



## BMED 8813/4813-MIT

# Systems Neuropathology & Translational Engineering

Fall 2019

Mon & Wed 4:30-5:45pm @ Georgia Tech

Professor: Cassie S. Mitchell, Ph.D.



This is a comprehensive dual-level (grad & undergrad) clinical course in systems neuropathology (disease and/or injury of the nervous system). The class covers foundational neurology, multi-scalar etiology, and clinical presentation with a large focus on *engineering* translatable diagnostic, prognostic, therapeutic, and rehabilitative technology for clinical management and patient care.

**Pre-requisites:** BMED 4813 (undergraduate course) requires at least one approved engineering fundamentals course and one approved biology/physiology course.

### Course Goals and Learning Outcomes

- Acquire fundamental knowledge on etiology and symptomology of all neuropathology, including brain & spinal cord injury, peripheral nerve injury, neurodegenerative disease, neuro-oncology, etc.
- Contrast clinical manifestations of neuropathology, including differential diagnostics, prognostic outcomes and appropriate clinical selection of therapeutic protocols.
- Translate neuropathology and interventions into a “system” analyzable with engineering methods.
- Develop skills to optimize/design new diagnostic, prognostic, therapeutic, and rehabilitative tools. Examples include deep brain stimulation, spinal drug delivery, predictive medicine, wheelchair design.

### Course Format & Grading

Predominantly lectures & in-class problem solving. Uses a medical resident’s textbook, “Pocket Neurology”. Problem solving resembles clinical grand rounds with patient cases studies. Engr. design focuses on translational applications. There are four Exams and an in-class engineering design challenge. No projects! Set grading scale. First cohort (Fall 2018) obtained a 3.5 class GPA.

### What past students think about Systems Neuropathology & Translational Engineering...

*“Systems Neuropathology & Translational Engineering was, without exception, the best course I have taken in my 5 years at Emory and Georgia Tech. The opportunity to learn fundamental engineering concepts coupled with basic and clinical neurology serves as a truly unique and fruitful experience. I would recommend this course without hesitation to any student interested in medicine, neuroscience, engineering, or all of the above.”*

--MT, MD-PhD student (BMED 8813)

*“Taking Dr. Mitchell's Systems Neuropathology & Translational Engineering course was a great opportunity. I learned a lot about neuropathology and how the engineering principles that I have learned over the years can be applied to address clinical problems...”*

--CE, BME PhD student (BMED 8813)

*This class was a highly enriching experience for me. I particularly enjoyed the diagnosis challenges at the end of each module, as they gave me a chance to take a step back and put all the details together to see the whole picture. I'd recommend this course to anyone interested in neuroengineering, neurology, or neuroscience.*

--PK, BME undergraduate student (BMED 4813)

**\*\*Note to “neuro” graduate students:** This GT course is more clinically focused than the Emory Neuroscience series and designed specifically for engineers; it can be taken alone or concurrently with the Emory series.

Email [cassie.mitchell@bme.gatech.edu](mailto:cassie.mitchell@bme.gatech.edu) if you have questions.