

# IMMUNOLOGY AND INFECTIOUS DISEASE, B.S.

**Begin Campus:** Any Penn State Campus

**End Campus:** University Park

## Program Description

Immunology is the study of how animals and humans protect themselves from pathogens. Understanding basic mechanisms of immunity provides insights into how blood cells develop and how pathogens are recognized and attacked. Furthermore, understanding the concepts behind immunology is necessary for drug and vaccine design. Dysregulation of the processes that regulate immunity can contribute to uncontrolled inflammation, tissue destruction, autoimmunity, immunodeficiencies, leukemia and related cancers. Immunology includes a broad range of disciplines including but not limited to microbiology, virology, animal health, genetics, biochemistry, molecular and cell biology. Students enrolled in the Immunology and Infectious Disease Major will develop and understanding of normal immune responses to bacterial, fungal, and viral agents and appreciate the potential pathological outcomes of these responses. Students will learn about events that shape the immune response; the general biology of pathogens and the mechanisms by which they cause disease. In addition, basic skills in microbiology, molecular biology and biochemistry will be acquired. Students completing a B.S. degree in Immunology and Infectious Disease will be well prepared for veterinary, medical or other professional schools, Ph.D. graduate training in a wide variety of areas including immunology, microbiology, virology, molecular medicine, animal science, molecular biology and biochemistry or highly competitive jobs as research technicians, laboratory assistants or sales representatives with a pharmaceutical company.

## What is Immunology and Infectious Disease?

Immunology and Infectious Disease is the study of how the body copes with bacterial, viral, or parasitic infections, cancer, autoimmune disease and other diseases of the immune system. The immune system protects us from infection through is a complex network of cells and tissues designed to fight invading pathogens. Immunology is the study of the response of the immune system to bacterial, viral or parasitic infections.

It is also the study of diseases caused by disorders of the immune system. Autoimmune diseases are diseases that cause your immune system to attack your own body. Immunodeficiency disease is a result of failure of the immune system to function in its normal capacity. Allergy is a result of the immune system responding to substances that are not usually harmful. Immunology also covers the development of the immune system as well as the malignant growth of immune cells, and the epidemiology of infectious disease.

## You Might Like this Program If...

- You are interested in studying mechanisms of human disease progression at the molecular, cellular, and whole organism levels, and how these diseases are impacted by components of the immune system
- You are looking for opportunities to perform research in the laboratories of faculty in areas of immune cell development,

inflammation, autoimmune disease, cancer biology, and infectious disease

## Entrance to Major

In order to be eligible for entrance to the Immunology and Infectious Disease major, a student must have:

- attained at least a 2.00 cumulative grade point average;
- completed BIOL 110, BIOL 230W, BIOL 220W or BIOL 240W, CHEM 110, CHEM 111, CHEM 112, CHEM 113, MATH 140, MATH 141;
- earned a grade of C or better in each of these courses.

## Degree Requirements

**For the Bachelor of Science degree in Immunology and Infectious Disease, a minimum of 124 credits is required:**

Requirement	Credits
General Education	45
Electives	3-5
Requirements for the Major	89-91

**15 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses.**

## Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
<b>Prescribed Courses</b>		
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
PHYS 250	Introductory Physics I	4
PHYS 251	Introductory Physics II	4
VBSC 448W	Current Topics in Immunology	3
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 110	Biology: Basic Concepts and Biodiversity	4
BIOL 230W	Biology: Molecules and Cells	4
BMB 401	General Biochemistry	3
BMB 402	General Biochemistry	3
CHEM 110	Chemical Principles I	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MICRB 201	Introductory Microbiology	3
MICRB 202	Introductory Microbiology Laboratory	2
MICRB 410	Principles of Immunology	3
VBSC 211	The Immune System and Disease	3

## Additional Courses

Select 3-4 credits of the following:		3-4
STAT 200	Elementary Statistics	
STAT 240	Introduction to Biometry	
STAT 250	Introduction to Biostatistics	
<i>Additional Courses: Require a grade of C or better</i>		
BIOL 220W	Biology: Populations and Communities	4
or BIOL 240W	Biology: Function and Development of Organisms	
VBSC 444	Epidemiology of Infectious Diseases	3
or BBH/HPA 440	Principles of Epidemiology	
Select 10-11 credits of the following:		10-11
VBSC 418	Bacterial Pathogenesis	
VBSC/MICRB/ BMB 432	Advanced Immunology: Signaling in the Immune System	
VBSC/MICRB 435	Viral Pathogenesis	
VBSC 445	Molecular Epidemiology of Infectious Diseases	
VBSC 451	Immunotoxicology of Drugs and Chemicals	

### Supporting Courses and Related Areas

*Supporting Courses and Related Areas: Require a grade of C or better*

Select 9 credits of 400-level courses from departmental list 9

## General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

### Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

### Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

### Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

### Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the

requirements for the student's degree program, whichever is higher: 6 credits

## University Degree Requirements

### First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

### Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

### Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

### Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

### Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

### Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

## Program Learning Objectives

- **Write Critical Reviews:** Students will be able to read the scientific literature and write critical reviews in the Immunology and Infectious Disease discipline
- **Present Scientific Data:** Students will be able to present and discuss scientific data and analysis in the field of Immunology and Infectious Disease
- **Careers:** Students will be familiar with potential careers in biomedical science and be prepared to apply for jobs or professional schools.
- **Quantitative Skills:** Students will obtain quantitative skills that allow them to analyze experimental data sets.
- **Professional School Acceptance:** Students will be able to obtain the skills critical to successful acceptance in and preparation for professional schools

## Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

## University Park

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## SUGGESTED ACADEMIC PLAN

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2023-24 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

## Immunology and Infectious Disease, B.S. at University Park Campus and Altoona Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
VBSC 50 (or First Year Seminar)	3 ENGL 15, 30H, or ESL 15 <sup>††</sup>	3
BIOL 110 <sup>*#†</sup>	4 BIOL 220W or 240W <sup>*#</sup>	4
CHEM 110 <sup>*#†</sup>	3 CHEM 112 <sup>*#†</sup>	3
CHEM 111 <sup>*#†</sup>	1 CHEM 113 <sup>*#†</sup>	1
MATH 140 <sup>*†#†</sup>	4 MATH 141 <sup>*†#†</sup>	4
General Education Course	3 General Education Course	3
	<b>18</b>	<b>18</b>

### Second Year

Fall	Credits Spring	Credits
BIOL 230W <sup>*#</sup>	4 VBSC 211 <sup>*</sup>	3
PHYS 250	4 PHYS 251	4

CHEM 210	3 CHEM 212	3
CAS 100, CAS 100A, CAS 100B, or CAS 100C <sup>††</sup>	3 CHEM 213	2
General Education Course (GHW)	1.5 MICRB 201 <sup>*</sup>	3

**15.5 15**

### Third Year

Fall	Credits Spring	Credits
BMB 401 <sup>*</sup>	3 BMB 402 <sup>*</sup>	3
MICRB 410 <sup>*</sup>	3 VBSC 444 or HPA 440 <sup>*</sup>	3
STAT 240, 200, or 250	3-4 ENGL 202C <sup>††</sup>	3
MICRB 202 <sup>*</sup>	2 Elective or Supporting Course	3
Supporting Course 400-level <sup>*</sup>	3 General Education Course	3
	General Education Course (GHW)	1.5

**14-15 16.5**

### Fourth Year

Fall	Credits Spring	Credits
VBSC 435, 445, or 451 <sup>*</sup>	3 VBSC 418 <sup>*</sup>	2
VBSC 435, 445, or 451 <sup>*</sup>	3 VBSC 432 <sup>*</sup>	3
General Education Course	3 VBSC 448W	3
Supporting Course 400-level <sup>*</sup>	3 General Education Course	3
Elective or Supporting Course	3 Supporting Course 400-level <sup>*</sup>	3
	<b>15</b>	<b>14</b>

### Total Credits 126-127

\* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

# Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will

replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C.  
Each course is 3 credits.

**Advising Note:**

**Electives and Supporting Courses** – Supporting courses are 400-level courses chosen from a department-approved list or approved by the Program Coordinator. Students must take 9 credits of supporting courses (all of which must have a grade of C or better). Elective credits may be used to earn a minor, usually commencing in the fifth semester. Please consult with your academic adviser for planning.

## Immunology and Infectious Disease, B.S. at Commonwealth Campuses (Except Altoona Campus)

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
First Year Seminar	1-3 ENGL 15, 30H, or ESL 15 <sup>††</sup>	3
BIOL 110 <sup>*#†</sup>	4 BIOL 220W <sup>*#</sup>	4
CHEM 110 <sup>*#†</sup>	3 CHEM 112 <sup>*#†</sup>	3
CHEM 111 <sup>*#†</sup>	1 CHEM 113 <sup>*#†</sup>	1
MATH 140 <sup>*†#†</sup>	4 MATH 141 <sup>*†#†</sup>	4
General Education Course	3 General Education Course	3
<b>16-18</b>		<b>18</b>

### Second Year

Fall	Credits Spring	Credits
BIOL 230W <sup>*#</sup>	4 PHYS 251	4
PHYS 250	4 BIOL 240W <sup>*#</sup>	4
CHEM 210	3 CHEM 212	3
CAS 100, CAS 100A, CAS 100B, or CAS 100C <sup>††</sup>	3 CHEM 213	2
General Education Course (GHW)	1.5 MICRB 201 <sup>*</sup>	3
General Education Course		1.5
<b>15.5</b>		<b>17.5</b>

### Third Year

Fall	Credits Spring	Credits
BMB 401 <sup>*</sup>	3 BMB 402 <sup>*</sup>	3
MICRB 410 <sup>*</sup>	3 VBSC 444 or HPA 440 <sup>*</sup>	3
STAT 240, 200, or 250	3-4 ENGL 202C <sup>††</sup>	3
MICRB 202 <sup>*</sup>	2 General Education Course	3
General Education Course	3 Supporting Course 400-level <sup>*</sup>	3
<b>14-15</b>		<b>15</b>

### Fourth Year

Fall	Credits Spring	Credits
VBSC 435, 445, or 451 <sup>*</sup>	3 VBSC 418 <sup>*</sup>	2
VBSC 435, 445, or 451 <sup>*</sup>	3 VBSC 432 <sup>*</sup>	3
General Education Course	3 VBSC 448W	3
Supporting Course 400-level <sup>*</sup>	3 Supporting Course 400-level <sup>*</sup>	3
Elective or Supporting Course	3 General Education Course	3
<b>15</b>		<b>14</b>

**Total Credits 125-128**

\* Course requires a grade of C or better for the major

† Course requires a grade of C or better for General Education

# Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Advising Note:

**Electives and Supporting Courses** – Supporting courses are 400-level courses chosen from a department-approved list or approved by the Program Coordinator. Students must take 9 credits of supporting courses (all of which must have a grade of C or better). Elective credits may be used to earn a minor, usually commencing in the fifth semester. Please consult with your academic adviser for planning.

## Career Paths

The Immunology and Infectious Disease major provides excellent preparation for a wide variety of careers in industry, government agencies, or academia, or for medical school, veterinary school, or graduate programs in any area of the biomedical sciences. Concern over bioweapons and emerging infectious diseases means high demand for specialists. Our major in Immunology and Infectious Disease is one of only a handful of such programs in the United States. Graduates distinguish themselves with focused courses in immunology and epidemiology while retaining the freedom to choose from a wide variety of courses in biomedicine and biotechnology.

## Careers

Thanks to the specialization students can obtain in immunology and epidemiology, there are plentiful employment opportunities for graduates after four years. Some of these opportunities include research positions in biotechnology or pharmaceutical firms, government or international health agencies, and academic research laboratories. Students should recognize, however, that professional advancement in research-oriented careers is less realistic without an advanced degree. Many students choose to get experience for a few years in entry-level positions, and then return to master's and/or doctoral studies.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE IMMUNOLOGY AND INFECTIOUS DISEASE PROGRAM (<https://agsci.psu.edu/academics/undergraduate/majors/immunology-and-infectious-disease/>)

## Opportunities for Graduate Studies

The direct relevance of the course work to human health strongly attracts students interested in medicine and related fields. The Immunology and Infectious Disease major provides strong preparation for further studies in medical school, veterinary school, pharmacy school, or school of public health. The program also helps prepare students for graduate

studies in the biomedical sciences. More than half of the students in the Immunology and Infectious Disease major obtain further education in one of these fields.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES  
(<https://agsci.psu.edu/academics/undergraduate/majors/immunology-and-infectious-disease/>)

## Contact

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