MICROBIOLOGY (ASC)

Description
Website: http://microbiology.unl.edu

The microbiology major is an interdepartmental major that offers educational opportunities in various areas of microbiology leading to a bachelor of science degree in microbiology. The training offered is suitable for a professional career in microbiology, which may lead to employment in the food industry, clinical microbiology, biotechnology, and pharmaceuticals; or federal agencies such as the Food and Drug Administration, U.S. Department of Agriculture, U.S. Public Health Service, and Environmental Protection Agency. The program is also suitable as preparation for graduate studies leading to academic careers and professional careers in medicine, dentistry, veterinary medicine, pharmacy, and health-related fields. (Completion of the microbiology baccalaureate degree program does not automatically fulfill the admission requirements for application to a given professional program. Students considering application to a professional program are strongly encouraged to work with their advisor to ensure that admission requirements are met during completion of the microbiology degree.)

Program Assessment. To gauge the effectiveness of the program, majors within their senior year will be required to complete selected assessment activities. Results of participation in these assessment activities will in no way affect a student’s GPA or graduation.

College Requirements

College Admission

College Admission

The entrance requirements for the College of Arts and Sciences are the same as the UNL General Admission Requirements. Students who are admitted through the Admission by Review process may have certain conditions attached to their enrollment at UNL. These conditions are explained under “Removal of Deficiencies.”

In addition to these requirements, the College of Arts and Sciences strongly recommends a third and fourth year of one foreign language. Four years of high school coursework in the same language will fulfill the College of Arts and Sciences’ language requirement. It will also allow students to continue language study at a more advanced level at UNL, and provide more opportunity to study abroad.

Transfer Students

To be considered for admission as a transfer student, Nebraska resident or nonresident, students must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who graduated from high school January 1997 and after must also meet the UNL General Admission Requirements. Those transfer students who graduated before January 1997 must have completed in high school, 3 years of English, 2 years of the same foreign language, 2 years of algebra, and 1 year of geometry. Transfer students who have completed less than 12 credit hours of college study must also submit either their ACT or SAT scores.

Ordinarily, hours earned at a similarly accredited college or university are applicable to the UNL degree. The College, however, will evaluate all hours submitted on an application for transfer, and reserves the right to accept or reject any of them, based upon its exclusion and restriction policies. Sixty is the maximum number of hours the University will accept on transfer from a two-year college or international institution. Transfer credit in the major or minor must be approved by the departmental advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major or minor. At least half of the hours in the major field must be completed at the University regardless of the number of hours transferred.

The College of Arts and Sciences will accept no more than 15 semester hours of C- and D grades from other schools. The C- and D grades cannot be applied toward requirements for a major or minor. This policy does not apply to the transfer of grades from UNO or UNK to UNL. All D grades may be transferred from UNO or UNK, but they are not applicable to a major or minor.

Readmitted Students

UNL students who choose not to take courses for more than 2 consecutive terms, must reapply to UNL. Students readmitted to the College of Arts and Sciences will follow the requirements stated in the catalog for the academic year of readmission and re-enrollment as a degree-seeking student in Arts and Sciences. In consultation with advisors, a student may choose to follow a catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991, the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Admission Deficiencies/Removal of Deficiencies

Students must remove entrance deficiencies in geometry and foreign language as soon as possible, and before graduating from the College of Arts and Sciences. For questions and more information, students should consult a college advisor in the Academic and Career Advising Center in 107 Oldfather Hall.

Removing Foreign Language Deficiencies

Students must complete the second semester of a first year language sequence to clear the deficiency and the second semester of the second year language sequence to complete the college graduation requirement in language.

Removing Geometry Deficiencies

A deficiency of one year of geometry can be removed by taking high school geometry courses through an approved independent study program, or by completing a geometry course from an accredited community college or a four-year institution. Neither of these options will count for college credit.

College Degree Requirements

College Distribution Requirements

Bachelor of Arts or Bachelor of Science (16 hours + Language)

The College of Arts and Sciences distribution requirements are designed to further the purposes of liberal education by encouraging study in several different areas within the College. All requirements are in addition to University ACE requirements. A student may not use a single course to satisfy more than one of the following five distribution requirements. A student cannot use a single course to satisfy both an ACE outcome and a College distribution requirement. A student cannot use a course from their primary major to satisfy the Breadth Requirement (F), but may apply an ancillary requirement of the primary major or a course from their second major toward this requirement. Independent study or reading courses and internships cannot be used to satisfy distribution requirements.

Microbiology (ASC)
requirements. To see a complete list of excluded courses, run a degree audit through MyRED.

Courses from interdisciplinary programs will count in the same area as courses from the home/cross-listed department(s).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDR A - Written Communication</td>
<td>Select from courses approved for ACE outcome 1.</td>
<td>3</td>
</tr>
<tr>
<td>CDR B and BL - Natural, Physical, and Mathematical Sciences with Lab</td>
<td>Select from biochemistry, biological sciences, chemistry, computer science, geology, meteorology, mathematics, physics and statistics. Must include one lab in the natural or physical sciences. Lab courses may be selected from biochemistry, biological sciences, chemistry, geology, meteorology and physics.</td>
<td>4</td>
</tr>
<tr>
<td>CDR C - Humanities</td>
<td>Select from classics, English, history, modern languages and literatures, philosophy, and religious studies.</td>
<td>3</td>
</tr>
<tr>
<td>CDR D - Social Science</td>
<td>Select from: anthropology, communication studies, geography, political science, psychology, or sociology.</td>
<td>3</td>
</tr>
<tr>
<td>CDR E - Language</td>
<td>Fulfilled by the completion of the 6-credit-hour second-year sequence in a single foreign language in one of the following departments: Classics and religious studies, modern languages and literatures, or anthropology. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Omaha, Russian, and Spanish. A student who has completed the fourth-year level of one foreign language in high school is exempt from the languages requirement.</td>
<td>0-16</td>
</tr>
<tr>
<td>CDR F - Additional Breadth</td>
<td>Select from: natural, physical and mathematical sciences (Area B), humanities (Area C), or social sciences (Area D). Cannot be a course from the primary major.</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 16-32

1 See degree audit or a College of Arts and Sciences advisor for approved geography and anthropology courses that apply as natural science.

2 Language courses numbered 210 or below apply only for the foreign language requirement.

3 See degree audit or College of Arts and Sciences advisor for list of natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

Scientific Base
Bachelor of Science Only (60 hours)
The bachelor of science degree requires students to complete 60 hours in mathematical, physical and natural sciences. Approved courses for scientific base credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIOL 101), biological sciences (excluding BIOS 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology, physics and statistics.

See your degree audit or a College of Arts and Sciences advisor for a complete list including individual classes that fall outside of the disciplines listed above. Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of a college advisor.

Foreign Languages/Language Requirement
Languages Exemption Policy
UNL and the College of Arts and Sciences will exempt or waive students from the UNL entrance requirement of two years of the same foreign language or from the College's language distribution requirement based on documentation only. The following are the options and procedures for documentation:

High School Transcripts
For the University entrance requirement, students must show an official high school transcript with two or more years of the same foreign language.

For the College of Arts and Sciences College Distribution Requirement E-Language, students must show an official high school transcript with four or more years of the same foreign language in high school, or show evidence of graduation from a non-English-speaking foreign high school. Students whose native language is not English must show English as a Second Language study on an official high school transcript. Four years of ESL at the high school level (9th, 10th, 11th and 12th grades) will be the basis for a waiver of the CDR E Language requirement.

Proficiency Examination at UNL
For the University entrance requirement, students who do not have transcript documentation can request to take a proficiency exam in the language. (This is not the same test as the Modern Languages Placement Exam.) However, UNL will provide testing only in the languages it teaches. Currently, these languages are: Arabic, French, German, Spanish, Russian, Czech, Japanese, Chinese.

For the College of Arts and Sciences College Distribution Requirement E-Language, the Department of Modern Languages will oversee the test at the 202 level. If the student passes the test, the department will sign the College Request for Waiver form and indicate the level of proficiency. The form is then forwarded to the Arts and Sciences Advising Center for approval.

The Department of Modern Languages will oversee the test and provide written documentation to the Arts and Sciences Advising Center the level of proficiency passed.

Distance Education
For the University entrance requirement, students without transcript documentation who claim proficiency in a language not taught at UNL, have the option of seeking out a distance education program in languages. If the student completes the equivalent of 102 from an approved distance education program, the student will meet the UNL entrance requirement. The student must have the course work approved before he/she takes/completes the course as equivalent to 102 by a College advisor. The student then completes the course and has the distance education program send the transcript to the Admissions Office.

For the College of Arts and Sciences College Distribution Requirement E-Language, the student can seek out a distance education program and complete the equivalent of the 202-level course. The student must submit
the request on the College Request for Substitution form and have the
course work approved by a College advisor. The student then completes
the course and has the distance education program send the transcript to
the Admissions Office.

Third Language Option
If a student demonstrates knowledge of two foreign languages at
the 102 level, the College of Arts and Sciences may consider waiving
two semesters of the four semester College Distribution Requirement
E-Languages requirement. If this waiver were granted, the student
would then be required to complete 101 and 102 in another, 3rd foreign
language at UNL.

Minimum Hours Required for Graduation
A minimum of 120 semester hours of credit is required for graduation
from the College of Arts and Sciences. A total grade point average of at
least 2.0 is required.

Grade Rules
Restrictions on C- and D Grades
The College will accept no more than 15 semester hours of C- and D
grades from other schools except for UNO and UNK. No transfer C- and
D grades can be applied toward requirements in a major or a minor. No
UNL C- and D grades can be applied toward requirements in a major or a
minor.

Pass/No Pass Privilege
University regulations for the Pass/No Pass (P/N) privilege state:

• The Pass/No Pass option is designed for your use by seeking to
expand your intellectual horizons by taking courses in areas where
you may have had minimal preparation.
• Neither the P nor the N grade contribute to your GPA.
• P is interpreted to mean C or above.
• A change to or from a Pass/No Pass may be made until mid-term (see
academic calendar for specific dates per term).
• The Pass/No Pass or grade registration cannot conflict with the
policy of the professor, department, college, or University governing
the grading option.
• Changing to or from Pass/No Pass requires using the MyRED system
to change the grading option or filing a Drop/Add form with the Office
of the University Registrar, 107 Canfield Administration Building. After
mid-term of the course, a student registered for Pass/No Pass cannot
change to a grade registration unless the Pass/No Pass registration is
in conflict with the policy of the professor, department, college, or
University governing Pass/No Pass.
• The Pass/No Pass grading option cannot be used for the removal of
C- or D or F grades.

Pass/No Pass privileges in the College of Arts and Sciences are extended
to students according to the following additional regulations:

• Departments may specify that certain courses of theirs can be taken
only on a P/N basis.
• The college will permit no more than a total of 24 semester hours
of P/N grades to be applied toward degree requirements. This total
includes all Pass grades earned at UNL and other U.S. schools. NOTE:
This 24-hour limit is more restrictive than the University regulation.

Grading Appeals
A student who feels that he/she has been unfairly graded must ordinarily
take the following sequential steps in a timely manner, usually by
initiating the appeal in the semester following the awarding of the grade:

1. Talk with the instructor concerned. Most problems are resolved at
this point.
2. Talk to the instructor’s department chairperson.
3. Take the case to the Grading Appeal Committee of the department
concerned. The Committee should be contacted through the
department chairperson.
4. Take the case to the College Grading Appeals Committee by
contacting the Dean’s Office, 1223 Oldfather Hall.

Course Level Requirements
Courses Numbered above 299
Thirty of the 120 semester hours of credit must be in courses numbered
above 299. Of the 30 hours above 299, 15 hours (1/2) must be completed
in residence at UNL.

Graduate Courses
Seniors in the University who have obtained in advance the approval
of the dean for Graduate Studies may receive up to 12 hours credit for
graduate courses taken in addition to the courses necessary to complete
their undergraduate work, provided that such credits are earned within
the calendar year prior to receipt of the baccalaureate. For procedures,
inquire at the Office of Graduate Studies.

ACE Requirements
Consistent with the mission and values of the University, ACE is based
on a shared set of four institutional objectives and ten student learning
outcomes. The ACE program was approved by faculty in all eight
undergraduate colleges and endorsed by the Faculty Senate, the student
government, and the Academic Planning Committee in January 2008
for implementation in the fall 2009. ACE aligns with current national
initiatives in general education.

Key characteristics of ACE demonstrate the benefits of the program to
students:
• Students receive a broad education with exposure to multiple disciplines, critical life skills and important reasoning, inquiry, and civic capacities.

• ACE is simple and transparent for students, faculty and advisors. Students complete the equivalent of 3 credit hours for each of the ten student learning outcomes.

• Students connect and integrate their ACE experiences with their selected major.

• Students can transfer all ACE certified courses across colleges within the institution to meet the ACE requirement and any course from outside the institution that is directly equivalent to a UNL ACE-certified course. Courses from outside institutions without direct equivalents may be considered with appropriate documentation for ACE credit (see academic advisor).

ACE allows faculty to assess and improve their effectiveness and facilitate students’ learning.

ACE Institutional Objectives and Student Learning Outcomes
To meet the ACE Program requirement, a student will complete a minimum of 3 credit hours for each of the ten ACE Student Learning Outcomes (a total of 30 ACE credit hours). See the ACE website at: http://ace.unl.edu for the most current information and the most recently certified courses.

Catalog Rule
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to and enrolled as a degree-seeking student at UNL. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991 the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Learning Outcomes
Majors in microbiology will be able to:

1. Understand the physiology, biochemistry and genetics of bacteria and other microorganisms including cell structure, function, diversity, metabolism and the genetics of metabolic regulation.

2. Be knowledgeable about the immune response and disease-causing microorganisms including aspects of the innate and adaptive immune responses, as well as an introductory understanding of the molecular basis for pathogenesis.

3. Understand the role of microorganisms in plant and animal agriculture, food-borne disease and spoilage, as well as beneficial roles played by microorganisms.

4. Understand the taxonomic, ecological, evolutionary, and genetic relationships among microorganisms including nutrient cycling, microbial diversity and the biotechnological application of microorganisms to solve environmental problems.

5. Be proficient at the scientific method of investigation and hypothesis testing including the development of theoretical and practical skills in the design and execution of experiments as well as the development of oral and writing skills necessary for the effective communication of experimental results and/or scientific principles.
Select one of the following:

**BIOC 321** Elements of Biochemistry
& **BIOC 321L** and Laboratory for Elements of Biochemistry
or **BIOC 431** Structure and Metabolism

Credit Hours Subtotal: 3-4

**Physics**

Select one of the following sequences:

**PHYS 141** Elementary General Physics I
& **PHYS 142** and Elementary General Physics II
or **PHYS 211** General Physics I
& **PHYS 221** and General Physics Laboratory I
& **PHYS 212** and General Physics II
& **PHYS 222** and General Physics Laboratory II

Credit Hours Subtotal: 10

Total Credit Hours: 45-53

**Additional Major Requirements**

**Grade Rules**

**C- and D Grades**
A grade of C or above is required for all courses in the major.

**Pass/No Pass**
No course taken Pass/No Pass will be counted toward the major, except for independent study, research, and seminars.

**PLEASE NOTE**
This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

**Microbiology (B.S.)**

**15 HR TERM 1**

**Chemistry**

complete **CHEM 109**

Credit Hours: 4

CHEM 109 is ideally completed in the first term of enrollment. It becomes critical to your success in the major if not completed by the third term of enrollment. It will fulfill the ACE 4 requirement.

**Mathematics**

complete **MATH 106**

Credit Hours: 5

MATH 106 will fulfill the ACE 3 requirement.
ACE 1 Written Texts
complete 1 from ACE1

CDR E: Language
recommend 1 or more courses

If not complete, choose a language course according to your placement and proficiency. CDR E is met after 4th level (202) of most languages.

14 HR TERM 2
Chemistry
complete CHEM 110

CHEM 110 will fulfill the CDR F requirement. CHEM 110 is not a critical requirement but is part of a sequence with CHEM 109, which is a critical requirement.

Life Science
complete LIFE 120, LIFE 120L

LIFE 120 and 120L will fulfill the CDR B and CDR BL requirements.

CDR A: Writing
complete 1 from ACE1

Complete an additional course approved as ACE 1.

CDR E: Language
recommend 1 or more courses

If not complete, choose a language course according to your placement and proficiency. CDR E is met after 4th level (202) of most languages.

15 HR TERM 3
Life Science
complete LIFE 121, LIFE 121L

LIFE 121 is ideally completed in the second term of enrollment. It becomes critical to your success in the major if not completed by the third term of enrollment.

Biochem And Organic Chem
complete CHEM 251, CHEM 253

CHEM 251 is ideally completed in the third term of enrollment. It becomes critical to your success in the major if not completed by the fifth term of enrollment.

ACE 2 Communication Skill
complete 1 from ACE2

ACE 5 Humanities
complete 1 from ACE5

Electives
complete Any Course

In consultation with your advisor, select elective courses or courses that meet a 2nd major, minor, sci-base or upper level requirement.

16 HR TERM 4
Biological Science
complete BIOS 206

Biochem And Organic Chem
complete CHEM 252

Statistics
complete 1 from EDPS 459, EDPS 459, ECON 215, STAT 218, STAT 380

ACE 6 Social Sciences
complete 1 from ACE6
Microbiology Core

complete BIOS 312

3hr

Complete an approved course from a Humanities discipline: ARAB, CLAS, CZEC, ENGL, FILM, FREN, GERM, GREK, HEBR, HIST, JAPN, LATN, PHIL, RELG, RUSS, SPAN.

14 HR TERM 5

Microbiology Core

complete BIOS 312

3hr

Complete an approved course from a Humanities discipline: ARAB, CLAS, CZEC, ENGL, FILM, FREN, GERM, GREK, HEBR, HIST, JAPN, LATN, PHIL, RELG, RUSS, SPAN.

12 HR TERM 6

Biochem And Organic Chem

complete BIOC 431

3hr

Complete PHYS 141 or PHYS 211.

Microbiology Core

complete MBIO 440, MBIO 443

6hr

Complete an approved course from a Social Science discipline: ANTH, COMM, GEOG, NSST, POLS, PSYC, SOCI.

Electives

complete Any Course

3hr

In consultation with your advisor, select elective courses or courses that meet a 2nd major, minor, sci-base or upper level requirement.

ACE 8 Ethical Principles

complete 1 from ACE8

2hr

ACE 9 Global/Human Divers

complete 1 from ACE9

3hr

17 HR TERM 7

Physics

complete PHYS 141

3hr

Complete PHYS 141 or PHYS 211.

Microbiology Core

complete MBIO 440, MBIO 443

6hr

Complete an approved course from a Social Science discipline: ANTH, COMM, GEOG, NSST, POLS, PSYC, SOCI.
**Additional Microbiology**

complete 1 from FDST 455, BIOC 432, BIOC 433, BIOC 437, BIOS 437, BIOC 442, STAT 442, BIOS 302, BIOS 303, BIOS 326, BIOS 402, BIOS 407, BIOS 425, BIOS 446, FDST 406, BIOS 444, GEOL 444, BIOS 447, AGRO 460, BIOS 477, BIOS 487, FDST 405, BIOS 445, FDST 415, FDST 455, FDST 455L, MBIO 421, PLPT 369, PLPT 369L, PLPT 370, AGRO 370, HORT 370, VBMS 303, VBMS 408, BIOS 408, VBMS 424, VBMS 441, BIOS 441

In consultation with your advisor, select elective courses or courses that meet a 2nd major, minor, sci-base or upper level requirement.

**Graduation Requirements**

1. A minimum 2.00 GPA required for graduation.
2. ***Total Credits Applying Toward 120 Total Hours***
3. Complete 30 hours in residence at UNL.

**Career Information**

*The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.*

**Transferable Skills**

- Comprehend and critically evaluate complex information
- Use quantitative & analytical computational techniques
- Make predictions using mathematical, statistical, and scientific modeling methods
- Understand and use proper laboratory and technical skills and instruments
- Define problems and identifying causes
- Support and communicate claims using clear evidence
- Simplify complex information and present it to others
- Apply mathematical and scientific skills to solve real-world problems
- Document and replicate processes and procedures
- Design and implement research experiments

**Jobs of Recent Graduates**

- Research Assistant, University of Nebraska Medical Center - Omaha NE
- Lab Manager, University of Nebraska-Lincoln - Lincoln NE
- Laboratory Technician, POET Research Center, Inc - Scotland SD
- Plant Research Biologist, Midwest Research Inc. - York NE
- Contractor, Syngenta - Omaha NE
- Postdoctorate, Harvard University - Boston MA
- Science Writer, LI-COR Biosciences - Lincoln NE
- Scientist I, Aerotek - Chicago IL
- Phlebotomist, BryanLGH - Lincoln NE

**Internships**

- R&D Summer Intern, Estee Lauder Companies - Melville NY
- Project Manager Assistant/Engineering Assistant, LI-COR Biosciences - Lincoln NE
- Construction Management Intern, Nemaha Landscape Construction - Lincoln NE
- Undergrad Student Research Intern, UNL Mid-America Transportation Center - Lincoln NE
- Certified Nursing Assistant, Delmar Gardens Retirement Home - CNA Program - O'Fallon MO
- Intern, Monsanto - Gothenburg NE
- Beckman Research Scholar, UNL College of Arts of Sciences Beckman Scholars - Lincoln NE
- Associate Management Intern, Cargill - Kansas City, MO
- Advanced Research Intern, Li-COR Biosciences - Lincoln NE
• Distinguished Life Sciences Scholar, College of Arts and Sciences - Lincoln NE

Grad Schools
• Medicine, University of South Dakota Sanford School of Medicine - Vermillion SD
• Dentistry, University of Nebraska Medical College - Lincoln NE
• College of Medicine, University of Nebraska - Medical Center - Omaha NE
• Cancer Research Graduate Program, UNMC - Omaha NE
• Medical Anatomy, University of Nebraska Medical Center - Omaha NE
• Interdisciplinary Biology and Chemistry with a focus on chemistry, West Texas A&M University - Canyon TX
• Dental Program, UNMC College of Dentistry - Lincoln NE
• BS Biochemistry, University of Nebraska-Lincoln - Lincoln NE
• Masters of Arts in Business Administration, University of Nebraska-Lincoln - Lincoln NE

• BS Biochemistry, University of Nebraska - Lincoln - Lincoln NE
• Masters of Arts in Business Administration, University of Nebraska-Lincoln - Lincoln NE