.
Covers regulations and policies on the use of laboratory animals, diversity, nutritional requirements, reproductive requirements, housing and care, minor surgical procedures and alternatives to animal use. Course Information: Animals used in instruction. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

MBT 539. Tools for Immunoassay Development. 3 hours.
Provides training in various immunological techniques such as protein expression, western blotting, flow-cytometry and ELISAs, with emphasis on laboratory reporting, data analysis, experimental design and troubleshooting. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Laboratory.

MBT 540. Advanced Protein Biochemistry. 3 hours.
Covers resin chemistry and chromatography, magnetic beads for life sciences and antibody-protein conjugation. Course Information: Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

MBT 541. Nanotechnology, Nanoparticle and Nanomaterials: Fundamentals and Future Directions. 1 hour.
Nanomaterials, nanosystems design, quantum confinement, emergence of nanotechnology, synthesis and assembly, 0D, 1D and 2D nanostructures, polymeric nanomaterials, characterization of nanomaterials, applications of nanomaterials. Course Information: Prerequisite(s): Graduate Standing in Medical Biotechnology Program or approval of the Department of Biomedical Sciences.

MBT 591. Departmental Seminar in Medical Biotechnology. 1-4 hours.
Lecture series by invited speaker or advanced students with lectures on topics of current or developing interest in medical biotechnology. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Approval of the department.

MBT 592. Internship in Medical Biotechnology. 0-8 hours.
Supervised internship in a laboratory or industrial setting. Credit is contingent on the submission of a final report and oral presentation. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated to a maximum of 8 hours. Students may register in more than one section per term. Internship placement must be approved by the Medical Biotechnology program. Prerequisite(s): Graduate standing in the Medical Biotechnology program and approval of the Department of Biomedical Sciences at COM - Rockford.

MBT 594. Special Topics in Medical Biotechnology. 1-4 hours.
Lectures and demonstrations of new topics of significance in medical biotechnology that are not covered in existing courses. Course Information: May be repeated. Prerequisite(s): Consent of the instructor.

MBT 595. Student Seminar in Medical Biotechnology. 1-2 hours.
Students are taught how to write and present literature research/review papers on topics directly related to medical biotechnology. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Graduate standing in Medical Biotechnology program or approval of the Department of Biomedical Sciences at College of Medicine - Rockford.

MBT 596. Independent Study in Medical Biotechnology. 1-4 hours.
Independent and individual study of a topic in medical biotechnology. Usually involves extensive literature research culminating in a review paper or hypothesis/conclusion argument paper. Course Information: May be repeated to a maximum of 4 hours if topics vary. Students may register in more than one section per term. Prerequisite(s): Completion of the first year of the MS in Medical Biotechnology program, approval of the department, and approval of a faculty mentor. The student also should have completed core or elective courses in the degree sequence that introduce the topic of independent study or have verifiable outside knowledge.

MBT 597. Master's Project Research. 0-16 hours.
Independent laboratory or library research under the guidance of a faculty member. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Student should have approval of the research committee to commence work.

MBT 598. Master's Thesis Research. 0-16 hours.
Master's thesis research conducted at the College of Medicine in Rockford under faculty supervision. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Completion of the first year of the program and consent of the instructor.