

# NUCLEAR ENGINEERING: RADIATION SCIENCES

## REQUIREMENTS

The Radiation Sciences option is intended for students interested in medical and non-power applications. Students must have and are expected to maintain a 3.0 cumulative GPA.

The following curriculum applies to students who entered the program starting in Fall 2022.

### SUMMARY OF REQUIREMENTS

Code	Title	Credits
	Mathematics and Statistics	22
	Science	16
	Engineering Science	27
	Radiation Sciences Core Requirement	25
	Radiation Sciences Electives	11
	Introduction to Engineering	3
	Communication Skills	8
	Liberal Studies	16
	Free Elective	1
<b>Total Credits</b>		<b>129</b>

### MATHEMATICS AND STATISTICS

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
or MATH 217	Calculus with Algebra and Trigonometry II	
or MATH 275	Topics in Calculus I	
MATH 222	Calculus and Analytic Geometry 2	4
or MATH 276	Topics in Calculus II	
MATH 234	Calculus--Functions of Several Variables	4
MATH 320	Linear Algebra and Differential Equations	3
MATH 321	Applied Mathematical Analysis	3
STAT 324	Introductory Applied Statistics for Engineers	3
<b>Total Credits</b>		<b>22</b>

### SCIENCE

Code	Title	Credits
Select one of the following:		5-10
CHEM 109	Advanced General Chemistry	
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
PHYSICS 202	General Physics	5
or PHYSICS 208	General Physics	
PHYSICS 241	Introduction to Modern Physics	3

or PHYSICS 205	Modern Physics for Engineers	
PHYSICS 322	Electromagnetic Fields	3
<b>Total Credits</b>		<b>16-21</b>

### ENGINEERING SCIENCE

Code	Title	Credits
E C E 376	Electrical and Electronic Circuits	3
or PHYSICS 321	Electric Circuits and Electronics	
E M A 201	Statics	3
E M A 202	Dynamics	3
or M E 240	Dynamics	
E M A 303	Mechanics of Materials	3
or M E 306	Mechanics of Materials	
E P 271	Engineering Problem Solving I	3-4
or COMP SCI 200	Programming I	
or COMP SCI 220	Data Science Programming I	
or COMP SCI 310	Problem Solving Using Computers	
M E 231	Geometric Modeling for Design and Manufacturing	3
M E 361	Thermodynamics	3
M S & E 350	Introduction to Materials Science	3
Computing Elective (select one of the following):		3
COMP SCI 300	Programming II	
COMP SCI 412	Introduction to Numerical Methods	
E M A/E P 471	Intermediate Problem Solving for Engineers	
E M A/E P 476	Introduction to Scientific Computing for Engineering Physics	
<b>Total Credits</b>		<b>27-28</b>

### RADIATION SCIENCES CORE REQUIREMENT

Code	Title	Credits
N E 305	Fundamentals of Nuclear Engineering	3
N E 405	Nuclear Reactor Theory	3
N E 408	Ionizing Radiation	3
N E 412	Nuclear Reactor Design	5
N E 424	Nuclear Materials Laboratory	1
N E 427	Nuclear Instrumentation Laboratory	2
N E 428	Nuclear Reactor Laboratory	2
N E 571	Economic and Environmental Aspects of Nuclear Energy	3
MED PHYS/ B M E/H ONCOL/ PHYSICS 501	Radiation Physics and Dosimetry	3
<b>Total Credits</b>		<b>25</b>

### RADIATION SCIENCES ELECTIVES

Code	Title	Credits
<i>Medical Physics Electives</i>		9
Select credits from Medical Physics Electives Course List below		
<i>Technical Electives (not to be confused with Medical Physics Electives) choose 2 credits from:</i>		2

N E 1	Cooperative Education Program (no more than 3 credits)
Courses numbered 300+ in the CoE except for E P D/ INTEREGR	
Courses numbered 300+ in MATH, PHYSICS, COMP SCI, STAT (except STAT 301), ASTRON, MED PHYS, and CHEM departments	
Students may also propose any class that they feel will benefit their education path with pre-requisite of two physics or calculus classes. For these courses the advisor will review the request and if approved, recommend a DARS substitution.	

**Total Credits** 11

### Medical Physics Electives Course List<sup>1</sup>

Code	Title	Credits
MED PHYS/N E 506	Monte Carlo Radiation Transport	3
MED PHYS/B M E 566	Physics of Radiotherapy	3
MED PHYS/N E 569	Health Physics and Biological Effects <sup>2</sup>	3-4
MED PHYS/B M E 573	Mathematical Methods in Medical Physics	3
MED PHYS/B M E 574	Data Science in Medical Physics	3
MED PHYS/B M E 578	Non-Ionizing Diagnostic Imaging	4
MED PHYS/B M E 580	The Physics of Medical Imaging with Ionizing Radiation	4
MED PHYS/PHYSICS 588	Radiation Production and Detection	4
MED PHYS 671	Selected Topics in Medical Physics <sup>2</sup>	1-4
MED PHYS 701	Ethics and the responsible conduct of research and practice of Medical Physics	1

Students are encouraged to access the online N E future course offering grid to plan their future course schedules and to confirm the offering of a course in the table.

1

Courses meeting the Medical Physics Electives requirement are selected MED PHYS courses numbered 500 and above and selected PHYSICS courses numbered 400 or above. No more than 3 credits of N E 699 Advanced Independent Study may be used to meet this requirement. (Refer to the NE handbook under Degree Information on the NE department website (<https://docs.google.com/document/u/1/d/e/2PACX-1vRMi-zHWv19rf6wMx2E5Nzdn1Awf0ZHG6pK-QXTSRfsD-13kYuBBCOMZbiWt9vcLejeTxBQQHEjZVs/pub/>)).

2

N E/MED PHYS 569 Health Physics and Biological Effects and MED PHYS 671 Selected Topics in Medical Physics are especially recommended for students in this focus area.

## INTRODUCTION TO ENGINEERING

Code	Title	Credits
N E 231	Introduction to Nuclear Engineering	3
<b>Total Credits</b>		<b>3</b>

## COMMUNICATION SKILLS

Code	Title	Credits
ENGL 100	Introduction to College Composition	3
or LSC 100	Science and Storytelling	
or COM ARTS 100	Introduction to Speech Composition	
or ESL 118	Academic Writing II	
E P D 275	Technical Presentations	2
INTEREGR 397	Engineering Communication	3
<b>Total Credits</b>		<b>8</b>

## LIBERAL STUDIES ELECTIVES

Code	Title	Credits
<b>College of Engineering Liberal Studies Requirements</b>		
Complete Requirements ( <a href="http://guide.wisc.edu/undergraduate/engineering/#requirements">http://guide.wisc.edu/undergraduate/engineering/#requirements</a> ) <sup>1</sup>		16
<b>Total Credits</b>		<b>16</b>

1

Students must take 16 credits that carry H, S, L, or Z breadth designators. These credits must fulfill the following subrequirements:

1. A minimum of two courses from the same subject area (<https://registrar.wisc.edu/subjectarea/>) (the description before the course number). At least one of these two courses must be designated as above the elementary level (I, A, or D) in the course listing.
2. A minimum of 6 credits designated as humanities (H, L, or Z in the course listing), and an additional minimum of 3 credits designated as social science (S or Z in the course listing). Foreign language courses count as H credits. Retroactive credits for language courses may not be used to meet the Liberal Studies credit requirement (they can be used for subrequirement 1 above).
3. At least 3 credits in courses designated as ethnic studies (lower case "e" in the course listing). These courses may help satisfy subrequirements 1 and 2 above, but they only count once toward the total required. *Note:* Some courses may have "e" designation but not have H, S, L, or Z designation; these courses do not count toward the Liberal Studies requirement.

For information on credit load, adding or dropping courses, course substitutions, pass/fail, auditing courses, dean's honor list, repeating courses, probation, and graduation, see the College of Engineering Official Regulations (<http://guide.wisc.edu/undergraduate/engineering/#policiesandregulationstext>).

## HONORS IN UNDERGRADUATE RESEARCH PROGRAM

Qualified undergraduates may earn an Honor in Research designation on their transcript and diploma by completing 8 credits of undergraduate honors research, including a senior thesis. Further information is available in the department office.