#### Georgia Tech

**CREATING THE NEXT** 

# Nuclear and Radiological Engineering

Dr. Steven Biegalski September 22, 2020



The George W. Woodruff School of Mechanical Engineering

#### **Georgia Tech**



- #1 in engineering doctoral degrees awarded to African-Americans (Diverse Issues in Higher Education)
- 150 labs, centers and affiliate programs involving students in research.
- Fall 2018 engineering enrollment topped 14,000 making us the largest College of Engineering in the country.
- The Georgia Tech College of Engineering is the largest producer of engineering degrees awarded to women and underrepresented minority students according to the American Society of Engineering Education (ASEE) and Diverse: Issues in Higher Education.



## **Georgia Tech**

- 30% of undergraduate students participate in the co-op program, which is the largest voluntary co-op program in the nation.
- First year retention rate at Georgia Tech is 97%.
- All undergraduate programs and graduate programs are ranked in the top 10 by U.S. News.





#### **Georgia Tech Mission Statement**



"Through relentless innovation in pedagogy, research, and institutional practices, the College of Engineering empowers students and researchers to be interdependent learners who are fearless in the face of complex problems and eminent contributors in their fields."



# **Diversity at Georgia Tech**



- American Society for Engineering Education (ASEE) as number one in bachelor's degrees awarded to women
- Diverse: Issues in Higher Education as:



- No. 1 in engineering doctoral degrees awarded overall to minorities
  No. 1 in engineering doctoral degrees awarded to African American students
  No. 1 in engineering doctoral degrees awarded to Asian American students
- No. 2 in engineering undergraduate degrees awarded overall to minorities

**No. 2** in engineering undergraduate degrees awarded to African American students



# **Global Citizenship**

- 54% of B.S. recipients study or intern abroad prior to graduation. National rate is 15%
- 96.7% six-year graduation rate for those who study abroad. For those who do not, 76.1%
- Out of the total number of Tech students studying abroad, engineers make up 62%







## **Innovation Culture on Campus**



Georgia Tech

#### **Nuclear and Radiological Engineering**

- Program focus includes:
  - Nuclear Power
    - Fission
    - Fusion
  - Radiological Engineering
    - Radiation detection
    - Nuclear forensics
    - Nuclear analytical methods
    - Radiation methods in Industry
  - Medical Physics
    - Nuclear imaging
    - Radiation therapy





#### **Georgia Tech NRE Graduate Employment**

- About 20% of our NRE graduates go on to graduate school.
- Of the students entering the workforce, about half start their careers with companies that they intern or co-op with.
- Students obtain jobs across the US and internationally.





#### Internships/Co-Op

- Nuclear Power Industry
  - Southern Nuclear
  - SCANA
  - TVA
  - Entergy
  - Exelon
  - Duke Energy
  - GE Nuclear
  - Progress Energy
  - Westinghouse
  - AREVA

#### ➤National Laboratories

- LANL
- LLNL
- ANL
- SRS
- ORNL
- BNL
- SNL



#### **Curriculum - BSNRE (126 hours)**

- Broad-based curriculum emphasizing both NE and RE
- Prepares students for entry level jobs in industry or graduate school
- Allows students to co-op
- 1<sup>st</sup> four semesters include modern physics + 2 NRE introductory courses
- Next four semesters include an advanced math + 9 NRE courses:

Radiation physics, detection & lab + reactor physics, reactor engineering + radiation protection, radiation sources & application + capstone NRE design

Six electives: criticality safety, fusion, LWR technology, nuclear chemical engineering, radiation imaging, radiological assessment & waste management

Geor

Course offering – NRE courses are offered once a year

#### For more information please contact Dr. Steven Biegalski Steven.Biegalski@me.gatech.edu

www.nremp.gatech.edu



#### **Curriculum - BSNRE (126 hours)**

Year Fall	CHEM 1310 General Chemistry (See Note 2) 3-3-4	MATH 1551 Differential Calculus (Minimum Grade C) 2-0-2	MATH 1553 Intro to Linear Algebra (Minimum Grade C) 2-0-2	ENGL 1101 English Composition 1 3-0-3	Legislative HIST 2111, HIST 2112, POL 1101, INTA 1200, or PUBP 3000 [Social Science] 3-0-3	Wellness APPH 1040 or APPH 1050 2-0-2
1st Spring	PHYS 2211 Physics 1 3-3-4 MATH 1551, MATH 1552*	MATH 1552 Integral Calculus (Minimum Grade C) 4-0-4 MATH 1551	CS 1371 Computing for Engineers 3-0-3	ENGL 1102 English Composition 2 3-0-3	Social Science Elective (See Note 6) 3-0-3	= 16 hours = 17 hours
all	PHYS 2212	MATH 2551 Multivariable	NRE 2120 Elements of Nuclear & Rad.	COE 2001	Economics ECON 2100, 2101,	
Year Fa	3-3-4 PHYS 2211	(Minimum Grade C) 4-0-4 MATH 1552, MATH 1553	Engineering 3-0-3 MATH 1551, PHYS 2211*	2-0-2 MATH 1552, PHYS 2211	2105, or 2106 (See Note 4) 3-0-3	= 16 hours

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#### **Curriculum - BSNRE (126 hours)**

Year Fall	NRE 3112 Radiation Detection (See Note 1, No W's) 2-3-3 NRE 3301	NRE 3208           Nuclear Reactor Physics           3-0-3           CS 1371, MATH 2552, (NRE 2120 or NRE 3301)	ME 3340 Fluid Mechanics (See Note 7) 3-0-3 COE 2001, ME 3322* MATH 2551, MATH 2552, ME 2202 (See Note 7)	ME 3322 Thermo- dynamics 3-0-3 PHYS 2211, MATH 2552	ECE 3741 Instrument & Electronics Lab 0-3-1 ECE 3710	Humanities Elective (See Note 6) 3-0-3
3rd Spring	NRE 3026 Experimental Nucl. Reactor Physics (See Note 1, No W's) 2-3-3 NRE 3112, NRE 3208	NRE 3316 Radiation Protection Engineering 3-0-3 NRE 3301, MATH 2552	Concentration NE: ME 3345 RSE: Con. Elect. (See Note 5) 3-0-3	MATH 3670 Statistics & Applications 3-0-3 MATH 2551	ISYE 3025 Engineering Economics 1-0-1 ECON 2100, 2101, 2105 or 2106	Math/Science Elective 2000 Level or Above (See Note 3) 3-0-3
			NDE 4250			
Year Fall	Concentration NE: NRE 4210 RSE: Con. Elect. (See Note 5) 3-0-3	Concentration NE: NRE 4214 RSE: NRE 4328 (See Note 5) 3-0-3	NRE 4350 NRE Design Methods & Tools <u>3-0-3</u> NRE 3208, NRE 3112, NRE 3316, NRE 3026, (NRE 4238* or 4214*)	Free Elective 1000 Level or Above (See Note 3) 3-0-3	Engineering Elective 2000 Level or Above (See Note 3) 3-0-3	= 16 hours

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## **BS/MS** Program

Who should apply

Apply if completed 30 credit hours (before 75 hours) Shown appropriate progress in your degree program Obtained a GPA of 3.5 or higher

• How to apply:

A one-page application form One recommendation letter from a GT faculty A short biographical essay

• Why now (benefits)?

No application fee No GRE May be supported in your fifth year Will obtain both BS and MS degrees in five years

- Degree Combinations: BS/MS in NRE, BSNRE/MSMP
- Advising Steven Biegalski



#### **NRE Minor and Certificate Program**

Minor in N	uclear and Radiological Engineering							
NRE 2120	Elements of Nuclear and Radiological Engineering	3	hours					
NRE 3301	Radiation Physics	3	hours					
NRE Electi	9	hours						
	15	hours						
Certificate	in Nuclear and Radiological Engineering							
NRE 3301	Radiation Physics	3	hours					
NRE 3208	Nuclear Reactor Physics	3	hours					
NRE 3316	Radiation Protection Engineering	3	hours					
NRE Electi	3	hours						
	Total	12	hours					



#### **Scholarships**

- Department of Energy NEUP Scholarships
  - \$5000 per year
  - Application's typically due mid-February (look for e-mail announcements)
  - www.neup.gov
- National Academy for Nuclear Training (NANT) Scholarship ٠
  - www.nei.org/nantscholarships/
  - \$2500 per yearApply by 2/1
- American Nuclear Society Scholarships
  http://www.ans.org/honors/scholarships/
  Range of \$\$\$ and eligibility requirements
  Entering Freshmen Scholarships Available
- Nuclear Regulatory Commission Scholarships
  - \$10,000 per year ٠
  - Must make commitment to enter nuclear employment after graduation (can be deferred by attending graduate school)
  - GPA > 3.0
- Georgia Tech NRE scholarships •
  - Typically \$2000 per year (mostly for entering freshman & sophomores) depending on the availability of funds selected by the Chair



#### **Student Activities**

- NRE/MP Student Advisory Committee
- ANS Student Chapter
  - Faculty advisor: Dr. Dan Kotlyar
  - Website: [http://gtans.gatech.edu/site/
  - Chapter Officer
    - President: Reed Herner
- INMM Student Chapter
- GT Energy Club