

# CHEMISTRY, B.S. - NANOTECHNOLOGY OPTION

## Major in Chemistry, BS

Code	Title	Hours
CHEM 188	Freshman Seminar in Chemistry	1

### 100 AND 200 LEVEL CHEMISTRY REQUIRED COURSES

A grade of C or better is required in the 100/200 level courses before proceeding to the courses for which they are pre-requisites.

CHEM 111	Introductory Chemistry 1 (C minimum)	4
CHEM 112	Introductory Chemistry 2 (C minimum)	4
CHEM 231	Organic Chemistry 1 (C minimum)	4
CHEM 232	Organic Chemistry 2 (C minimum)	4
CHEM 251	Inorganic Chemistry 1 (C minimum)	3
CHEM 265	Quantitative Analysis (C minimum)	4

### 300 AND 400 LEVEL CHEMISTRY REQUIRED COURSES

CHEM 341	Physical Chemistry 1	4
CHEM 342	Physical Chemistry 2	4
CHEM 487	Seminar in Chemistry 1	0.5
CHEM 488	Seminar in Chemistry 2	0.5
Independent Study - Choose 1 hour from:		1
CHEM 498	Independent Study	

### CHEMISTRY OPTIONS

Option in Nanotechnology - See separate block

**Total Hours** 34

## Option in Nanotechnology, Chemistry, BS

Code	Title	Hours
CHEM 312	Chemistry in Nanotechnology	3
Electives - Choose 4 hours from:		4
CHEM 300	Co-Op Ed Experience in Chem	
CHEM 326	Biochemistry 1	
CHEM 375	Environmental Chemistry	
CHEM 381	Polymer Chemistry 1	
CHEM 391	Advanced Laboratory 1	
CHEM 392	Advanced Laboratory 2	
CHEM 435	Advanced Organic Chemistry	
CHEM 452	Inorganic Chemistry	
CHEM 465	Analytical Chemistry	
CHEM 486	Topics in Chemistry	
CHEM 489	Honors Course	
CHEM 498	Independent Study	
CHEM 499	Departmental Honors	

### PROFESSIONAL BLOCK PENN STATE COURSES

Courses taken in a Capstone Semester at Penn State University in the Nanofabrication Facility.

NFMT 311	Materials, Safety & Equipment Overview for Nanotechnology	3
NFMT 312	Basic Nanotechnology Processes	3
NFMT 313	Thin Film Utilization	3
NFMT 314	Lithography	3

NFMT 315	Materials Modification in Nanotechnology	3
NFMT 316	Characterization, Testing Nanotech Structures & Materials	3

**Total Hours** 25

## Req Related for Chemistry, BS

Code	Title	Hours
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### MATHEMATICS

Calculus I or Honors Calculus - Choose 1 of the following:		4-5
MATH 161	Calculus 1	
MATH 163H	Honors Calculus 1	
MATH 211	Calculus 2	4
MATH 311	Calculus 3	4

### PHYSICS

PHYS 231	Physics 1 with Calculus	5
PHYS 232	Physics 2 with Calculus	5

**Total Hours** 22-23

## American Chemical Society Certification - Optional

Code	Title	Hours
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THIS BLOCK IS NOT REQUIRED FOR DEGREE COMPLETION. The following block contains courses which are required/recommended to students opting for ACS Certification. While not required, an introductory Economics course, elementary German or Russian (GERM/RUSS 101 and 102) are recommended for inclusion in the core Liberal Arts core requirements for general education. Students must take a minimum of two hours of CHEM 489, 498, or 499 (Research) under Chemistry Electives. This means you will need a total of 3 credits in CHEM 489, 498 or 499.

### REQUIRED COURSES FOR ACS CERTIFICATION

CHEM 326	Biochemistry 1	4
CHEM 392	Advanced Laboratory 2	1
Required Independent Research - Choose 3 hours from:		3
CHEM 489	Honors Course	
CHEM 498	Independent Study	
CHEM 499	Departmental Honors	

### RECOMMENDED COURSES FOR ACS CERTIFICATION

Introductory Economics - Optional Recommended	0
Elementary Language German or Russian - Optional Recommended	0

**Total Hours** 8