

## Biomedical Data Science Focus Area – Upper-Level Engineering Courses – updated January, 2024

|            |   |   |
|------------|---|---|
| EN.520.344 | Digital Signal Processing                             | 3 |
| EN.520.412 | Machine Learning for Signal Processing                | 3 |
| EN.520.414 | Image Process and Analysis I                          | 3 |
| EN.520.415 | Image Process and Analysis II                         | 3 |
| EN.520.432 | Medical Imaging Systems                               | 3 |
| EN.520.439 | Machine Learning for Medical Applications             | 3 |
| EN.520.440 | Machine Intelligence on Embedded Systems              | 3 |
| EN.520.447 | Information Theory                                    | 3 |
| EN.540.409 | Dynamic Modeling and Control                          | 4 |
| EN.540.414 | Computational Protein Structure Prediction and Design | 3 |
| EN.540.421 | Project in Design: Pharmacodynamics                   | 3 |
| EN.540.432 | Project in Design: Pharmacokinetics                   | 3 |
| EN.540.468 | Intro Nonlinear Dynamics and Chaos                    | 3 |
| EN.553.361 | Introduction to Optimization                          | 4 |
| EN.553.362 | Introduction to Optimization II                       | 4 |
| EN.553.371 | Cryptology and Coding                                 | 4 |
| EN.553.385 | Scientific Computing: Differential Equations          | 4 |
| EN.553.391 | Dynamical Systems                                     | 4 |
| EN.553.400 | Mathematical Modeling and Consulting                  | 4 |
| EN.553.401 | Introduction to Research                              | 3 |
| EN.553.413 | Applied Statistics and Data Analysis                  | 4 |
| EN.553.420 | Introduction to Probability (or EN.553.421)           | 4 |
| EN.553.426 | Introduction to Stochastic Processes                  | 4 |
| EN.553.430 | Introduction to Statistics                            | 4 |
| EN.553.433 | Monte Carlo Methods                                   | 3 |
| EN.553.436 | Intro Data Science                                    | 4 |
| EN.553.450 | Computational Molecular Medicine                      | 4 |
| EN.553.463 | Network Models in Operations Research                 | 4 |
| EN.553.467 | Deep Learning in Discrete Optimization                | 3 |
| EN.553.472 | Graph Theory  | 4 |
| EN.553.488 | Computing for Applied Mathematics                     | 3 |
| EN.553.492 | Mathematical Biology                                  | 3 |
| EN.553.493 | Mathematical Image Analysis                           | 3 |
| En.553.630 | Introduction to Statistics                            | 4 |
| EN.553.720 | Probability Theory I                                  | 4 |
| EN.553.721 | Probability Theory II                                 | 3 |
| EN.553.730 | Statistical Theory                                    | 4 |
| EN.553.731 | Statistical Theory II                                 | 4 |
| EN.553.764 | Modeling, Simulation, and Monte Carlo                 | 4 |
| EN.580.428 | Genomic Data Visualization                            | 3 |
| EN.580.431 | Introduction to Computational Medicine: Imaging       | 2 |
| EN.580.433 | Introduction to Computational Medicine: The Physiome  | 2 |
| EN.580.437 | Neuro Data Design I                                   | 4 |

|            |  |   |
|------------|--|---|
| EN.580.438 | Neuro Data Design II   | 4 |
| EN.580.439 | Models of the Neuron   | 4 |
| EN.580.446 | Physical Epigenetics   | 3 |
| EN.580.447 | Computational Stem Cell Biology                                | 3 |
| EN.580.448 | Computational Genomics: Data Analysis                          | 3 |
| EN.580.458 | Computing the Transcriptome                                    | 3 |
| EN.580.460 | Epigenetics at the Crossroads of Genes and the Environment     | 2 |
| EN.580.462 | Representations of Choice                                      | 3 |
| EN.580.464 | Advanced Data Science  | 3 |
| EN.580.480 | Precision Care Medicine I                                      | 4 |
| EN.580.481 | Precision Care Medicine II                                     | 4 |
| EN.580.488 | Foundations of Computational Biology & Bioinformatics          | 4 |
| EN.580.491 | Learning Theory  | 3 |
| EN.580.709 | Sparse Representations in Computer Vision and Machine Learning | 3 |
| EN.601.315 | Databases (or EN.601.415)                                      | 3 |
| EN.601.318 | Operating Systems  | 3 |
| EN.601.320 | Parallel Programming   | 3 |
| EN.601.350 | Introduction to Genomic Research                               | 3 |
| EN.601.402 | Digital Health and Biomedical Informatics                      | 1 |
| EN.580.425 | Radiology for Engineers  | 3 |
| EN.601.433 | Introduction to Algorithms                                     | 3 |
| EN.601.434 | Randomized and Big Data Analysis                               | 3 |
| EN.601.443 | Security and Privacy Computing                                 | 3 |
| EN.601.446 | Sketching and Indexing for Sequences                           | 3 |
| EN.601.447 | Computational Genomics: Sequences                              | 3 |
| EN.601.454 | Augmented Reality  | 3 |
| EN.601.455 | Computer Integrated Surgery I                                  | 4 |
| EN.601.456 | Computer Integrated Surgery II (or EN.601.496)                 | 3 |
| EN.601.457 | Computer Graphics  | 3 |
| EN.601.461 | Computer Vision  | 3 |
| EN.601.463 | Algorithms for Sensor-Based Robotics                           | 3 |
| EN.601.464 | Artificial Intelligence  | 3 |
| EN.601.465 | Natural Language Processing                                    | 3 |
| EN.601.466 | Information Retrieval and Web Agents                           | 3 |
| EN.601.468 | Machine Translation  | 3 |
| EN.601.474 | Machine Learning Theory  | 3 |
| EN.601.475 | Introduction to Machine Learning                               | 3 |
| EN.601.476 | Machine Learning: Data to Models                               | 3 |
| EN.601.477 | Casual Inference   | 3 |
| EN.601.482 | Machine Learning: Deep Learning                                | 3 |
| EN.601.491 | Human Robot Interaction  | 3 |

Contact the department advising office for course additions.

## 200-Level Engineering Courses

(maximum of 3 credits from this list may count in focus area)

|            |                      |   |
|------------|----------------------|---|
| EN.580.212 | Design Team          | 3 |
| EN.580.298 | Advanced Design Team | 3 |

|            |                 |     |
|------------|-----------------|-----|
| EN.601.226 | Data Structures | 3/4 |
|------------|-----------------|-----|

## Non Upper-Level Focus Area Courses

(maximum of 3 credits from this list may count in focus area)

(courses used from this category cannot be double-counted)

|            |                               |     |
|------------|-------------------------------|-----|
| AS.110.311 | Methods of Complex Analysis   | 3/4 |
| AS.110.405 | Introduction to Real Analysis | 3/4 |
| AS.110.421 | Dynamical Systems             | 3   |
| AS.110.443 | Fourier Analysis              | 3/4 |
| EN.580.112 | BME Design Group              | 3/4 |
| EN.601.231 | Automata & Computation Theory | 3   |

Students may use a maximum of 3 research credits as a non-upper-level engineering course.