Nanomedicine (NNMD)

NNMD 4991. Research. (4 Hours)
Offers an opportunity to conduct research under faculty supervision. May be repeated twice.

Attribute(s): NUpath Integration Experience

NNMD 5270. Foundations in Nanomedicine: Therapeutics. (3 Hours)
Offers an interdisciplinary, state-of-the-art introduction to nanotechnology-based therapeutics. Covers the foundations of nanoparticle synthesis, characterization, scale-up, translation, and regulatory approval. Discusses disease-specific considerations for in vivo transport, targeting, and drug delivery. Offers students an opportunity to blog about enabling innovations in nanomedicine related to a disease of their choice. Features weekly case studies presented by Northeastern faculty and guest experts from academia, hospitals, and industry.

Attribute(s): NUpath Natural/Designed World, NUpath Writing Intensive

NNMD 5271. Foundations in Nanomedicine: Diagnostics. (3 Hours)
Offers an interdisciplinary, state-of-the-art introduction to nanotechnology-based diagnostics. Covers the foundations of in vitro diagnostics and in vivo imaging, including considerations for designing diagnostic tests, device research and development, innovation vs. invention, contrast agents, companion diagnostics, medical device regulation, device reporting requirements, and challenges unique to devices for global health. Highlights examples of diagnostic technologies currently in clinical trials through talks by Northeastern faculty and guest experts from academia, hospitals, and industry.

NNMD 5272. Nanomedicine Seminar. (1 Hour)
Presents examples of research and innovation in the field of nanomedicine, with a focus on emerging technologies to solve pressing problems in human health. Features both medical case studies and rotating talks from experts in hospitals, government, academia, and industry. Offers students opportunities to practice scientific and professional skills through interactive nanomedicine activities. This course may be repeated up to three times for credit.

NNMD 5310. Bioethics in the Age of Artificial Intelligence. (1 Hour)
Discusses forward-looking case studies centered on emerging technologies for healthcare and medical decision making. Draws on examples from nanomedicine, bioinformatics, and artificial intelligence to highlight the importance of developing technological innovations in a safe, responsible, equitable, and bias-free manner. Offers students an opportunity to define/refine their own ethical standards, develop ethical reasoning skills, and practice identifying evidence-based solutions for evolving ethical challenges in the laboratory, co-op, and workplace.

NNMD 5370. Nanomedicine Research Techniques. (4 Hours)
Presents an in-depth look at the theory, methods, and instrumentation for studying nanomaterials used in biology and medicine. Students explore research theory using interactive online modules, read detailed protocols, watch laboratory demonstrations, practice interactive laboratory simulations, and analyze student-generated data. Offers students an opportunity to experience a wide range of laboratory techniques including nanoparticle synthesis, electron microscopy, optical microscopy, magnetic resonance imaging, high-performance liquid chromatography, in vitro measurements of bioactivity and cytotoxicity, and in vivo measurements of treatment efficacy.

NNMD 5380. Electron Microscopy Techniques. (4 Hours)
Offers an in-depth look at scanning and transmission electron microscopy techniques for materials characterization at the nanoscale in science, engineering, and medicine applications. Provides fundamental theory as well as comprehensive hands-on lab experience in imaging, diffraction, and spectroscopy. Studies both organic and inorganic specimen preparation including block face sectioning, fixation, and sputter coating.

NNMD 5470. Nano/Biomedical Commercialization: Concept to Market. (3 Hours)
Offers a comprehensive overview of the commercialization process for nano- and biomedical technologies. Discusses the key elements of a successful business plan, including scientific innovation, market assessment, customer discovery, intellectual property protection, business modeling, and value extraction. Also covers regulatory processes and market-specific strategies for raising capital. Offers students an opportunity to gain entrepreneurship skills through the creation of a team business proposal. Students have opportunities to interact with guest entrepreneurs.

Attribute(s): NUpath Creative Express/Innov

NNMD 5570. Preclinical and Clinical Study Design. (3 Hours)
Offers an in-depth look at preclinical and clinical considerations for drug discovery and development. Emphasizes identifying and addressing challenges associated with animal models, evaluation of drug-tissue interactions, qualifying for good laboratory practices, clinical trial design, patient stratification, and clinical trial management. Identifies key terminology and statistical considerations used in preclinical and clinical settings. Students practice steps of preclinical and clinical translation through a combination of case studies, data analysis, discussions, and a team project.

NNMD 6272. Professional Nanomedicine Seminar. (0 Hours)
Presents examples of research and innovation in the field of nanomedicine, with a focus on emerging technologies to solve pressing problems in human health. Features both medical case studies and rotating talks from experts in hospitals, government, academia, and industry. Offers students opportunities to practice scientific and professional skills through interactive nanomedicine activities. May be repeated up to three times.

NNMD 6370. Nanomedicine Experiential Capstone. (4 Hours)
Offers hands-on experience in the design, synthesis, and optimization of a nanoparticle using high-throughput microfluidics. Students work in teams to rationally design and synthesize a therapeutic nanoparticle, as well as develop and implement in vitro nanocharacterization protocols. Involves iterative collection, analysis, and interpretation of laboratory data to optimize nanoparticle synthesis.

Prerequisite(s): NNMD 5370 (may be taken concurrently) with a minimum grade of B

NNMD 6962. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NNMD 6984. Independent Research. (1-4 Hours)
Offers an opportunity to conduct independent research under faculty supervision. May be repeated once.

NNMD 7500. Reflection Capstone. (0 Hours)
Offers students an opportunity to reflect on and integrate new knowledge and skills acquired in course-based, research-based, and co-op–based experiential learning. Enhances the learning outcomes of prior and ongoing real-world experiences through engagement in self-reflection activities centered around growth of professional skills and competencies, professional identity, and positionality in relation to the profession students are preparing to enter. Presents a reflective practice toolkit designed to empower students to develop an actionable plan for lifelong learning and personal growth.

Prerequisite(s): EESC 6500 with a minimum grade of B ; NNMD 5270 with a minimum grade of B ; NNMD 5271 with a minimum grade of B