Course Approval Form

For instructions: *http://registrar.gmu.edu/facultystaff/catalog-revisions/course/*

Action Requested: (definitions available at website above)
[x] Create NEW [ ] Inactivate
[ ] Modify (check all that apply below)

[ ] Title [ ] Repeat Status [ ] Prereq/coreq [ ] Grade Mode
[ ] Credits [ ] Schedule Type [ ] Restrictions [ ] Other: _____

Course Level: [X] Undergraduate [ ] Graduate

College/School: College of Science **Department:** Neuroscience
Submitted by: Saleet Jafri **Ext:** 3-8420 **Email:** sjafri@gmu.edu

Subject Code: NEUR **Number:** 480
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term: [X] Fall [ ] Spring [ ] Summer *Year* 2017

Title: Current
Banner (30 characters max w/ spaces)
New Biological Bases of Alzheimer's Disease

Fulfills Mason Core Req? (undergrad only)
[ ] Currently fulfills requirement
[ ] Submission in progress

Credits: (check one) [X] Fixed → 3 [ ] Variable → to [ ] Lec + Lab/Rct→ 0 or

Repeat Status: (check one) [X] Not Repeatable (NR) [ ] Repeatable within degree (RD) → [ ] Repeatable within term (RT) → Max credits allowed: (required for RT/RD status only)

Grade Mode: (check one) [X] Regular (A, B, C, etc.) [ ] Satisfactory/No Credit [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT if linked sections will be offered
[X] Lecture (LEC) [ ] Lab (LAB) [ ] Recitation (RCT) [ ] Internship (INT)
[ ] Independent Study (IND) [ ] Seminar (SEM) [ ] Studio (STU) [ ] Activity (ACT)
[ ] Research (RSC) [ ] Student Teaching (STC) [ ] Thesis (THS-798/799) [ ] Dissertation (DIS-998/999)

Prerequisite(s) (NOTE: hard-coding requires separate Prereq Checking form; see above website): PSYC 375; PSYC 376; PSYC 372 or equivalent; or permission of instructor

Corequisite(s):

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code(s).

Equivalencies (check only as applicable):
[ ] YES, course is 100% equivalent to
[x] YES, course renumbered to or replaces: NEUR 380

Catalog Copy (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
A survey of the causes, symptoms, drug treatments, risk factors and preventative measures associated with Alzheimer's disease.	

Indicate number of contact hours: Hours of Lecture or Seminar per week: 3 Hours of Lab or Studio:
When Offered: (check all that apply) [ ] Fall [ ] Summer [X] Spring

Approval Signatures

Department Approval Date College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

Undergraduate or Graduate Council Approval

UGC or GC Council Member Provost's Office UGC or GC Approval Date

Form revised 11/10/2016

Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL COURSES (required)
Course Number and Title: NEUR 480

Date of Departmental Approval: December 2016

FOR NEW COURSES (required if creating a new course)

- Reason for the New Course:

This course replaces NEUR 380. The material in this class is quite advanced. It has been taught as a NEUR 461 (special topics) class for the last two years so that it can be cross listed as PSYC 592. As 592 it has been taken by graduate students in Psychology and in Community Health. It could attract more students if it were listed in the schedule of classes as a course on Alzheimer's disease, rather than as a special topics class.

- Relationship to Existing Programs:

We are making the prerequisites more flexible as students in Community Health have also taken this course and may do so in the future.

- Relationship to Existing Courses: Replaces NEUR 380.

- Semester of Initial Offering: Spring 2018

- Proposed Instructors:

- Insert Tentative Syllabus Below

ALZHEIMER'S DISEASE, SPRING 2017

DR. JANE FLINN

THE GOAL OF THIS COURSE IS TO UNDERSTAND THE BIOLOGICAL CAUSES OF ALZHEIMER'S DISEASE, THE BEHAVIORS ASSOCIATED WITH THE DISEASE, AND POSSIBLE THERAPEUTIC APPROACHES.

SYLLABUS (DRAFT)

JAN 24/26. Overview
History of AD. Different types of memory
AD is characterised by cognitive impairments and the presence of deposits, plaques and tangles, in the brain. Functional anatomy of the brain. There are different forms of memory which depend on different brain regions.
Maurer,1997, Julia vignettes in Decoding Darkness.

JAN 31/Feb 2 . Correlates of brain pathology in AD and behavioural changes.
Assessment of behavioural changes seen in AD.
Speaking our Minds. Aging with Grace, Chapter 9 pp 140-152.

FEB 7/9 . Stains and Imaging; Localization of brain damage .
How do you know what brain damage there is and where the amyloid and tau are? Different types of plaques and amyloid; cerebral amyloid angiopathy (CAA). Tangles are another marker for AD. Histological studies, Imaging studies. fMRI and PET. AD may begin much earlier than we thought.
Braak and Braak, 1991. Cohen .and Klunk , 2015. Early detection of Alzheimer's disease using PiB and FDG PET. Kirby 2015, Marquie, et al, 2015.

FEB 14/16 Where does amyloid come from?
Amyloid is produced from APP. Enzymes involved with APP and amyloid. The search for the genes underlying AD. There are 2 forms of AD, early-onset and late-onset.
Decoding Darkness. Hardy & Selkoe, 2002.

FEB 21/23. Other factors involved in AD
The role of tau. APOE4, a late-onset gene, may interact with the blood brain barrier .
Decoding Darkness. Aging with Grace, Chapter 8. Yu et al. 2014. (Zlokovic, TBA,)
APOE4, a late-onset gene.
FRIDAY FEB 24, LAST DAY TO DROP WITHOUT PENALTY OF "F"

FEB 28/MAR 1 Animal models: Mice are useful. Soluble versus non-soluble amyloid.
Transgenic mice have been used to model AD. They can be used to assess treatments and understand factors influencing the progress of the disease. Hsiao, J20 and triple transgenic mice.
Behavioral measures of memory loss, LTP. Memory loss is seen before plaques appear and may be due to soluble amyloid which precedes τ. There is synaptic damage. ADDLS, oligomers, etc.

Billings et al., (2005) Selkow (2002). Student presentation/paper topics due.

MAR 7/9 Can Alzheimer's be stopped? (Film)
AD may begin much earlier than we thought. The default network is altered early in AD.

MAR 13/19 SPRING BREAK

MAR 21/23 review, EXAM

MAR 28/30 Role of metals in AD.
Possible role of the metals in AD. The plaques are high in iron, copper, zinc, and (?) aluminium. Zinc can cause memory loss, but this may be due to an induced copper deficit. Zinc is prescribed for age-related macular degeneration. Cholesterol with copper may be a risk factor. Iron may be dangerous. Drugs acting as Metal ionophores; PBT2 is a possible remedy for AD.
Anti-cholesterol drugs.
Sparks & Schreurs, 2003. Duce et al, 2011. (Bush et al, 2008, Duce et al, 2010, James 2012.)
Bjorklund et al. 2012.

APR 4/6 Risk factors
Lack of education, low SES, head injury (inflammation), stroke (smoking) are risk factors.
APOE status may have an interactive effect with the environment.
Prescription drugs can cause memory loss.
Aging with Grace. Snowden et al., 1997. Moceri et al., 2001.

APR 11/13 Prescription Drugs for AD; AChE inhibitors, most AD drugs target acetylcholine degradation.
Memantine targets a glutamate receptors. Antibody treatment may be effective.
Ballard et al., 2005. Parsons et al., 2007

APR 18/20 Preventative factors.
Exercise, education, and music, etc. are helpful.
Diet can include foods with folic acid, caffeine and those acting as anti oxidants: dark chocolate, spinach, blueberries, curcumin, pomegranates. The rate of dementia might be going down
Adlard et al., 2005. Mathews et al., 2013, Drew, 2014.

APRIL 25/27
Grad Student presentations.

MAY2/4 Summary.

PAPERS DUE MAY 5
FINAL EXAM DUE MAY12TH (take home)
There will be a take home quiz most weeks on an assigned paper. The exams will be fill-in-the-

blank and essays. Graduate student presentations should be ~ 20 mins (- points for going over!)
GRADING
MID-TERM EXAM, 30%
FINAL EXAM 30%
IN CLASS PARTICIPATION, INCLUDING IN-CLASS QUIIZES. 5%

UNDERGRADUATE, QUIZZES 15% , PAPER 10%
GRADUATE, QUIZZES 10%
IN-CLASS PRESENTATIONS 7%, PAPER 8% (ON SAME SUBJECT AS PRESENATION.)

OFFICE HOURS, TU 3-4, TH 4:30-5 DKH AND BY APPOINTMEN
PHONE, 993-4107
OFFICE, DKH 2022
E-MAIL jflinn@gmu.edu

Books

Aging With Grace, D. Snowden. Describes the School Sisters of Notre Dame study in which risk factors for Alzheimer's disease are studied.

Speaking Our Minds L. Snyder. Personal reflections from individuals with Alzheimer's disease.

Decoding Darkness, R. Tanzi & A. Parsons. A history of the search for genes underlying Alzheimer's disease.

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Required Papers

Adlard P.A., Perreau V.M., Pop V. & Cotman C.W.. Voluntary exercise decreases amyloid load in a transgenic model of Alzheimer's disease, *J Neurosci* **25** (2005), 4217-4221.

Ballard C.G., Greig N.H., Guillozet-Bongaarts A.L., Enz A. & Darvesh S. (2005) Cholinesterases: roles in the brain during health and disease. Curr. Alzheimer res. 2(3):307-18

Billings L.M., Oddo S., Green K.N., McGaugh J.L. & LaFerla M. (2005) Intraneuronal Aβ Causes the onset of early Alzheimer's disease-related cognitive deficits in transgenic mice. Neuron. Mar 3;45(5):675-88

Bjorklund NL, Reese LC, Sadagoparamanujam VM, Ghirardi V, Woltjer RL, Taglialatela G. (2012) Absence of amyloid β oligomers at the postsynapse and regulated synaptic Zn2+ in cognitively intact aged individuals with Alzheimer's disease neuropathology. Mol Neurodegener. 7:23 (Find on google)

Braak H. & Braak E. (1991) Neuropathalogical staging of Alzheimer-related changes. Acta Neuropath 82:239-159.)

Buckner R.L., Andrewa-Hanna J.R., Schatcter D.L. (2008) The Brain's Default Network, Anatomy, Function, and Relevance to Disease. Ann. N.Y. Acad. Sci. 1124: 1–38 (2008).

Cohen AD, Klunk WE. (2015). Early detection of Alzheimer's disease using PiB and FDG PET. Neurobiol

Dis. 2014 Dec;72 Pt A:117-22.

Drew L. (2014) Down with Dementia. New Scientist, Jan 11.

Duce J.A., Bush, A.I. Adlard P.A. (2011) Role of amyloid-β- metal interactions in Alzheimer's disease. (2011). Future Neurology, 6(5):641.

Hardy J. and Selkow D. (2002). The amyloid hypothesis of Alzheimer's disease: progress and problems on the road to therapeutics. Science 297(5580): 353-356.

Hsiao K. Chapman P., Nilsen S., Eckman C., Harigaya Y., Younkin S., Yang F., and Cole G. (1996) Correlative memory deficits, Abeta elevation, and amyloid plaques in transgenic mice. Science 274:99-102.

Kirby, T. (2015) William Klunk: imaging Alzheimer's disease in vivo Lancet Neurol. 14(8):791.

Marquie et al, (2015) Validating novel tau positron emission tomography tracer [F-18]-AV-1451 (T807) on postmortem brain tissue. Ann Neurol. 2015 Nov;78(5):787-800

Maurer, K., Volk S., Gerbaldo H. (1997). Auguste D. and Alzheimer's disease. Lancet, 349:1546-49.

Mathews, F.E., Arthur, A., Barnes, L.E., Bond, J., Jagger, C., Robinson, L., Brayne, C. (2013). A two-decade comparison of prevalence of dementia .... Lancet 382: 1405-1411

Moceri VM, et al. (2001) Using census data and birth certificates to reconstruct the early-life socioeconomic environment and the relation to the development of Alzheimer's disease. Epidemiology. 12(4):383-9.

Parsons, C.G., Sto¨ffler, A., Danysz, W. Memantine: a NMDA receptor antagonist that improves memory by restoration of homeostasis in the glutamatergic system - too little activation is bad, too much is even worse. Neuropharmacology 53 (2007) 699e723

Selkoe D.J. Alzheimer's disease is a synaptic failure. (2002) Science 298:789-791.

Snowden et al. Brain Infarction and the clinical expression of Alzheimer Disease. The Nun Study. (1997) JAMA 277:813-817.

Sparks D.L. & Schreurs B.G. Trace amounts of copper in water induce beta-amyloid plaques and learning deficits in a rabbit model of Alzheimer's disease. P.N.A.S. (2003) 100(19) :11065-9.

Yu, J.T., Tan, L., Hardy J. Apolipoprotein E in Alzheimer's Disease: An Update. Annu Rev Neurosci. 2014

Reference papers

Bero AW, Yan P, Roh JH, Cirrito JR, Stewart FR, Raichle ME, Lee JM, Holtzman DM (2011) Neuronal activity regulates the regional vulnerability to amyloid-β deposition. Nature Neurosci. Jun;14(6):750-6.

Bishop G.M., Robinson S.R., Liu Q., Perry G., Atwood C.S., & Smith M.A.. (2002). Iron: A pathological marker of Alzheimer Disease? Developmental Neuroscience, 24:184-187.

Bjorklund NL, Sadagoparamanujam VM, Taglialatela G. (2012) Selective, quantitative measurement of releasable synaptic zinc in human autopsy hippocampal brain tissue from Alzheimer's disease patients. J. Neurosci Methods. 203(1):146-51.

Duce et al. (2010) Iron-export ferroxidase activity of β-amyloid precursor protein is inhibited by zinc in Alzheimer's disease. Cell. 142(6):857-67.

House E., Collingwood J., Khan A., Korchazkina O., Berthon G., and Exley C. (2004) Aluminum, iron, zinc and copper influence the *in vitro* formation of amyloid fibrils of $A\beta_{42}$ in a manner which may have consequences for metal chelation therapy in Alzheimer's disease. J. Alz. Dis. 6:291-301.

James SA, Volitakis I, Adlard PA, Duce JA, Masters CL, Cherny RA, Bush AI. (2012) Elevated labile Cu is associated with oxidative pathology in Alzheimer disease. Free Radic Biol Med. 2(2):298-302

Linkous, D. H.. Adlard P.A., Wanschura P.B., Conko K.M., Flinn J.M. (2009) The effects of enhanced zinc on spatial memory and plaque formation in transgenic mice. J. Alzheimer's Disease. 18(3) 541-551.

Ognibene E., Middei S., Daniele S., Adriani W., Ghirardi O., et al. (2005) Aspects of spatial memory and behavioral disinhibition in Tg2576 transgenic mice as a model of Alzheimer's disease. Behav. Brain Res. 2005:225-232.

Roberts BR, Ryan TM, Bush AI, Masters CL, Duce JA. (2012) The role of metallobiology and amyloid-β peptides in Alzheimer's disease. Neurochem. 2012 Jan;120 Suppl 1:149-66. *

Tanzi R. (2005) The synaptic Aβ hypothesis of Alzheimer disease. Nature Neuroscience 8: 977-979. (2005)

Alzheimer's Disease, George Perry, an e book

If you are a student with a disability and you need academic accommodations, please see me and contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through that office.

Honor Code

George Mason University has an Honor Code, which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited. It is every student's responsibility to familiarize himself or herself with the Honor Code. The Honor Code is available at: http://oai.gmu.edu/the-mason-honor-code-2/ All violations of the Honor Code will be reported to the Honor Committee.

Communications via GMU E-mail:

Mason uses electronic mail to provide official information to students. Examples include communications from course instructors, notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their Mason e-mail account and are required to activate that account and check it regularly.

Technology

Quizzes will be posted on Blackboard. Dr Flinn and the TA will also communicate with students in the class via e mail.

Cell phones may not be used in class. Students may use computers to take class notes but for no other purpose. I may ask to see your notes at the end of class, those using the computer for other reasons than not taking can get a zero on the next quiz.

Class Cancellation

If class has to be cancelled, e.g. for weather, an e mail will be sent to the class. In such cases the class will be rescheduled during the snow day.

Add/Drop deadlines

1/30 last day to add/drop with no tuition penalty, 2/13 last day to drop with a 33% tuition penalty, 2/24 last day to drop with 67% tuition penalty