

Guide to Minors, Areas of Special Interest (ASI), and Electives in Technical Options Related to Geophysics

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This guide is new, and the coordination of Minor and ASI programs is still being worked out between the Department of Geophysics and other departments. Therefore, it is strongly advised that, before embarking on any of the course sequences recommended in this Guide, students not only consult with their advisor in the Department of Geophysics, but also obtain approval from the specific department offering the Minor or ASI program.

As you use the Guide, you will undoubtedly see ways in which it could be improved. Please send your suggestions to Professors Larner (klarner@dix.mines.edu) and Young (tkyoung@mines.edu) for incorporation in the next revision.

1 Introduction

Undergraduates majoring in Geophysics take at least eighteen hours of electives, nine of which must be in an approved humanities and social sciences (HSS) cluster. Geophysics students in the McBride Honors Program generally devote all their elective credits to this program, which leads to a certificate and a Minor in Public Affairs for Engineers. Other geophysics undergraduates may also organize their selection of unrestricted elective hours to earn a Minor or to establish an Area of Special Interest. Minor Programs consist of a minimum of eighteen credit hours in a logical sequence of courses, only three hours of which may generally be taken in the major department, i.e., Geophysics. Areas of Special Interest (ASI) require twelve credit hours in a logical sequence of courses, only three hours of

which may be at the 100- or 200- level. By combining the right selection of unrestricted elective credits with non-geophysics coursework already required in the curriculum, all undergraduates have the opportunity to form a Minor Program or ASI.

1.1 Purpose of this Guide

This Guide aims to help undergraduate students studying geophysics at CSM select elective courses offered in other engineering and science departments, that may relate to their various interests. CSM undergraduates are free to choose their elective courses, both technical and non-technical, from course offerings across campus. Neither faculty nor Department may impose any restrictions on the choice of elective courses that a student takes other than that pertinent course prerequisites must be satisfied and that CSM requirements, such as a HSS cluster sequence, must be taken. The geophysics faculty, nevertheless, believe that geophysics students would appreciate and benefit from suggestions regarding technical courses in other departments that could be of particular interest, depending on a student's individual inclinations and projected career directions. Some students may wish to minor in or choose an "area of specialization" in some subject outside geophysics. Others may wish to do neither, but would still value suggestions about individual courses in other departments that they might consider taking for credit. The organization of this Guide is by CSM Option. For each option, the geophysics faculty offer some guidance here on courses that might constitute a minor. Students who wish to have an area of specialization may then select a subset of courses from those listed for the minor. Likewise, those students who wish simply to choose an individual course will likely find courses of interest from among those listed for the minor.

In any case, students are encouraged to discuss their plans for electives with their faculty advisors, and to consult with other relevant departments before embarking on a sequence of courses expected to lead to a Minor or ASI.

1.2 Design of the Guide

For each of the options contained in the Guide, students will find specific requirements that the option has set for a minor in its program. Likewise, listed for the courses are prerequisites that either need to be satisfied or might be addressed through discussion with the instructor. Further information about specific courses

can be found in the *CSM Bulletin*. This Guide does not contain every last undergraduate course offered by any given option. Rather, the geophysics faculty have been selective in choosing the courses included here, based on their understanding of the perceived value of the course to geophysics students in particular. Students who wish to take courses that are not included in this Guide may do so.

Because geophysics is built on a foundation that includes physics, mathematics, computer science, and geology, students will find that, for these options, they may have already satisfied one or more of the courses required for a minor just by virtue of courses that have been required for the major in geophysics. These options will therefore likely offer the most efficient choices for fulfilling the requirements of a minor.

Finally, not listed here are interesting course offerings at Colorado University or beginning graduate courses in geophysics that some geophysics seniors might wish to consider taking if they have the time during their final semesters at CSM.

1.3 Some Background

With geophysics, it's a two-way street—being a hybrid of many fields, including physics, mathematics, geology, computer science, and signal theory, geophysics has drawn on learning from all of these sciences; conversely, geophysics has fed many of its ideas and developments back to each of these disciplines. The undergraduate geophysics program at CSM reflects the hybrid nature of the field; the preparation of undergraduates for any of a wide variety of career directions in geophysics requires an integrated foundation in all of these disciplines.

Moreover, the role of applied geophysics in the world is such that it often is a key source of technical information and data for many disciplines and fields. Examples include understanding of geology and petroleum reservoirs obtained from remote-sensing information provided by geophysics. Other examples are the many environmental and mining applications, as well as civil-engineering and hydrogeology applications, for shallow-target geophysics. Courses available at CSM in those fields can give geophysics students a good start at understanding the language of and problems in those fields, both of which can be highly beneficial in the world of interdisciplinary science and engineering ahead.

For those students who contemplate continuing with studies in graduate school or who simply wish to strengthen their understanding of underlying principles and methods of geophysics, CSM programs in mathematics and computer sciences, physics, geochemistry, and mechanical and electrical engineering offer excellent

courses that go beyond or support material covered in the geophysics courses.

1.4 The Options Listed in this Guide

Electives of possible interest are listed here by option, with options grouped into three categories: (1) those that support the scientific foundations, (2) those that offer applications of geophysics, and (3) economics and business (a group of one), for its value in broadening the background of those interested in business aspects of geophysics (such as students who may wish to join a high-tech start-up company early in their career).

In this Guide, suggested electives are drawn from the following options:

1.4.1 Basic sciences

- computer science
- mathematics
- physics

1.4.2 Fields of application

- engineering
 - civil / geotechnical
 - electrical / instrumentation
 - environmental (Engineering Division)
 - environmental (Environmental Science and Engineering Division)
 - earthquake
 - rock mechanics / labwork
- geology, geological engineering, and hydrogeology
- mining engineering
- petroleum engineering

1.4.3 Useful for young entrepreneurs

- economics and business

The above categorization is somewhat arbitrary in places. For example, signal theory courses in electrical engineering, mechanics courses in mechanical engineering, and courses such as mineralogy, petrology, and paleontology in geology generally provide useful fundamentals. At the same time, courses related to the design of electrical circuits and computer circuits in electric engineering and hydraulics in mechanical engineering could be of practical interest to geophysicists who choose to work in field-data acquisition. Similarly of practical interest would be courses in petroleum geology and geologic interpretation.

The following sections give detailed recommendations about electives in the various options. Keep in mind that, for all options, a *minor* requires 18 credit hours in the Option, and an *Area of Specialization* requires 12 hours.

2 Basic Sciences

2.1 Computer Science

The requirements for an Area of Special Interest in Computer Science include:

- MACS262 Data Structures (3 hr)
(prereq: MACS261)
 - MACS306 Techniques of Program Design (3 hr)
(prereq: MACS262)
 - MACS341 Machine Organization and Assembly Language Programming (3 hr)
(prereq: MACS261)
 - MACS406 Design and Analysis of Algorithms (3 hr)
(prereq: MACS213 or MACS223, 262, 358)
- or-
- MACS407 Introduction to Numerical Methods (3 hr)
(prereq: MACS315)

Note that MACS261 Computer Programming Concepts is a prerequisite for MACS262 and MACS341. MACS261 is a required course for Geophysical Engineering majors and, according to the general rules associated with minor programs, geophysics students may count the three credit hours for this course toward a Minor or ASI in Computer Science. (We are in process of confirming this point with the MACS Department.) We recommend MACS407 rather than MACS406 because of the immediate value and long-term benefit of numerical techniques in many fields of geophysics.

To obtain a Minor in Computer Science, one needs to take two more courses in addition to those required for an Area of Special Interest, two 400-level course which may not be languages transferred from another university. For the two additional electives we recommend two of the following:

- MACS400 Principles of programming languages (3 hr)
(prereq: MACS262)
- MACS411 Introduction to Expert Systems (3 hr)
(prereq: MACS262, MACS358)
- MACS440 Parallel Comp. for Sci. and Engr. (3hr)

Among these, MACS400 is of immediate practical value for carrying out work in geophysics, while MACS411 is aligned with current trends in analysis and interpretation of large-scale data sets (although the prerequisite means it requires extra course work). MACS440 is excellent to have in one's background, since parallel and distributed computation is essential for solution of large-scale scientific and engineering problems, such as are common in geophysics. Seismic data processing and electromagnetic modeling have benefitted greatly from developments in parallel and distributed computation.

The prerequisites for these courses are basically MACS213, 261, and 315, which are all required courses for the Bachelor of Science in Geophysical Engineering.

2.2 Mathematics

The requirements for an Area of Special Interest in Mathematical Science include:

- MACS323 Probability and Statistics for Engineers (3 hr)
(prereq: MACS112 or 122)
- MACS332 Linear Algebra (3 hr)
(prereq: MACS213 or 223)
- MACS333 Introduction to Mathematical Modeling (3 hr)
(prereq: MACS315)
- MACS407 Introduction to Numerical Methods (3 hr)
(prereq: MACS315)

To obtain a Minor in Mathematics, one needs to take two additional courses:

- MACS261 Programming Concepts (3 hr)
- MACS4XX
(3 hr)

Since MACS261 is required for the Geophysical Engineering degree, one needs only five additional courses (15 credit hours) to obtain a Minor in Mathematics. The first four courses required for a minor in Mathematics are almost a must for a well-rounded geophysicist. Unfortunately, they could not be fit into the geophysics curriculum. MACS323 will be very useful for anyone who deals with observational data, and MACS332 and MACS407 provide the necessary foundation for carrying out quantitative work in geophysics.

There are a number of possible choices for the electives at the 400 level. We recommend any of the following:

- MACS401 Applied Analysis (3 hr)
(prereq: MACS213)
- MACS428 Applied Probability (3 hr)
(prereq: MACS213 or 223)
- MACS454 Complex Analysis (3 hr)
(prereq: MACS315)

The prerequisites for these courses are basically MACS112, 213, and 315, which are all required courses for Geophysical Engineering.

2.3 Physics

The good news for geophysics majors who wish to minor in Physics is that nine semester hours in the Physics option are already required for Geophysical Engineering:

- PHGN100 Physics I - Mechanics (4.5 hr)
- PHGN200 Physics II - Electromagnetics and Optics (4.5 hr)

Potentially bad news, in terms of restrictions, is that two courses of modern physics are specifically required for a minor:

- PHGN300 Physics III - Modern Physics I (3 hr)
- PHGN325 Modern Physics II (4 hr)

This leaves room for just one more course, which must be selected from among

- PHGN341 Thermal Physics (3 hr)
- PHGN350 Intermediate Mechanics (4 hr)
- PHGN361 Intermediate Electromagnetism (3 hrs)

Of these three courses, Intermediate Electromagnetism complements material taught in GPGN322 and Intermediate Mechanics complements material in GPGN220. While Thermal Physics as it is taught in many universities would provide a fundamental understanding of thermodynamics via statistical physics, the course at CSM seems to be oriented along a more classical approach.

Given the rigid requirements for a Minor in Physics, as defined above, geophysics students may prefer to pursue an Area of Specialization in Physics, which requires only Physics I and II, plus just one other course of the student's choosing. Courses that we recommend include:

- PHGN300 Physics III - Modern Physics I (3 hr)
- PHGN350 Intermediate Mechanics (4 hr)
- PHGN361 Intermediate Electromagnetism (3 hr)
- PHGN412 Mathematical Physics (3 hr)

- PHGN320 Intro to Astronomy and Astrophysics (3 hr)

Prerequisites for these courses are no more than Physics I and II, and MACS347, which is the counterpart of MACS349, taught in the Department of Geophysics. It is likely that MACS349 will be considered a valid substitute for the MACS347 prerequisite. Geophysics students would likely find PHGN320 to be an interesting course, although it would have little direct application except for those who might later be interested in an area of planetary physics, such as the study of volcanism on Io.

Other courses in Physics that look interesting and are listed in the *CSM Bulletin*, such as Physics of the Environment, Computational Physics and Astrophysics, are taught on and off (mostly off), depending on the interests and availability of instructors. Others (e.g., Plasma Physics) are no longer offered. Still others, such as Nuclear Physics and Solid State Physics, require PHGN325.

One final course that should be enjoyable and of general interest is PHGN402 Great Physicists (1 hr; no prerequisites).

3 Fields of Application

3.1 Engineering

The Engineering Division offers Minor and Area of Special Interest (ASI) Programs in several engineering specialties that relate to areas of geophysical applications. For instance, a Minor or ASI in Civil Engineering would be appropriate for someone interested in geotechnical applications of geophysics. The Electrical Minor or ASI is well suited to someone interested in geophysical instrumentation. For geophysics students interested in environmental applications, the Engineering Division offers an Environmental Minor or ASI. The courses specifically recommended for geophysics students in each of these areas are:

1. Civil / Geotechnical Minor (18 hrs) or ASI (12 hrs)
 - EGGN331 Photogrammetry (3 hr)
 - EGGN342 Structural Theory (3 hr)
(prereq: EGGN320)
 - EGGN430 Global Positioning Systems (3 hr)
(prereq: EGGN233 or consent)

- EGGN461 Soil Mechanics (3 hr)
(prereq: EGGN320)
- EGGN463 Soil Mechanics Laboratory (1 hr)
(prereq: EGGN461 or concurrent enrollment)
- EGGN464 Foundations (3 hr)
(prereq: EGGN461)
- EGGN466 Construction Site Engineering (3 hr)
(prereq: consent)

Note that EGGN320 Mechanics of Materials (3 hr) is a prerequisite for the sequence of courses listed here. EGGN320 requires DCGN241 Statics (3 hr) as a prerequisite. Hence, six hours of prerequisites are needed before embarking on this Minor or ASI sequence, and these prerequisites are not normally required of students in Geophysical Engineering. The net effect is to make the ASI an eighteen hour program, and the Minor 24 hours. Before commencing this particular Minor or ASI program it would be advisable for a geophysics student to consult with the Engineering Division faculty to see if there are any reasonable options for reducing this requirement (based on similarities with courses in the geophysics program).

2. Electrical / Instrumentation Minor (18 hrs) or ASI (12 hrs)

- DCGN381 Electrical Circuits, Electronics and Power (3 hr)
(prereq: PHGN200)
- EGGN250 Multidisciplinary Engineering Lab I (1.5 hr)
(prereq: DCGN381 or concurrent enrollment)
- EGGN382 Engineering Circuit Analysis (2 hr)
(prereq: DCGN381, EGGN383 (?); coreq: MACS315)
- EGGN388 Information Systems Science (3 hr)
(prereq: DCGN381)
- EGGN385 Electronic Devices and Circuits (4 hr)
(prereq: DCGN381 and EGGN250)
- EGGN483 Intro to Communication and Signal Processing (4 hr)
(prereq: EGGN382)

- EGGN481 Adv. Electronics and Digital Systems (4 hr)
(prereq: DCGN381, EGGN250)
- EGGN485 Microcomputer Architecture and Interfacing (4 hr)
(prereq: EGGN385, EGGN389)

DCGN381 is required for the Geophysical Engineering Option, but it is not normally taken until Fall Semester of the Senior Year. A student wishing to pursue a Minor or ASI Program in Electrical / Instrumentation should take DCGN381 during Fall Semester of the Junior Year to allow an earlier start on this course sequence. Students interested in this sequence of courses should consult with the Engineering Division regarding the possibility of substituting GPGN306 and GPGN404 for EGGN382; GPGN302 and GPGN452 for EGGN483.

3. Environmental Minor (18 hrs) or ASI (12 hrs) – Engineering Division

- EGGN353 Fundamentals of Environmental Science and Engr I (3 hr)
(prereq: MACS213)
- EGGN354 Fundamentals of Environmental Science and Engr II (3 hr)
(prereq: MACS213)
- EGGN453 Wastewater Engineering (3 hr)
(prereq: EGGN353)
- EGGN454 Water Supply Engineering (3 hr)
(prereq: EGGN353)
- EGGN455 Solid and Hazardous Waste Engineering (3 hr)
(prereq: EGGN354)
- EGGN456 Scientific Basis of Environmental Regs. (3 hr)
(prereq: EGGN353)
- EGGN457 Site Remediation Engineering (3 hr)
(prereq: EGGN354)

Note that this course sequence does not require prerequisites outside the sequence itself, except for MACS213, which is already required of students in the Geophysical Engineering Option.

4. Environmental Minor (18 hrs) or ASI (12 hrs) – Environmental Science and Engineering Division

A second, very attractive route to obtain a Minor or ASI in the environmental area is through the Environmental Science and Engineering (ESE) Division. This route allows geophysics students to take advantage of their required Physics of the Earth (GPGN494) course, and to select other interesting courses from a variety of departments. First, any course offered by the ESE Division may be applied to the ESE Minor or ASI. We recommend selecting from among these ESE courses:

- ESGN200 Intro to Environmental Science (3 hr)
(prereq: MACS111, CHGN121; coreq: PHGN100)
- ESGN301 Environmental Biology (3 hr)
(prereq: ESGN200 or SYGN101)
- ESGN302 Intro to Environmental Chemistry (3 hr)
(prereq: ESGN200 or SYGN101)
- ESGN412 Environmental Toxicology (3 hr)
(prereq: ESGN301)
- ESGN473 Hazardous Waste Management (3 hr)
(prereq: ESGN200 or SYGN101)

In addition, with approval of the ESE Division, it is possible to select courses from various other departments, including:

- GEGN467 Groundwater Engineering (4 hr)
(prereq: MACS315, GEOL309, GEOL314)
- GPGN494 Physics of the Earth (3 hr)
- PHGN404 Physics of the Environment (3 hr)
(prereq: PHGN200)

It is also acceptable to include one course from Liberal Arts and International Studies. We recommend choosing from the following:

- LISS364 Engineering, Science and Technology (3 hr)
(prereq: LIHU100, coreq: SYGN200)

- LISS431 Global Environmental Issues (3 hr)
(prereq: LIHU100, coreq: SYGN200)
- LISS460 Technology and Wilderness (3 hr)
(prereq: LIHU100, coreq: SYGN200)
- LISS480 Environmental Politics and Policy (3 hr)
(prereq: LIHU100, coreq: SYGN200)
- LISS 482 Water Politics and Policy (3 hr)
(prereq: LIHU100, coreq: SYGN200)

The actual slate of courses chosen from the above must be presented to the ESE Division for approval.

5. Earthquake Engineering ASI (12 hrs)

Students interested in Earthquake Engineering should first consider the sequence described above for the Civil Engineering specialty, since this has been formally established by the Engineering Division. Alternatively, we suggest that geophysics students consult with the Engineering Division to obtain approval for an ASI using the following course sequence:

- DCGN241 Statics (3 hr)
- EGGN320 Mechanics of Materials (3 hr)
(prereq: DCGN241)
- EGGN342 Structural Theory (3 hr)
(prereq: EGGN 320)
- EGGN422 Advanced Mechanics of Materials (3 hr)
(prereq: EGGN320)

6. Rock Mechanics / Labwork ASI (12 hrs)

For students interested in Rock Mechanics and Labwork, there are no suitable Minor or ASI Programs already defined in the Engineering Division. However, we suggest that geophysics students consult with the Engineering Division to obtain approval for an ASI using the following course sequence:

- DCGN241 Statics (3 hr)
- EGGN250 Multidisciplinary Engineering Laboratory (1.5 hr)
(prereq: DCGN381)

- EGGN351 Fluid Mechanics (3 hr)
(prereq: DCGN241)
- EGGN320 Mechanics of Materials (3 hr)
(prereq: DCGN241)
- EGGN350 Multidisciplinary Engineering Laboratory (1.5 hr)
(prereq: DCGN381, EGGN 383(???), EGGN250)
(coreq: EGGN351, EGGN320)

3.2 Geology, Geological Engineering, and Hydrogeology

A minor in Geology requires 18 hours of coursework in Geology or Geological Engineering. An Area of Special Interest consists of 12 hours, only three of which may be at the 100- or 200- level, and not more than three of which may be specifically required by the department in which the student is graduating; i.e., Geophysics.

Geophysics students have a huge start toward a Minor in Geological Engineering because the following courses required for the Geophysical Engineering degree count toward a geology minor: SYGN101 Earth and Environmental Systems (4 hr), GEOL309 Structural Geology and Tectonics (4 hr), GEOL314 Stratigraphy (4 hr). These courses total twelve hours; only six more hours are required for a minor. Depending on a student's area of interest, two courses should be selected from the following:

- GEOL212 Mineralogy (3 hr)
(prereq: SYGN101, CHGN124)
- GEOL306 Petrology (4 hr)
(prereq: GEOL212, GEOL314, DCGN209)
- GEGN401 Mineral Deposits (4 hr)
(prereq: GEGN316, DCGN209)
- GEGN438 Petroleum Geology (4 hr)
(prereq: GEOL309 or GEOL315; GEGN316 or GPGN386)
- GEGN467 Groundwater Engineering (4 hr)
(prereq: MACS315, GEOL309, GEOL314)

- GEGN468 Engineering Geology and Geotechnics (4 hr)
(prereq: MNGN321, EGGN461/EGGN463 or consent)

In selecting from the list of courses above, students will note that the prerequisites for GEOL212, GEGN438 and GEGN467 are automatically met by required courses in the Geophysical Engineering program. The other courses would necessitate additional prerequisite credits or consent of the instructor. GEGN438, GEGN467 and GEGN468 are highly recommended for geophysics students interested in those particular areas of application.

For an ASI in Geological Engineering, due to the restrictions noted above, geophysics students must select six credit hours beyond the SYGN and GEOL courses required in Geophysical Engineering. Ironically, this means that two additional geology courses are required for an ASI program; i.e., the same as for a Minor. Hence, geophysics students are advised to pursue the Minor program described above.

3.3 Mining Engineering

Out of the 18 credits required for a minor, the Mining Department generally accepts one course (3 hrs) from the student's regular program, i.e., Geophysical Engineering. For the remaining 15 hours, the following courses are recommended:

- MNGN 210 Introductory Mining (3 hr)
(prereq: none)
- MNGN 312 Surface Mine Design (3 hr)
(prereq: MNGN210)
- MNGN 321 Introduction to Rock Mechanics (3 hr)
(prereq: DCGN241 or MNGN371; coreq: GEOL308 or 309)
- MNGN 314 Underground Mine Design (3 hr)
(prereq: MNGN210)

Note that there are three additional, "hidden" credits required in this course sequence, since MNGN321 has DCGN241 Statics as a prerequisite. Consult instructors to see if these prerequisites can be relaxed. According to their specific interests students may also want to take MNGN 316 Coal Mining Methods (3 hr; prereq: MNGN210), or MNGN438 Introduction to Geostatistics (2 hr; prereq: MACS323).

3.4 Petroleum Engineering

There are no programs outlined by the Petroleum Engineering (PE) Department for either a Minor or ASI. Students interested in a Minor (18 hrs) or ASI (12 hrs) in PE are advised to choose a sequence from the list of recommended courses below and then consult the PE Department for prior approval. It should be noted that there are “hidden” additional credits required in this sequence, since DCGN241 Statics, DCGN209 Thermodynamics, and MACS323 Probability and Statistics are not normally taken by students in the Geophysical Engineering Option.

- PEGN308 - Reservoir Rock Properties (3 hr)
(prereq: DCGN241)
- PEGN310 - Reservoir Fluid Properties (3 hr)
(prereq: DCGN209, PEGN308)
- PEGN408 Introduction to Offshore Technology (3 hr)
(prereq: MACS315)
- PEGN419 - Well Log Analysis and Formation Evaluation (3 hr)
(prereq: PEGN308, PEGN310; coreq: GEOL308)
- PEGN422 - Economics and Evaluation of Oil and Gas Projects (3 hr)
(prereq: MACS323)
- PEGN423 - Petroleum Reservoir Engineering I (3 hr)
(prereq: MACS315 for non PE majors)
- PEGN424 - Petroleum Reservoir Engineering II (3 hr)
(prereq: PEGN423)
- PEGN439/GEGN439/GPGN439 - Multidisciplinary Petroleum Design (3 hr)
(prereq: GPGN302 and GPGN303 for GP Majors)

4 Useful for Young Entrepreneurs

4.1 Economics and Business

For the industrial and commercial world of the future, understanding of business practice and economics, combined with the breadth of the geophysics education, is superb preparation for those whose goal is to become leaders in their organizations, whether they be small start-up companies or large corporations. Future graduates will find an increasing number of career opportunities in small high-tech companies, perhaps shortly after their graduation, and those who choose to work in large corporations will see their value and effectiveness enhanced by their knowledge of both business practice and economics. CSM's Division of Economics and Business offers a program of courses for minors, areas of specialization, and individual electives that is well-targeted for geophysics undergraduates.

In addition to EBG211 (Principles of Economics), which all CSM undergraduates are required to take, 15 additional semester hours are required for the minor in business and economics, and only 9 additional semester hours are required for the area of specialization. For students who wish to bring business sense to a small start-up company, the following are recommendations (all EBG211 courses grant 3 semester hours of credit).

For the Minor:

- *EBG211 - Principles of Economics
- *EBG311 - Microeconomics (how markets for goods and services work; market structure and pricing; efficiency and equity)
- *EBG305 - Financial Accounting (how to read and understand financial statements; and much more; this course is a prerequisite for EBG306 and EBG345)
- *EBG345 - Principles of Finance (investment strategies, financing decisions, capital budgeting, etc.)
(prereq: EBG305)
- EBG314 - Principles of Management (the people side of management)
- EBG306 - Managerial Accounting (how to use accounting information to make management decisions)
(prereq: EBG305)

In the above list, those course numbers preceded by an asterisk indicate courses that constitute a strong sequence for an area of specialization. Other courses that might be of interest for the minor, area of specialization, or as individual electives include

- EBG*421 - Engineering Economics (cash-flow analysis, time value of money and related topics)
- EBG*430 - Energy Economics (development and application of models to current energy issues)

The above lists are also appropriate for graduates who wish to work in a large corporation. EBG*430 and EBG*306 could be particularly useful preparation for employment in a larger company.

The Economics and Business (EB) Division offers other courses, such as those in decision analysis and international economics, that could be of interest as well. Some of those courses are offered only periodically. We recommend that you meet with a faculty member in the EB Division for specific guidance.