Spring 3-23-2020

MIT 362-102: Geriatric Engineering I (Revised for Remote Learning)

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Syllabus MIT 362 Spring 2020 (Updated)

Grading:

Exam(s)
- Midterm Exam 15%
- Final Exam 20%

Homework
- Bi-Weekly assignment 40%
- Final project 25%
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Exams (modified for njit campus closures)
- Four versions of exams emailed to students randomly to ensure no class collaboration
- Strict 2hr time limits to return answers.
- Answers must exclude any screen shots or automated online tools, diagrams of anatomy and physiology including coronary systems have to be handwritten and scanned or pictures via phone returned.
- During exam a WebEx session will be on.

Class Schedule:

Modifications to in class lectures:

Additional videos and PowerPoints have been added to canvas using Kaltura to cover weekly topics and exam review videos replace the final exam review.

(students receive weekly emails about class material, and require acknowledgement to take attendance)

WEEK 1:

-Introduce the unique challenges individuals experience as they age. **Introduction to System Design** to facilitate assistive technologies that foster independent living.

-Introduction to Microcontrollers: the Raspberry Pi and Arduino. Setup and physical attributes. Setup of base software distribution.

Lab Assignment:
- Students setup Raspberry Pi hardware.
- Introduction to the Raspberry Pi and Arduino. Setup and physical attributes. Setup of base software distribution.

WEEK 2:

System characterization:

i. **Identification of objectives, design variables, constraints, subsystems**
ii. System-level coupling and interactions
iii. Visualization techniques in design optimization

Lab Assignment:
- Complete sample program.
- Hello World: Using IDLE 3 the Python interpreter.

WEEK 3:

Automation Techniques for Intelligent Environments

Lab Assignment: Overview of the general purpose input / output pins of the Raspberry Pi.

WEEK 4:

Research Techniques for **focus groups** for aging population, to identify individual challenges.

Reference: http://www.cse.lehigh.edu/~glennb/mm/FocusGroups.htm

Lab Assignment: Create rudimentary circuit using buttons, LEDs, and potentiometers to interact with the physical world.

WEEK 5:

Costs and resources of home living vs assistive environments.

Many families struggle to make decisions about the best living situation for their aging parent. Most seniors, if given the choice, would choose to remain in their own home for as long as possible, and most families want to respect that choice. What is it that makes staying home possible? This is very subjective and varies in each situation. Many family members or caregivers have a threshold - an event in which they know that living at home is no longer an option, yet others are absolute in their commitment to keep their loved one at home no matter the circumstances. There are many options, some of which people don't always think about:

Reference: Assisted Living & In-Home Care Compared: *May 6, 2015*

http://www.aplaceformom.com/senior-care-resources/articles/seniors-stay-home-or-move

WEEK 6:

Subsystem model development:

i. Model partitioning and decomposition, interface control
ii. Collaborative Optimization
iii. Subsystem model selection: fidelity versus expense
iv. Model and simulation development and validation

WEEK 7:

Optimization and exploration techniques:

i. **Design Space Exploration:** Design of Experiments (DOE): Full factorial search, parameter study, Taguchi/orthogonal arrays, latin hypercubes
ii. Review of linear and nonlinear programming
iii. Heuristic techniques
iv. Mixed integer programming

Lab Assignment: Introduction to **sensors.** Setting up circuits to monitor, and record humidity and temperature.

WEEK 8:

Midterm

WEEK 9:

Introduction to robust design

i. Monte-Carlo Sampling
ii. Design under uncertainty
iii. Reliability analysis

Lab Assignment: Introduction to E-Health: Biosensors. Complete setup and take readings of various sensors. Muscle, Heart, and environmental.

WEEK 10:

Implementation Issues and Real World Applications (Part I)

System assessment and extensions:

i. What is optimality?
ii. Design for value: including lifecycle costing
iii. Optimizing product families and platforms

Lab Assignment: Python, C, and Me: Create Python and Arduino applications to interact with and visualize sensor data

WEEK 11 & 12:

Implementation issues: (Part II)

i. Model reduction
ii. Approximation techniques: response surfaces, kriging, neural networks
iii. Concurrent design

Lab Assignment: Short Circuit Part 2: Create more complex circuits to interact with Raspberry Pi and activation of various sensor modules.

WEEK 13 and Week 14
Two Week Term Project

Term Project: This is central to the success of the course. Students form small teams with between two and three members (no individual projects!). They can choose between a number of sample projects provided by the faculty or pick a project based on their own research. The semester culminates with a final project presentation and writing a final report in the form of a conference article.

Putting it all together: Final Project: Setup and use of open-source software in conjunction with medical sensors to create an all-in-one solution for medical personnel in remote areas.

MIT 360: Introduction to Gerontology

COURSE DESCRIPTION:

Introduction to Gerontology is an introduction to the field of human aging. The course of study will include a multidisciplinary examination of the way in which human aging is viewed – how we perceive the process of growing older and how society responds to the issues of aging. The class will look at aging from multiple perspectives that include the social, political and biological sciences, arts and humanities, care giving and social services.

This proposed course will provide students with an understanding of the the unique challenges individuals experience as they age. Second it provides some basic hands/labs on entry into the emerging field of assitive technologies and personal and mobile sensors

COURSE OBJECTIVES:

This proposed course will provide students with an understanding of the the unique challenges individuals experience as they age. Second it provides some basic hands/labs on entry into the emerging field of assitive technologies and personal and mobile sensors

REQUIRED TEXTBOOKS:

Required Text: Aging 12-13, Annual Edition, edited by Harold Cox, Ph.D., Indiana State University. New York: Dushkin/McGraw-Hill.

Supplementary Materials: Include all the materials posted under "Course Documents" on

Blackboard. These materials are supplements to the textbook and provide additional resources and researched on gerontological issues.

RECOMMENDED READING:

There are several great resources on the web for project ideas:

1. "Universal Design: A Step toward Successful Aging:" http://www.hindawi.com/journals/jar/2013/324624/
2. "HCI and the older population": http://www.hindawi.com/journals/jar/2013/324624/

Schedule:

WEEK 1:

Introduction to Gerontology

- Review of the course syllabus & assignments
- Overview of gerontology
- Aged & aging for all ages
- Social gerontology/ biogerontology/ medical gerontology (Geriatric)

Lab: Intro to basic assistive technologies

WEEK 2:

The Demography of Aging

- Aging facts & statistics
- Baby boomers
- Growth & diversity in older population

Lab: Part I Utilizing existing user interfaces (manufacturer) programming devicves

WEEK 3:

The Phenomenon of Aging

- Chronological age, psychological age, sociological age, functional age
- Optimal aging, normal aging, pathological aging and successful aging

http://www.pbs.org/wgbh/pages/frontline/livingold/

Lab: Part II Utilizing existing user interfaces (manufacturer) programming devicves

WEEK 4:

Aging Process

- Theories in aging
- Sociological, psychological, and biological theories of aging
- Rowe & Kahn Model / Baltes & Baltes Definition
- Myths & realities of Aging

Lab: Part III Utilizing existing user interfaces (manufacturer) programming devicves

WEEK 5:

Exploring Life Extension

- Life expectancy / Life Span
- Longevity quiz game
- Longevity / postponing human aging
- Is it good or bad for mankind? Living Longer … Living Better?
- Video: Immortality Institute

http://video.google.com/videoplay?docid=6581761732541483047&q=immo

rtality or http://www.imminst.org/film

Lab: Part IV Utilizing existing user interfaces (manufacturer) programming devicves

WEEK 6:

Generational Differences

- Current living generations
- Challenges and rewards of intergenerational intergenerational relationships
- Intergenerational programs and community resources
- Video: Family Matters / San Pascual Academy

http://www.youtube.com/watch?v=lTMsRBYEGSc

Lab: Part I: Integrating Multiples sensors into cohesive monitoring System

WEEK 7: Societal Attitudes toward Old Age

- Images of aging

- Combating ageism

- Stereotypes

- Is aging a sub-culture?

- Cognitive aging

- Fighting Stereotypes & Ageism in Society

Lab: Part II: Integrating Multiples sensors into cohesive monitoring System

WEEK 8:

Mid-term Exam

WEEK 9:

Aging in the New Millennium

- Overview of elder abuse
- Abuse categories
- Reporting abuse
- Adult Protective Services
- Overview of Alzheimer's disease
- Symptoms and diagnosis
- Causes and risk factors
- Treatments and research
- Caring for a patient with Alzheimer's disease

 Mental Disorder

Depression, Dementia

- Suicide

Lab: Class project (multiple weeks) brain storming new assistive tehnologies

WEEK 10:

The Health Care System in United States

- Types of health plan
- Medicaid/ Medical/ Medicare (Part A, B, and D)
- Indemnity/ Managed care (PPO, HMO, POS, EPO)
- Universal Health Care System
- Primary care physicians (gatekeepers)/ Specialists

 Out of pocket costs

- Co-payment
- Premium
- Deductible
- Maximum annual cap
- Long term care
- Hospice care / nursing homes/ others

Lab: Class project (multiple weeks) brain storming new assistive tehnologies

WEEK 11:

Retirement: American Dream or Dilemma?

- History of retirement
- Retirement planning from a life course perspective
- Importance of maintaining physical and mental health
- Effect of career choices on retirement planning
- Financial planning for retirement (Four-Legged Stool analogy)
- Impact of retirement on roles and relationships
- Role Theory, Continuity Theory
- Timing/ class/ education/ gender differences/ family relationships

 Future of retirement

- Shift from "retirement" to "productive aging"
- Age integrated vs. age segregated society
- The Age Discrimination in Employment Act

 Video: David Walker on CBS 60 Minutes

http://video.google.com/videoplay?docid=-7461407498377956300#

Lab: Class project (multiple weeks) brain storming new assistive tehnologies

WEEK 12:

Caring for Aging Parents

Types of caregivers

- Caregiving Support Services
- The Inner Circle/ Sharing the Care with Sibling
- The Eden Alternative (nursing homes)
- Sandwich generation

 Video: And Thou Shalt Honor"

http://www.youtube.com/watch?v=CmZ1dOgMZk8

http://www.youtube.com/watch?v=AKSvQa29gvQ&mode=related&search

 Video: Burnout Among Caregivers

http://www.youtube.com/watch?v=NO7by5lYnXs

Lab: Class project (multiple weeks) brain storming new assistive tehnologies

WEEK 13:

The Experience of Dying

- Dying Process / Care of the Dying
- Death as Loss- Grieving and Going On
- Ethical & legal issues
- Preventing Late Life Suicide
- 5 wishes

 Leading Cause of Death Among older Adults

- Fall & Fall Prevention / Video
- Tobacco Use: Single most Preventable Cause of Death & Disease

- Suicide

WEEK 14:

Legal and Ethical Issues

Power of Attorney

- Conventional/ durable
- Living trust/ living will/advance healthcare directive
- Consumer & financial fraud
- Most common types of problems for seniors
- Health Insurance Counseling and Advocacy Program (HICAP)

Public policy Issues in Aging

Older American Acts

- Entitlement programs for the aged
- Structural lag and policy

 White House Conferences on Aging (WHCoA)

- 2015 WHCoA
- 5 Top Resolutions

Lab: Class Project Presentations

WEEK 15: Final Exam

Recommended READING LIST

A. Garrett, D. 2012. New Insights in Aging: 500 words at a time (Volume 1) http://www.amazon.com/New-Insights-Aging-words-Volume/dp/1470040999

or https://www.createspace.com/3784458

B. Arnett, Dixon and Chan, Wende Dawson, *The Wisdom To Choose: A Comprehensive Guide to Health and Independence for Elders.* Northridge, CA: Studio 4 Productions, 2002.
C. Handbook of Theories of Aging: Vern L, Bengtson and K. Warner Schaie, Editors By Vern L.Bengtson, Klaus Warner Schaie. Springer Publishing Company, 1999 http://books.google.com/books?id=7qpHuXKsaC0C&pg=PA60&lpg=PA60&dq=Phenomenon+of+Aging&source=web&ots=FPN5Uximu6&sig=IrMeqsV0F72pKN6YQwvrL7aZBoI&hl=en&sa=X&oi=book_result&resnum=2&ct=result#PPP1,M1
D. Brooks, David, *Bobos in Paradise: The New Upper Class and How They Got There.* NewYork: Simon & Schuster, Inc., 2000.
E. Northrup, Christiane, M.D., *Women's Bodies, Women's Wisdom*. New York: Bantam/Dell Publishing Group, 1998.
F. Thomas, William H., M.D., *Life Worth Living: How Someone You Love Can Still Enjoy Life in a Nursing Home.* Acton, MA: Wanderwyck & Bunham, 1997.
G. Weston, Liz Pulliam, "Most Households Not Saving Enough for Retirement, Analysis Shows," *Business Section, 4/27,00.* Los Angeles: The Los Angeles Times, 2000.
H. Health Insurance Counseling & Advocacy http://video.google.com/videoplay?docid=4552911981466723004&q=-

%09Health+Insurance+Counseling+and+Advocacy+Program&total=3&start=0&num=10&s

o=0&type=search&plindex=0

I. Aging in the New Millennium: Mental and Emotional Well-being
http://video.google.com/videoplay?docid=4065064255839599674&q=aging+issues&total=1

856&start=10&num=10&so=0&type=search&plindex=9

What's up with that? – Ageism http://video.google.com/videoplay?docid=-

1609200850107529103&q=ageing