



Geography

Geography is the study of phenomena and events on the earth's surface, including the activities of human beings. Technical skills in remote sensing, mapping, computer applications, GIS, survey research, and writing are the geographer's tools.

All terrestrial activities are subject to geographic analysis. Students in the program learn specific geographic techniques and their application on regional, national, and global levels. Studies in the field, and in effective communication and higher level problem-solving, further prepare students for immediate employment in entry level jobs and for graduate study.

Language study and a strong minor (such as computer science, applied public policy, international studies, space science, biology) enhance employment options for students with bachelor's degrees. Graduate study broadens employment opportunities.

Programs

- Geography, B.S. (Earth Science Emphasis) *major*
- Geography, B.S. (Giscience Emphasis) *major*
- Global Studies, B.A. *major*
- Policy and Planning, B.S. (Urban Resources Planning Emphasis) *major*
- Policy and Planning, B.S. (Natural Resources Planning Emphasis) *major*
- Social Studies, B.A. (Geography Emphasis) *major*
- Sustainability and Resource Management, B.A.S. *major*
- Geography *minor*
- GIS *minor*
- Geographic Information Science *cert*

Career Directions

- Aerial Photo Interpreter
- Cartographer
- Digital Mapper
- Geographic Consultant
- Geographic Information Systems (GIS) Practitioner
- Land Use/Recreation Planner
- Market Analyst
- Park Ranger/Planner
- Park/Recreation Planner
- Teacher
- Urban/Regional Planner
- Also: Graduate Study

Preparation

Recommended High School Courses

- Algebra
- Computer Science
- English
- Geography
- Social Studies
- Speech Communication

Geography, B.S. *major* Earth Science Emphasis

Required Credits: 48

Required GPA: 2.25

I REQUIRED CORE COURSES

Complete the following courses:

- BUAD 2231 Business Statistics I (3 credits)
or PSY 3401 Basic Statistics for Research (4 credits)
or STAT 2610 Applied Statistics (4 credits)
- ENGL 2150 Technical Writing (3 credits)
or ENGL 3150 Writing In The Disciplines (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3410 Geography of North America (3 credits)
or GEOG 3800 Regional Geography (1-3 credits)
or GEOG 3810 Geography of Europe (3 credits)
or GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
or GEOG 3840 Geography of Africa (3 credits)
or GEOG 3850 Geography of the Middle East (3 credits)
or GEOG 3860 Geography of Latin America and the Caribbean (3 credits)
- or* GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)

II EARTH SCIENCE EMPHASIS

REQUIRED EMPHASIS CORE

Complete the following courses:

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4910 Directed Independent Study (3 credits)
or GEOG 4970 Internship (3 credits)
or GEOG 4990 Thesis (3 credits)
- GEOL 1110 Physical Geology (4 credits)
- GEOL 2110 Mineralogy and Petrology (4 credits)

EARTH SCIENCE ELECTIVES

Select 3 courses from the following, or related upper division courses as approved in advance by advisor:

- BIOL 3120 Soils (4 credits)
or GEOL 3120 Soils (4 credits)
- BIOL 3361 Limnology (4 credits)
- BIOL 3730 Plant Diversity (4 credits)
- BIOL 3840 Wetlands Ecology (3 credits)
- BIOL 4623 Forest Ecology (4 credits)
- ENVR 3040 Environmental Economics (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)
- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630 Conservation Biology (3 credits)
- GEOL 1120 Historical Geology (4 credits)
- GEOL 3211 Environmental Hydrology (3 credits)

- GEOL 3212 Hydrogeology (3 credits)
- GEOL 3400 Glacial and Pleistocene Geology (3 credits)
- GEOL 3500 Topics in Paleontology (3 credits)
- GEOL 3600 Stratigraphy and Sedimentation (3 credits)
- GEOL 3700 Environmental Geophysics (3 credits)
- GEOL 4300 Global Environmental Change (3 credits)

III SPATIAL METHODS ELECTIVES

Select 1 of the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- STAT 3610 Time Series Analysis (3 credits)

Geography, B.S. *major* Giscience Emphasis

Required Credits: 49

Required GPA: 2.25

I REQUIRED CORE COURSES

Complete the following courses:

- BUAD 2231 Business Statistics I (3 credits)
or PSY 3401 Basic Statistics for Research (4 credits)
or STAT 2610 Applied Statistics (4 credits)
- ENGL 2150 Technical Writing (3 credits)
or ENGL 3150 Writing In The Disciplines (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3410 Geography of North America (3 credits)
or GEOG 3800 Regional Geography (1-3 credits)
or GEOG 3810 Geography of Europe (3 credits)
or GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
or GEOG 3840 Geography of Africa (3 credits)
or GEOG 3850 Geography of the Middle East (3 credits)
or GEOG 3860 Geography of Latin America and the Caribbean (3 credits)
- or* GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)

II GIScience EMPHASIS

REQUIRED EMPHASIS CORE

Complete the following courses:

- CS 1309 Problem Solving and Computation (3 credits)
- CS 2270 Introduction to Web Programming (3 credits)
- CS 2321 Computer Science I (4 credits)
- GEOG 2100 Introduction to Physical Geography (3 credits)
or GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- GEOG 4970 Internship (3 credits)

Select 2 of the following courses:

- GEOG 2400 Introduction to Planning (3 credits)

- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3400 Economic Geography (3 credits)
- GEOG 3560 Metropolitan Land Use Planning (3 credits)
- GEOG 3580 Regional Development Planning (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630 Conservation Biology (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- BUAD 4385 Data Modeling and Visualization (3 credits)
- CS 2322 Computer Science II (4 credits)
- CS 3270 Advanced Web Programming (3 credits)
- CS 3507 Introduction to Databases (3 credits)
- ECON 2000 Principles of Microeconomics (3 credits)
- ECON 3040 Environmental Economics (3 credits)
or ENVR 3040 Environmental Economics (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOG 3120 Soils (4 credits)
or BIOL 3120 Soils (4 credits)
- GEOL 4300 Global Environmental Change (3 credits)
- STAT 3610 Time Series Analysis (3 credits)
- TADT 1460 2D Graphics And Laser Etching (3 credits)

Global Studies, B.A. *major*

Required Credits: 57

Required GPA: 2.25

I REQUIRED CORE

Complete the following courses:

- GEOG 1400 World Regional Geography (3 credits)
- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3400 Economic Geography (3 credits)
- GEOG 3531 Political Geography (3 credits)
- GEOG 3532 Political Ecology (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)

II REGIONAL GEOGRAPHY ELECTIVES

Select 4 of the following courses:

- GEOG 3410 Geography of North America (3 credits)
- GEOG 3800 Regional Geography (1-3 credits)
- GEOG 3810 Geography of Europe (3 credits)
- GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
- GEOG 3840 Geography of Africa (3 credits)
- GEOG 3850 Geography of the Middle East (3 credits)
- GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

III SPATIAL METHODS ELECTIVES

Select 2 of the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)

IV PHYSICAL GEOGRAPHY ELECTIVES

Select 2 of the following courses:

- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630 Conservation Biology (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)

V GEOGRAPHY ELECTIVES

Select 6 semester credits in Geography courses at the 3000-4000 level

VI THESIS REQUIREMENT

Complete the following course:

- GEOG 4990 Thesis (3 credits)

Suggested Semester Schedule | Global Studies, B.A.

The following is a list of major courses arranged by year. This suggested schedule

is intended to help students plan their courses in an orderly fashion. Some courses

or course sequences may appear more than once. Global Studies majors and Geography minors are strongly encouraged to meet with advisors in the program prior to selecting courses as all courses are not offered each year.

Freshman

- GEOG 1400 World Regional Geography (3 credits)
- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3400 Economic Geography (3 credits)
- Core Curriculum requirements

Sophomore

- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- Regional Courses (select 4)
 - GEOG 3410 Geography of North America (3 credits)
 - GEOG 3800 Regional Geography (1-3 credits)
 - GEOG 3810 Geography of Europe (3 credits)
 - GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
 - GEOG 3840 Geography of Africa (3 credits)
 - GEOG 3850 Geography of the Middle East (3 credits)
 - GEOG 3860 Geography of Latin America and the Caribbean (3 credits)
 - GEOG 3870 Planning for Sustainable Cities (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)(recommended)
- Complete Core Curriculum requirements

Junior

- GEOG 3531 Political Geography (3 credits)
- GEOG 3532 Political Ecology (3 credits)
- GEOG 3XXX any remaining Regional Geography courses
- Spatial Methods electives (select 2)
 - GEOG 3226 Cartography (3 credits)
 - GEOG 3255 Introduction to Remote Sensing (3 credits)

- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- Physical Geography electives (select 2)
 - GEOG 3125 Weather and Climate (3 credits)
 - GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630 Conservation Biology (3 credits)
 - GEOG 4130 Biogeography (3 credits)
 - GEOG 4140 Landscape Ecology (3 credits)
- GEOG 3XXX/4XXX Geography elective (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)

Senior

- GEOG 3XXX any remaining Regional Geography courses
- GEOG 3XXX/4XXX any remaining Spatial Methods electives
- GEOG 3XXX/4XXX any remaining Physical Geography electives
- GEOG 3XXX/4XXX Geography elective (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- GEOG 4990 Thesis (3 credits)

Policy and Planning, B.S. *major* Urban Resources Planning Emphasis

Required Credits: 48

Required GPA: 2.25

I REQUIRED CORE

Complete the following courses:

- GEOG 2400 Introduction to Planning (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3550 Site and Resource Analysis in Planning (3 credits)
- GEOG 3580 Regional Development Planning (3 credits)

II REQUIRED ELECTIVES

Complete one of the following courses:

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOL 1110 Physical Geology (4 credits)

Complete one of the following courses:

- ECON 3040 Environmental Economics (3 credits)
or ENVR 3040 Environmental Economics (3 credits)
- GEOG 3400 Economic Geography (3 credits)

Complete one of the following courses:

- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)

Complete one of the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)

Complete one of the following courses:

- BIOL 3630 Conservation Biology (3 credits)
or GEOG 3630 Conservation Biology (3 credits)
- GEOG 3125 Weather and Climate (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)

Complete one of the following courses:

- GEOG 3410 Geography of North America (3 credits)
- GEOG 3810 Geography of Europe (3 credits)
- GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
- GEOG 3840 Geography of Africa (3 credits)
- GEOG 3850 Geography of the Middle East (3 credits)
- GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

Complete one of the following courses:

- ENGL 2150 Technical Writing (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)

III REQUIRED CAPSTONE

Complete the following courses:

- ENVR 3880 Environmental Controversies (2 credits)
- ENVR 4880 Senior Seminar I (1 credit)

Complete one of the following courses for 3 credits:

- ENVR 4970 Internship (3 credits)
- GEOG 4970 Internship (3 credits)
- ENVR 4990 Thesis (3 credits)
- GEOG 4990 Thesis (3 credits)

IV REQUIRED EMPHASIS

Complete the following courses:

- GEOG 3560 Metropolitan Land Use Planning (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)

Suggested Semester Schedule | Policy and Planning, B.S.

The following is a list of Geography Policy and Planning major courses arranged by year. This suggested schedule is intended to help students plan their courses in an orderly fashion. Some courses or course sequences may appear more than once. Geography majors and minors are strongly encouraged to meet with advisors in the Geography program prior to selecting courses as all courses are not offered each year.

Freshman

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 2400 Introduction to Planning (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3400 Economic Geography (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOL 1110 Physical Geology (4 credits)
- Core Curriculum requirements

Sophomore

- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- Regional Courses (select 4)
 - GEOG 3410 Geography of North America (3 credits)
 - GEOG 3800 Regional Geography (1-3 credits)
 - GEOG 3810 Geography of Europe (3 credits)
 - GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
 - GEOG 3840 Geography of Africa (3 credits)
 - GEOG 3850 Geography of the Middle East (3 credits)
 - GEOG 3860 Geography of Latin America and the Caribbean (3 credits)
- GEOG 3550 Site and Resource Analysis in Planning (3 credits)
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ENGL 2150 Technical Writing (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)
- ENVR 3880 Environmental Controversies (2 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)
- Complete Core Curriculum requirements

Junior

- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 3532 Political Ecology (3 credits)
- GEOG 3560 Metropolitan Land Use Planning (3 credits)
- GEOG 3570 Public Lands Planning (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630
- GEOG3XXX any remaining Regional Geography course
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ECON 3040 Environmental Economics (3 credits)
or ENVR 3040 Environmental Economics (3 credits)

Senior

- GEOG 3XXX any remaining Regional Geography course
- GEOG 3580 Regional Development Planning (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4970 Internship (3 credits)
or ENVR 4970 Internship (3 credits)
or GEOG 4990 Thesis (3 credits)
or ENVR 4990 Thesis (3 credits)
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ENVR 4880 Senior Seminar I (1 credit)

Policy and Planning, B.S. *major* Natural Resources Planning Emphasis

Required Credits: 48
Required GPA: 2.25

I REQUIRED CORE

Complete the following courses:

- GEOG 2400 Introduction to Planning (3 credits)

- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3550 Site and Resource Analysis in Planning (3 credits)
- GEOG 3580 Regional Development Planning (3 credits)

II REQUIRED ELECTIVES

Complete one of the following courses:

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOL 1110 Physical Geology (4 credits)

Complete one of the following courses:

- ECON 3040 Environmental Economics (3 credits)
or ENVR 3040 Environmental Economics (3 credits)
- GEOG 3400 Economic Geography (3 credits)

Complete one of the following courses:

- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)

Complete one of the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)

Complete one of the following courses:

- BIOL 3630 Conservation Biology (3 credits)
or GEOG 3630 Conservation Biology (3 credits)
- GEOG 3125 Weather and Climate (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)

Complete one of the following courses:

- GEOG 3410 Geography of North America (3 credits)
- GEOG 3810 Geography of Europe (3 credits)
- GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
- GEOG 3840 Geography of Africa (3 credits)
- GEOG 3850 Geography of the Middle East (3 credits)
- GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

Complete one of the following courses:

- ENGL 2150 Technical Writing (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)

III REQUIRED CAPSTONE

Complete the following courses:

- ENVR 3880 Environmental Controversies (2 credits)
- ENVR 4880 Senior Seminar I (1 credit)

Complete one of the following courses for 3 credits:

- ENVR 4970 Internship (3 credits)
- GEOG 4970 Internship (3 credits)
- ENVR 4990 Thesis (3 credits)
- GEOG 4990 Thesis (3 credits)

IV REQUIRED EMPHASIS

Complete the following courses:

- GEOG 3532 Political Ecology (3 credits)
- GEOG 3570 Public Lands Planning (3 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)

Suggested Semester Schedule | Policy and Planning, B.S.

The following is a list of Geography Policy and Planning major courses arranged by year. This suggested schedule is intended to help students plan their courses in an orderly fashion. Some courses or course sequences may appear more than once. Geography majors and minors are strongly encouraged to meet with advisors in the Geography program prior to selecting courses as all courses are not offered each year.

Freshman

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 2400 Introduction to Planning (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3400 Economic Geography (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- GEOL 1110 Physical Geology (4 credits)
- Core Curriculum requirements

Sophomore

- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- Regional Courses (select 4)
 - GEOG 3410 Geography of North America (3 credits)
 - GEOG 3800 Regional Geography (1-3 credits)
 - GEOG 3810 Geography of Europe (3 credits)
 - GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
 - GEOG 3840 Geography of Africa (3 credits)
 - GEOG 3850 Geography of the Middle East (3 credits)
 - GEOG 3860 Geography of Latin America and the Caribbean (3 credits)
- GEOG 3550 Site and Resource Analysis in Planning (3 credits)
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ENGL 2150 Technical Writing (3 credits)
- ENGL 3150 Writing In The Disciplines (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)
- ENVR 3880 Environmental Controversies (2 credits)
- ENVR 4210 Environmental Law and Policy (3 credits)
- Complete Core Curriculum requirements

Junior

- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 3532 Political Ecology (3 credits)
- GEOG 3560 Metropolitan Land Use Planning (3 credits)
- GEOG 3570 Public Lands Planning (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630
- GEOG3XXX Any Remaining Regional Geography Course
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ECON 3040 Environmental Economics (3 credits)
or ENVR 3040 Environmental Economics (3 credits)

Senior

- GEOG 3XXX Any Remaining Regional Geography Course
- GEOG 3580 Regional Development Planning (3 credits)
- GEOG 3870 Planning for Sustainable Cities (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4970 Internship (3 credits)
or ENVR 4970 Internship (3 credits)
or GEOG 4990 Thesis (3 credits)
or ENVR 4990 Thesis (3 credits)
- ECON 3010 Public Economics (3 credits)
- ECON 3230 Benefit/Cost Analysis (3 credits)
- ENVR 4880 Senior Seminar I (1 credit)

Social Studies, B.A. *major* Geography Emphasis

Required Credits: 48
Required GPA: 2.50

Note: A minimum of 22 semester credits used to meet course requirements in I and II must be completed at Bemidji State University. No course grade below a C may be used to meet these requirements and a minimum GPA of 2.50 in this major is required for graduation. Students who desire a second field of emphasis are to consider a completion of a minor or a second major in that field. Such action may complement and increase the marketability of this major.

I REQUIRED CORE CURRICULUM

CAPSTONE COURSE

COMPLETE THE FOLLOWING COURSE:

- POL 4500 Thesis and Career Preparation (3 credits)

ECONOMICS COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- ECON 2000 Principles of Microeconomics (3 credits)
- ECON 2100 Principles of Macroeconomics (3 credits)

GEOGRAPHY COURSES

SELECT 1 OF THE FOLLOWING COURSES

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)

GEOGRAPHY COURSES

SELECT 1 OF THE FOLLOWING COURSES:

- GEOG 3410 Geography of North America (3 credits)
- GEOG 3800 Regional Geography (1-3 credits)
- GEOG 3810 Geography of Europe (3 credits)
- GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
- GEOG 3840 Geography of Africa (3 credits)

WORLD HISTORY

SELECT 1 OF THE FOLLOWING COURSES

- HST 2218 Medieval Europe (3 credits)
- HST 2219 Medieval European Culture (3 credits)
- HST 2228 Renaissance and Reformation Europe (3 credits)
- HST 2580 Russia (3 credits)
- HST 2600 Topics in History (3 credits)

- HST 2660 Women and History (3 credits)
- HST 2700 The History of World Religions (3 credits)
- HST 3159 The World at War, 1931-1945 (3 credits)
- HST 3208 Greece And Rome, 1500 BCE-500 CE (3 credits)
- HST 3258 The Roman Civil Law Tradition (3 credits)
- HST 3277 Readings and Research in European History (3 credits)
- HST 3409 Colonialism and Modernization in the Non-Western World (3 credits)
- HST 3419 East Asia (3 credits)
- HST 3429 South and Southeast Asia (3 credits)
- HST 3459 Latin America (3 credits)

U.S. HISTORY

SELECT 1 OF THE FOLLOWING COURSES

- HST 2600 Topics in History (3 credits)
- HST 2610 Minnesota History (3 credits)
- HST 2667 Men and Women: Gender in America (3 credits)
- HST 3117 American Revolutionary Era, 1763-1800 (3 credits)
- HST 3128 Testing Democracy: Reform in Antebellum America, 1787-1865 (3 credits)
- HST 3137 The American Civil War (3 credits)
- HST 3159 The World at War, 1931-1945 (3 credits)
- HST 3187 American West (3 credits)

POLITICAL SCIENCE COURSES

SELECT 1 OF THE FOLLOWING COURSES

- POL 1200 Introduction to American Politics (3 credits)
- POL 1300 Introduction to International Relations (3 credits)
- POL 1400 Introduction to Comparative Politics (3 credits)

POLITICAL SCIENCE COURSES

SELECT 1 OF THE FOLLOWING COURSES

- POL 3100 American Foreign Policy (3 credits)
- POL 3130 Asian Political Development (3 credits)
- POL 3150 Topics in Political Science (1-3 credits)
- POL 3160 Comparative European Politics (3 credits)
- POL 3170 International Relations (3 credits)
- POL 3180 International Law and Organization (3 credits)
- POL 3190 International Political Economy (3 credits)
- POL 3200 Minnesota Politics (3 credits)
- POL 3210 Public Administration (3 credits)
- POL 3230 Environmental Politics (3 credits)
- POL 3410 Legislative and Executive Relations (3 credits)
- POL 3420 Campaigns and Elections (3 credits)
- POL 4200 Constitutional Law (3 credits)

SOCIOLOGY COURSES

COMPLETE THE FOLLOWING COURSES:

- SOC 3010 Sociological Theory (3 credits)
- SOC 3210 Social Movements - How to Change the World (3 credits)

II REQUIRED FIELD OF EMPHASIS

SELECT 18 SEMESTER CREDITS OF ELECTIVES FROM GEOGRAPHY

Sustainability and Resource Management, B.A.S. *major*

Required Credits: 54
Required GPA: 2.25

I REQUIRED CORE COURSES

Complete the following courses:

- BUAD 2231 Business Statistics I (3 credits)
or PSY 3401 Basic Statistics for Research (4 credits)
or STAT 2610 Applied Statistics (4 credits)
- ENGL 2150 Technical Writing (3 credits)
or ENGL 3150 Writing In The Disciplines (3 credits)
- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- ENVR 2000 Introduction to Environmental Science (3 credits)
- ENVR 3600 Environmental Justice and Sustainability (3 credits)
- ENVR 3880 Environmental Controversies (2 credits)

II SUSTAINABILITY AND RESOURCE MANAGEMENT

Select 27 credits from the following courses. Other related courses may be selected with prior approval of department.

- ENVR 3040 Environmental Economics (3 credits)
or ECON 3040 Environmental Economics (3 credits)
- GEOG 3125 Weather and Climate (3 credits)
- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 3532 Political Ecology (3 credits)
- GEOG 3550 Site and Resource Analysis in Planning (3 credits)
- GEOG 3570 Public Lands Planning (3 credits)
- GEOG 3630 Conservation Biology (3 credits)
or BIOL 3630 Conservation Biology (3 credits)
- GEOG 4130 Biogeography (3 credits)
- GEOG 4140 Landscape Ecology (3 credits)
- GEOG 4190 Qualitative Methods in Geographic Research (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- GEOL 3120 Soils (4 credits)
- GEOL 3211 Environmental Hydrology (3 credits)
- GEOL 3212 Hydrogeology (3 credits)
- GEOL 3700 Environmental Geophysics (3 credits)

REGIONAL GEOGRAPHY ELECTIVES

Select 1 of the following courses:

- GEOG 3410 Geography of North America (3 credits)
- GEOG 3800 Regional Geography (1-3 credits)
- GEOG 3810 Geography of Europe (3 credits)
- GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)
- GEOG 3840 Geography of Africa (3 credits)
- GEOG 3850 Geography of the Middle East (3 credits)
- GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

III CAPSTONE PROJECT

Select 1 of the following courses:

- GEOG 4910 Directed Independent Study (3 credits)
- GEOG 4970 Internship (3 credits)
- GEOG 4990 Thesis (3 credits)

Geography *minor*

Required Credits: 18
Required GPA: 2.00

I REQUIRED COURSES

COMPLETE THE FOLLOWING COURSES:

- GEOG 2100 Introduction to Physical Geography (3 credits)
- GEOG 2200 Introduction to Human Geography (3 credits)
- GEOG 2400 Introduction to Planning (3 credits)

II GEOGRAPHY ELECTIVES

SELECT 3 ADDITIONAL GEOGRAPHY COURSES, AT LEAST ONE OF WHICH MUST BE AT THE 3,000 OR 4,000 LEVEL (9 CREDITS)

GIS *minor*

Required Credits: 18
Required GPA: 2.00

I. REQUIRED COURSES

Complete the following courses:

- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- ENVR 3800 Sustainability Analytics & Modeling (3 credits)

II REQUIRED GIS COURSES

Complete 9 credits from the following courses:

- GEOG 3226 Cartography (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)
- GEOG 4980 Research (3 credits)
- CS 2270 Introduction to Web Programming (3 credits)
- CS 2321 Computer Science I (4 credits)
- CS 3270 Advanced Web Programming (3 credits)

Geographic Information Science *cert*

Required Credits: 12
Required GPA: 2.25

I REQUIRED COURSES

Note: The Geographic Information Science certificate is not available to students pursuing the Geography, BS major GIScience emphasis or to students pursuing the GIScience minor.

It is advised that students not having previously taken a GIS course include GEOG 3231, Introduction to Geographic Information Systems, as one of their courses.

Select 4 courses from the following list:

- GEOG 3226 Cartography (3 credits)
- GEOG 3231 Introduction to Geographic Information Systems (3 credits)
- GEOG 3232 Intermediate Geographic Information Systems (3 credits)
- GEOG 3255 Introduction to Remote Sensing (3 credits)
- GEOG 4150 Applications of Machine Learning (3 credits)
- GEOG 4265 Spatial Analysis (3 credits)
- GEOG 4275 Advanced Geographic Information Systems (3 credits)

Geography Courses

GEOG 1224 Introduction to Map Use (3 credits)

This course is designed for the core curriculum and provides an introduction to common characteristics and social aspects for the use of map media. Topographic maps will be used for physical analysis as well as to discern cultural and economic features of landscapes. Thematic maps, their use and applications will be presented. Includes some study out-of-doors with map and compass. Core Curriculum Goal Area(s) 5 & 11.

GEOG 1400 World Regional Geography (3 credits)

A survey of physical, cultural, and economic aspects of world regions. An introduction to how constituent parts of the world differ from one another in their associated resources, cultures and economics. Attention is given to the interrelationships, interdependencies, and associations that bind together the diverse communities of the world. [****Core Curriculum Goal Area(s) 7 & 8**]

GEOG 2100 Introduction to Physical Geography (3 credits)

This course is designed for the core curriculum program and provides an introduction to spatial patterns derived from earth system processes. The course provides a systematic survey of landforms, weather and climate, soils and vegetation. This course utilizes a combination of in class discussion and laboratory-like exercises to investigate these topics. Core Curriculum Goal Area(s) 3 & 10.

GEOG 2200 Introduction to Human Geography (3 credits)

Emphasizes the study of geographical relationships and interactions of cultural, social, economic, ethnic, and political phenomena. Topical approach to population subgroups, religions, languages, urban and rural settlements, and other attributes of the cultural landscape. Core Curriculum Goal Area(s) 7 & 8.

GEOG 2400 Introduction to Planning (3 credits)

This course is designed for the core curriculum program and provides information on the background and fundamentals of the community planning process. Includes discussion of contemporary issues in physical, environmental and social planning. Emphasis is on the local and subregional levels. Core Curriculum Goal Area(s) 5 & 9.

GEOG 2925 People of the Environment: Geography Perspective (3 credits)

An integrative study of the natural, social, value-based, and citizen-action contexts for environmental awareness. The disciplinary component surveys geographic approaches to and institutional settings for environmental problems and decision making, including our spatial behaviors as either sources or recipients of environmental impacts. Interdisciplinary perspectives are evaluated in light of different geographic concepts of spatial distributions, physical geography, and regional planning. Core Curriculum Goal Area(s) 7 & 10.

GEOG 3125 Weather and Climate (3 credits)

Weather is the study of the atmosphere over short time scales, while climate is the study of long-term weather trends. The study of weather is commonly termed meteorology, which is actually a branch of physics associated with fluid dynamics. Climate is associated with statistical procedures and analyses. This course examines the geographic patterns and processes of global climate and weather, as well as topics such as global climate change, global climate models, and extreme weather events. Students learn about the Earth's atmosphere; energy budgets and astronomical controls on weather processes; oceanic and atmospheric circulation; the basic atmospheric parameters; atmospheric hazards such as tornadoes, hurricanes, hail, and lightning; and global climate change issues. Prerequisite: GEOG 2100 or consent of instructor.

GEOG 3226 Cartography (3 credits)

This course provides a more integrated, practical link between cartographic theory and practice for users of GIS. This course blends theoretical discussion of GIS as a science and GIS as a software application and addresses through lecture and laboratory work map productions for a variety of audiences. A particular focus of this course is on quality communication through maps. Experience with GIS software is essential. Prerequisite: GEOG 3231.

GEOG 3231 Introduction to Geographic Information Systems (3 credits)

This course develops a proficiency in basic GIS skills for those new to GIS. The premise of the course revolves around analytical problem solving using spatial data and techniques. The course also focuses on graphic communication of quantitative data including cartographic mapping concepts and data classification. This course concentrates on learning to navigate the current version of ArcGIS software at a beginner's level and developing and creating maps as communication tools. Core Curriculum Goal Area 4.

GEOG 3232 Intermediate Geographic Information Systems (3 credits)

An intermediate course on the theories and application of GIS for spatial data management and analysis, thematic mapping, environmental modeling. This course expands on the concepts and methods presented in Introduction to GIS and guides students through a more comprehensive overview of principles and techniques used in GIS. Course objectives include (1) enhance and build knowledge of GIS as a system and science, (2) improve skills at GIS analysis, and (3) develop and improve problem solving skills. Prerequisite: GEOG 3231 or consent of instructor.

GEOG 3255 Introduction to Remote Sensing (3 credits)

Analysis of a special class of pictures that provide an overhead perspective. These images have unique properties that provide a distinct advantage to assessing spatial changes and patterns of change on the Earth's surface. Students develop an understanding and the skills necessary for interpreting air photos, satellite, and remotely sensed images. Prerequisite: GEOG 3231 or consent of instructor.

GEOG 3400 Economic Geography (3 credits)

This course helps students understand the world's increasingly complex economic interdependence by examining issues confronting the Global Economy today. This course looks at countries' economic and social well-being, their relationships to other countries and internal and global economic patterns of productivity, wealth and development. [****Core Curriculum Goal Area 5**]

GEOG 3410 Geography of North America (3 credits)

A regional analysis of the physical, demographic, economic and cultural characteristics of the nations in North America. Core Curriculum Goal Area(s) 5 & 7.

GEOG 3531 Political Geography (3 credits)

This course utilizes "World Systems Theory" to investigate 1) theories of State formation and organization; 2) historical processes of imperialism, colonialism, and decolonization; 3) major issues of the emerging political economy; 4) historical and contemporary geopolitics; and 5) the political geography of everyday life.

GEOG 3532 Political Ecology (3 credits)

Political ecology utilizes a necessary geographical perspective to understand and analyze the biophysical processes that shape issues otherwise inadequately conceptualized as political, economic or social. This spatial understanding developed by political geographers reveals relationships of the ecological and the political that are simultaneously mutually reinforcing and, often, mutually antagonistic. Prerequisite: GEOG 3531 or consent of instructor.

GEOG 3550 Site and Resource Analysis in Planning (3 credits)

This course emphasizes techniques and methods in the location, analysis, evaluation, and design of sites, focusing on identifying use potentials and impact limitations for planning and management. Prerequisite: GEOG 2400 or consent of instructor.

GEOG 3560 Metropolitan Land Use Planning (3 credits)

An examination of the identification and inventory methods of land use analysis including the designing of land use models which are compatible with environmental, social, and economic goals. Prerequisites: GEOG 2100, GEOG 2400, or consent of instructor. Prior completion of or concurrent enrollment in either GEOG 3550 or GEOG 3570 is recommended.

GEOG 3570 Public Lands Planning (3 credits)

Comparison and evaluation of natural resource management policies and analytical techniques of the U.S. Forest Service, Bureau of Land Management, National Park Service and U.S. Fish and Wildlife Service. Attention is paid to the historical and contemporary land management approaches used to protect, exploit, manage, and/or use public lands in the United States. Especially relevant are jurisdictional issues over public land, federal agencies involved in land management, state and local issues and land management, and contemporary issues associated with land management in the 21st Century. Prerequisites: GEOG 2400 and GEOG 3550, or consent of instructor.

GEOG 3580 Regional Development Planning (3 credits)

An examination of methods and processes emphasizing contemporary relationships between planners and governments, the private sector, and nongovernmental organizations regarding relationships between regions nationally and internationally, with special attention to environmental sustainability. Prerequisite(s): GEOG 2400 or consent of instructor.

GEOG 3630 Conservation Biology (3 credits)

Principles and theories of conservation biology. Topics include biodiversity, threats to biodiversity, extinctions, management of threatened and endangered species, managing habitats for conservation, and methods to mitigate biodiversity loss. Prerequisites: BIOL 1400 and BIOL 1500, or consent of instructor. Also BIOL 3630.

GEOG 3800 Regional Geography (1-3 credits)

A regional and topical analysis of the cultural and physical features of a continent or major region of the earth. May be repeated provided different regions are involved. Note: Recommended for students in international studies, foreign languages, and for prospective teachers in the humanities or social studies.

GEOG 3810 Geography of Europe (3 credits)

A regional analysis of Europe emphasizes both the physical and cultural environments across the continent. We explore the regional differentiation of economic and political affairs throughout different regions. Examine the population distributions, natural resources, and the ever-interweaving globalized world. Core Curriculum Goal Area(s) 5 & 8.

GEOG 3820 Geography of East, South, and Southeast Asia (3 credits)

This course is designed to provide a more in depth look at Asian sub regions of South, East and Southeast Asia. Geographically, we will examine and analyze activities in this part of the world through cultural, demographic, political, economic, urban and geopolitical lenses. [****Core Curriculum Goal Area 8**] Might not be offered every year. Prerequisite: GEOG 1400 or GEOG 2200.

GEOG 3840 Geography of Africa (3 credits)

Despite persistent bias about it, Africa's cultural complexity, social dynamism, and political/economic struggle have tremendous relevance for the study of global trends at the start of the twenty-first century. The central purpose of this course is to demonstrate that relevance by investigating the cultural, historical, economic, and political dimensions of change in Africa.

GEOG 3850 Geography of the Middle East (3 credits)

This course is designed to provide a more in depth look at the region we routinely describe as the Middle East. Geographically, we will examine activities in SW Asia and the nations of North Africa. We may extend our discussion to the countries of Afghanistan, the Sudan, South Sudan and Turkey to provide a more comprehensive analysis of a particular topic or subtopic. This is a highly complex region and may be looked at from numerous perspectives. Our objective thus is to examine the region through economic, cultural, environmental, urban and geopolitical lenses. Prerequisite: GEOG 1400 or GEOG 2200.

GEOG 3860 Geography of Latin America and the Caribbean (3 credits)

This course is designed to provide a more in depth look at the region of Latin America and the Caribbean. We recognize at the outset that this is a broad subject and may be looked at from numerous perspectives. Our objective thus is to examine this geographic region through economic, cultural, environmental, urban and political lenses. The text book provides the basis for our study which is further complemented by each students (1) research into an issue or event that had a far reaching impact on this region or within its sub-regions, (2) reading of works of fiction set in Latin America and (3) viewing feature films with Latin American themes. Prerequisite: GEOG 1400 or GEOG 2200.

GEOG 3870 Planning for Sustainable Cities (3 credits)

Using a World Regional Geography approach, this course examines the dynamics of urban development across the globe, with particular reference to sustainable urban design and urban biodiversity. Political, cultural, environmental and economic influences on the city are examined in both the developed and the developing world. [****Core Curriculum Goal Area 5**]

GEOG 4130 Biogeography (3 credits)

This course examines the distribution and diversity of flora and fauna across multiple scales. It will focus on the factors that shape and influence these patterns and investigate the role of disturbance in this process. It will also incorporate both field and lab experiences to further examine the key concepts of biogeography. Prerequisites: GEOG 2100 and GEOG 3231.

GEOG 4140 Landscape Ecology (3 credits)

This course examines the connection of pattern and process at the scale of the landscape. Students will utilize several analytical methods to examine and explain how humans, disturbance and natural process work in concert to create landscape-level dynamics and change. The course will also cover how landscape ecology is applied to assist in conservation efforts. Prerequisites: GEOG 2100 and GEOG 3231.

GEOG 4150 Applications of Machine Learning (3 credits)

The uses of machine learning, data science and artificial intelligence are everywhere today. Much of the data we create through our daily activities gets processed and used to customize services, offer better health care, or target you for specific advertising. Although there are many benefits of using data in these ways, there can be pitfalls and caution is always warranted when employing these tools. As such this class attempts to teach you the basic foundations of machine learning with particular emphasis to its application in environmental and spatial analysis. To this end, we will use the python development environment and we will emphasize the most commonly used tools including supervised learning algorithms (logistic regression, linear regression, neural networks), unsupervised learning algorithms (k- means, principal component analysis). In addition, we also cover anomaly detection, natural language processing and building recommender systems. A central focus will be building this foundation so students can successfully participate in a Kaggle competition which is a premier venue for testing your machine learning skillset.

GEOG 4190 Qualitative Methods in Geographic Research (3 credits)

As a geographic perspective becomes increasingly important in analysis of critical issues at multiple scales from the local to the global, this course demonstrates how research grounded in qualitative methodologies encourages innovative approaches and yields significant insights. Prerequisite: GEOG 2200. While not required, it is highly recommended that GEOG 4210 and GEOG 4265 be taken previously or concurrently.

GEOG 4210 The History and Development of Geographic Thought (3 credits)

Development of the discipline of Geography with emphasis on both the historical and recent developments in the field. Includes a critical analysis of writing of representative geographers.

GEOG 4265 Spatial Analysis (3 credits)

An examination in the concepts and application of advance spatial statistical methodologies. These include, kriging, spatial autocorrelation, spatial regression models, and cluster analysis. Prerequisites: STAT 2610 or PSY 3401 or BUAD 2231 and GEOG 3231.

GEOG 4275 Advanced Geographic Information Systems (3 credits)

This course will give students hands on experience working with advanced geodatabases, the basic automation and scripting of geospatial processes, web mapping, and server side application in GIS. Prerequisites: GEOG 3231 and GEOG 3232.

GEOG 4910 Directed Independent Study (3 credits)

Arranged individual study.

GEOG 4917 DIS Tchg Assoc | (1-2 credits)

Directed Independent Study | Teaching Associate

GEOG 4930 Experimental Course (3 credits)

A course proposed for inclusion in the University curriculum. May not be offered more than two times as an experimental course.

GEOG 4970 Internship (3 credits)

Graded Satisfactory/Unsatisfactory only. Student internships may be either full-time or part-time in a public or private agency appropriate to the degree objective. Internships consist of closely supervised periods of service that are arranged in advance of the course registration. Students should consult their advisor concerning prerequisites.

GEOG 4980 Research (3 credits)

Research carried out by the student that is based on appropriate methodology and scholarship.

GEOG 4990 Thesis (3 credits)

Working individually with a thesis advisor, the student produces a Geography thesis. The thesis must be a scholarly piece of work, based on empirical or archival research of a geographical issue (physical, demographic, economic, cultural, and/or political) of present or future relevance. The end product is a documented essay of at least minimally required length and format that must be approved by the advisor and at least one other member of the Geography Department after a brief oral defense.

All-University Courses

The course numbers listed below, not always included in the semester class schedule, may be registered for by consent of the advisor, instructor, or department chair, or may be assigned by the department when warranted. Individual registration requires previous arrangement by the student and the completion of any required form or planning outline as well as any prerequisites.

1910, 2910, 3910, 4910 DIRECTED INDEPENDENT STUDY
 1920, 2920, 3920, 4920 DIRECTED GROUP STUDY
 1930, 2930, 3930, 4930 EXPERIMENTAL COURSE
 1940, 2940, 3940, 4940 IN-SERVICE COURSE
 1950, 2950, 3950, 4950 WORKSHOP, INSTITUTE, TOUR
 1960, 2960, 3960, 4960 SPECIAL PURPOSE INSTRUCTION
 1970, 2970, 3970, 4970 INTERNSHIP
 1980, 2980, 3980, 4980 RESEARCH
 1990, 2990, 3990, 4990 THESIS