

# **Fundamentals of Neuroimaging**

## **BENG 485b / 585b (WR)**

- Instructors:** D. S. Fahmeed Hyder <fahmeed.hyder@yale.edu>  
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203-785-6202 (Douglas Rothman) or 203-785-6199 (Lesley Nadeau)
- Time:** Wednesday, 3:30-5:30 pm
- Location:** N135 TAC (300 Cedar Street)
- Section:** Immediately after class and via appointments conducted on-line using Zoom.
- Main text:** 1. “Brain Energetics & Neuronal Activity” (Wiley 2004). Shulman and Rothman (will be kept on reserve at the MRRC library; contact Lesley Nadeau)
- Secondary text:** 1. On-line and photocopied materials will also be distributed when needed.  
2. “Dynamic Brain Imaging” (Humana Press 2009). Hyder (will be kept on reserve at the MRRC library; contact Lesley Nadeau)  
3. “Brain Imaging: What it Can (and Cannot) Tell Us About Consciousness” (Oxford 2013) Shulman (will be kept on reserve at the MRRC library; contact Lesley Nadeau)
- Goal:** To understand the neuroenergetic and neurochemical basis of several dominant neuroimaging methods, including fMRI. Topics will range from technical aspects of different methods to interpretation of the neuroimaging results. Controversies and/or challenges for application of fMRI and related methods in medicine will be identified.
- Workload:** Read 20-40 pages of main text each week. Engage in class discussions. Selected participants will present seminars in class.
- Weekly synopsis (double spaced, no figures, 350 words maximum, 200 words minimum)
- arguments for / against
  - be precise and succinct
  - feedback / questions on synopsis
- Two up-to-date reports on chosen or assigned topics. Papers may be proposal style using principles presented in lectures.
- Midterm paper 10 pages (double spaced without figures).
  - feedback on midterm paper
  - Final paper 15 pages (double spaced without figures).
- Credit requirements:** Students taking the course for credit will be graded based upon weekly class participation (33.33%) which includes attendance, discussion, and presentation, weekly 1-page synopsis reports of lectures (16.67%), and two papers (50%).
- Course evaluation:** What have you learned about writing in this course that you can use in future courses?

## Syllabus for BENG 485 / ENAS 585 “Fundamentals of Neuroimaging”

1/17	Lecture 1	FH	Class overview
1/24	Lecture 2	DLR	Energy metabolism (Chapters 1 and 2)
1/31	Lecture 3	FH	Principles of fMRI (Chapter 3 & parts of Chapter 9)
2/7	Lecture 4	FH	Bottom up cortical energy budget (Chapter 7)
2/14	Lecture 5	DLR	Neurotransmission & Neuroenergetics (glutamate, GABA) (Chapter 4-6)
2/21	Lecture 6	Lasya/Dave	17O MRS and calibrated fMRI for energy (Chapter 8 & 9)
2/28	Lecture 7	Rosario/Ludivine	Bioelectricity & Neuroanatomy (parts of Chapter 7 & 10)
3/7	Lecture 8	Jacob/Alex	Relationship of energy and activity (Chapter 10)
3/14	Recess		
3/21	Recess		
3/28	Lecture 9	Joshua/William	Clinical: Cancer (out of textbook)
4/4	Lecture 10	Brigita/Lili	Clinical: Epilepsy (Chapter 11 and 12)
4/11	Lecture 11	Raeven/Nia	Clinical: Other + Psychiatric disorders (Chapter 13)
4/18	Lecture 12	Victoria/Ziad	Psychology: Long term memory (Chapter 14)
4/25	Lecture 13	Parthib/Kevin	Psychology: Mind and Brain (Chapter 15)

Attendance	5
Discussion	10
Presentation	20
Synopsis	15
Two Papers	50
	100