

## Syllabus MIT 362 Spring 2022 (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:

- Identification of objectives, design variables, constraints, subsystems**
- System-level coupling and interactions
- 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 assitive 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 devices

### **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 devices

### **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 devices

### **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=immortality> or <http://www.imminst.org/film>

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

### **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=ITMsRBYEGSc>

**Lab: Part I:** Integrating Multiples sensors into cohesivemonitoring 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 cohesivemonitoring 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 technologies

**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 technologies

**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://wwwcreatespace.com/3784458>

B. Arnett, Dixon and Chan, Wende Dawson, *The Wisdom To Choose: A Comprehensive Guideto 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 VernL.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](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/DellPublishing Group, 1998.

F. Thomas, William H., M.D., *Life Worth Living: How Someone You Love Can Still Enjoy Lifein a Nursing Home*. Acton, MA: Wanderwyck & Bunham, 1997.

G. Weston, Liz Pulliam, "Most Households Not Saving Enough for Retirement, AnalysisShows," *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&so=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=1856&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>