UNIVERSITY OF FLORIDA
COLLEGE OF MEDICINE SYLLABUS
NEUROSCIENCE

GMS 6082 Introduction to Functional Magnetic Resonance Imaging (1 credit hour)

Fall: 2020 (Module 2, Sep. 28-Oct. 29; 15 lectures hours total)
Delivery Format: In-Person Classroom MBI LG-101A
(For Online Communications, Zoom link below)

Instructor Name:	Marcelo Febo
Room Number:	Department of Psychiatry, MBI Room L4-100F
Phone Number:	352-294-4911
Email Address:	febo@ufl.edu
Office Hours:	Monday 10:00-11:00AM from September 28-October 28, 2021
Graduate Assistant:	Matteo Grudny, MBI L1-135, 352-294-4955, mgrudny@ufl.edu

Preferred Course Communications: Canvas messsage board and email. A discussion board will be available on the UF e-Learning support services: https://elearning.ufl.edu/. For urgent matters, students may also contact professor directly by email.

Prerequisites: Consent of instructor. There are no prerequisite courses and an introductory overview of magnetic resonance will be provided at the beginning of the course. GMS 6082 will follow conceptual paths in discussions of functional magnetic resonance imaging and as it specifically applies to studies in neuroscience. In some instances, quantitative concepts deemed important for in class discussions and for understanding functional MRI may be used. Thus, it is recommended that students take GMS 6080 (Basic Magnetic Resonance Imaging) for an in-depth introduction to nuclear magnetic resonance and image formation.

Purpose and Outcome: Introduction to functional magnetic resonance imaging methods and applications, with a focus on understanding the methods and how these are applied in studies of brain function in relation to behavior and cognition.

Course Overview: Introduction to Functional MRI will provide students with the basic and practical principles underlying fMRI as applied in the fields of basic, medical and cognitive neuroscience. Students will complete the course having an in-depth introduction to neurophysiological mechanisms that couple magnetic resonance phenomenon to task- or stimulus-dependent changes in neuronal activity and cerebral metabolism. An emphasis of the course is a comprehension of how fMRI is applied to advance our understanding of neural activity in relation to behavioral and cognitive brain function.

Relation to Program Outcomes: This course is designed to provide or solidify background knowledge and instruction on the principles and applications of fMRI as applied to basic and medical research.

Course Objectives and/or Goals: Upon completion students will be able to (i) critically formulate methodological considerations for using fMRI in neuroscience studies, (ii) discriminate between various forms of fMRI, including methods to measure blood flow, BOLD, task based studies and resting state functional connectivity, and (iii) prescribe neurophsyiologicla and neurovascular principles governing the fMRI signal and will be able to critically formulate potential mechanisms that are important in interpreting the fMRI data.

Instructional Methods: Learning in the course is intended to be a product of interactive and dynamic discussions, with introductory lectures and discussions by the instructor combined with student presentations on assigned material, critical thinking questions and one hands-on session. Expert faculty/researcher guests may be invited to supplement class lectures/discussions.

Description of Course Content:

Topical Outline/Course Schedule*

Week (Lecture duration)	Date(s)	Topic(s)	Readings
1 (1h:30m)	Sept. 28	Brief overview of instrumentation, MR signal contrast and image formation	Ch. 2-4
1 (1h:30m)	Sept. 30	The BOLD effect on the MR signal, Neuronal metabolic activity, and neurovascular coupling	Ch. 6
2 (1h:30m)	Oct. 5	The hemodynamic response	Ch. 7
2 (1h:30m)	Oct. 7	Properties of the BOLD signal and stimuli used in fMRI studies	Ch. 7
3 (1h:30m)	Oct. 12	Separating wanted from unwanted signal	Ch. 8
3 (1h:30m)	Oct. 14	Image processing steps (‘pipelines’) and experimental design	Ch. 8-9

4 (1h:30m)	Oct. 19	Statistical analysis of stimulus evoked BOLD fMRI	Ch. 10
4 (1h:30m)	Oct 21	Stimulus evoked fMRI applications in cognitive neuroscience	Ch. 10-11
5 (1h)	Oct. 26	Exploratory and 'connectivity' analyses of fMRI and applications part 1	Ch. 11-12
5 (1h)	Oct. 28	Exploratory and 'connectivity' analyses of fMRI and applications part 2	Ch. 11-12

*Disclaimer: Topics outlined in the schedule above are subject to change. The present syllabus represents the instructor's current plans and objectives. As the course progresses, scheduled topics and the instructor's considerations of relevant topics may change in order to enhance the student's learning. Such changes will be communicated clearly and in a timely fashion and is not unusual or unexpected.

Course Materials and Technology:

REQUIRED TEXT(S): Scott a. Huettel, Allen W. Song and Gregory McCarthy, Functional Magnetic Resonance Imaging 3rd Edition 2014 Sinauer. **ISBN:** 0878936270, 9780878936274

RECOMMENDED TEXT(S):

Richard B. Buxton, Introduction to Functional Magnetic Resonance Imaging: Principles and Techniques, 2nd Edition, Cambridge University Press, 2009. **ISBN:** 1139481304, 9781139481304

Michael Gazzaniga, Richard B. Ivry. Cognitive Neuroscience: Biology of the Mind, 4th Edition, W.W. Norton, 2013. **ISBN:** 0393922286, 9780393922288

ADDITIONAL RESOURCES: The professor may assign literature to complement discussions of specific textbook chapters. Representative papers are below.

Representative Readings:

Malonek, D., Dirnag l,U., Lindauer, U., Yamada, K., Kanno, I.,and Grinvald, A.(1997).Vascular imprints of neuronal activity: relationships between the dynamics of cortical blood flow, oxygenation, and volume changes following sensory stimulation. Proc. Natl. Acad. Sci. U.S.A. 94, 14826–14831.

Thompson, J.K.,Peterson,M.R., and Freeman,R.D.(2003).Single neuron activity and tissue oxygenation in the cerebral cortex. Science 299, 1070–1072.

Kasischke, K.A.,Vishwasrao, H.D., Fisher,P.J., Zipfel, W.R., and Webb, W.W.(2004). Neural activity triggers neuronal oxidative metabolism followed by astrocytic glycolysis. Science 305, 99–103.

Fox, P.T., and Raichle, M.E.(1986). Focal physiological uncoupling of cerebral blood flow and oxidative metabolism during somatosensory stimulation in human subjects. Proc. Natl. Acad. Sci. U.S.A. 83, 1140–1144.

Lee,S.P., Duong, T.Q., Yang,G., Iadecola, C.,and Kim,S.G.(2001). Relative changes of cerebral arterial and venous blood volumes during increased cerebral blood flow: implications for BOLD fMRI. Magn. Reson.Med. 45, 791–800.

Logothetis, N.K., Pauls,J., Augath, M., Trinath,T., and Oeltermann,A. (2001). Neurophysiological investigation of the basis of the fMRI signal. Nature 412, 150–157.

Davis, T.L., Kwong, K.K., Weisskoff, R. M., and Rosen, B.R. (1998). Calibrated functional MRI: mapping the dynamics of oxidative metabolism. Proc. Natl. Acad. Sci. U.S.A. 95, 1834–1839.

Attwell, D., and Iadecola, C. (2002). The neural basis of functional brain imaging signals. Trends Neurosci. 25, 621 - 625.

Buckner RL, Kelley WM, Petersen SE (1999) Frontal cortex contributes to human memory formation. Nature Reviews in Neuroscience, 2: 311-314.

For technical support for this class, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- UF eLearning

Academic Requirements and Grading:

Assignments: Quizzes or short tests will be given to assess students on concepts covered in the lectures. The quizzes correspond to 90 % of the total grade. Review quizzes will be on the subject matter of the prior week and will be due every Tuesday morning at 9 am before the next class. Each student is responsible for timely completion of quizzes. Please note that tests are individual and the instructor will check for plagiary or copying.

Grading: Take home or in class assignments will be graded according to the table below. Multiple choice may be used in combination with short answer questions.

Requirement	Due date	Points or % of final grade (% must sum to 100%)
Week 1 Review quiz	Oct. 2	20 points
Week 2 Review quiz	Oct. 9	20 points
Week 3 Review quiz	Oct. 16	20 points
Week 4 Review quiz	Oct. 23	20 points
Week 5 Review quiz	Oct. 28	15 points
Class participation	n/a	5 points

Point system used (i.e., how do course points translate into letter grades).

Percentage Earned	Letter Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
Below 60	E

Please be aware that a C- is not an acceptable grade for graduate students. The GPA for graduate students must be 3.0 based on 5000 level courses and above to graduate. A grade of C counts toward a graduate degree only if based on credits in courses numbered 5000 or higher that have been earned with a B+ or higher.

Letter Grade	Grade Points
A	4.0
A-	3.67
B+	3.33
B	3.0
B-	2.67
C+	2.33
C	2.0
C-	1.67

D+	1.33
D	1.0
D-	0.67
E	0.0
WF	0.0
I	0.0
NG	0.0
S-U	0.0

More information on UF grading policy may be found at:

http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Exam Policy: Exams will be given either as take-home tests to be handed in on specific dates or in class exams. Assignment policies are consistent with university policies. In general, acceptable reasons for absence from or failure to participate in class include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligation, severe weather conditions, religious holidays and participation in official university activities such as music performances, athletic competition or debate. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved.

Policy Related to Make up Exams or Other Work: Students may take missing exams. The student will need to coordinate with the professor to take the exam outside of the normal class hours. A reasonable excuse consistent with University Policies listed above under 'Assignment Policy" will be requested from the student.

Please note: Any requests for make-ups due to technical issues MUST be accompanied by the UF Computing help desk (http://helpdesk.ufl.edu/) correspondence. You MUST e-mail me within 24 hours of the technical difficulty if you wish to request a make-up.

Policy Related to Required Class Attendance: Attendance is important. Absence may occur due to personal or health reasons. The student should meet with the professor to discuss and obtain the missed class materials.
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Excused absences must be consistent with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance). Additional information can be found here:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Student Expectations, Roles, and Opportunities for Input:

Expectations Regarding Course Behavior: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php.

Communication Guidelines: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats.
http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf

Academic Integrity: Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

"**We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity**."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:
https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/
http://gradschool.ufl.edu/students/introduction.html
Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Online Faculty Course Evaluation Process:
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on

how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/ . Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Support Services:

Accommodations for Students with Disabilities:
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting https://disability.ufl.edu/students/get-started/ . It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health:

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: http://www.counseling.ufl.edu. On line and in person assistance is available.

- You Matter We Care website: http://www.umatter.ufl.edu/. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.

- The Student Health Care Center at UF Health is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at UF Health offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: https://shcc.ufl.edu/

- UF Health Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road,Gainesville, FL 32698, ufhealth.org/emergency-room-trauma-center.

- University Police Department: Visit police.ufl.edu/ or call 352-392-1111 (or 9-1-1 for emergencies).

- Crisis intervention is always available 24/7 from:

  Alachua County Crisis Center:
  (352) 264-6789
  http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services career.ufl.edu/.

Library Support: cms.uflib.ufl.edu/ ask various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall 352-392-2010 or to make an appointment 352 392-6420. General study skills and tutoring. teachingcenter.ufl.edu/

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. writing.ufl.edu/writing-studio/

Student Complaints On-Campus: sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

On-Line Students Complaints: distance.ufl.edu/student-complaint-process

Zoom Information for Course:

Marcelo Febo is inviting you to a scheduled Zoom meeting.

Topic: GMS6082-FEBO(26974) - Intr Fun Mag Res Imag
Time: Sep 28, 2021 01:00 PM Eastern Time (US and Canada)
Every week on Tue, Thu, until Oct 28, 2021, 10 occurrence(s)
Sep 28, 2021 01:00 PM
Sep 30, 2021 01:00 PM
Oct 5, 2021 01:00 PM
Oct 7, 2021 01:00 PM
Oct 12, 2021 01:00 PM
Oct 14, 2021 01:00 PM
Oct 19, 2021 01:00 PM
Oct 21, 2021 01:00 PM
Oct 26, 2021 01:00 PM
Oct 28, 2021 01:00 PM

Please download and import the following iCalendar (.ics) files to your calendar system.
Weekly: https://ufl.zoom.us/meeting/tJ0lcuugqD0iGNXoTHf-eXzxCzCQvVJZo0VP/ics?icsToken=98tyKuChpj4oEtKTuBuGRox5Go_4a_zwpiFHjY1lkyvNBW1WWhnuFfhhA6RJOuLf

Join Zoom Meeting
https://ufl.zoom.us/j/99852866821?pwd=bFpVbEhIQjEvWWRwZEhremgwUXR3Zz09

Meeting ID: 998 5286 6821
Passcode: 9k240r
One tap mobile
+16465588656,,99852866821# US (New York)
+13017158592,,99852866821# US (Germantown)

Dial by your location
+1 646 558 8656 US (New York)
+1 301 715 8592 US (Germantown)

+1 312 626 6799 US (Chicago)
+1 669 900 6833 US (San Jose)
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
Meeting ID: 998 5286 6821
Find your local number: https://ufl.zoom.us/u/aABJEG9Yj

Join by SIP
99852866821@zoomcrc.com

Join by H.323
162.255.37.11 (US West)
162.255.36.11 (US East)
115.114.131.7 (India Mumbai)
115.114.115.7 (India Hyderabad)
213.19.144.110 (Amsterdam Netherlands)
213.244.140.110 (Germany)
103.122.166.55 (Australia)
149.137.40.110 (Singapore)
64.211.144.160 (Brazil)
69.174.57.160 (Canada)
207.226.132.110 (Japan)
Meeting ID: 998 5286 6821
Passcode: 134527

Join by Skype for Business
https://ufl.zoom.us/skype/99852866821